Développement et évaluation d'une simulation numérique visant à améliorer les habiletés relationnelles des infirmières dans un contexte de formation continue

Thèse

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Résumé

Les personnes vivant avec le VIH (PVVIH) doivent recourir à un traitement antirétroviral (TAR) à vie pour contrôler leur charge virale et prévenir la transmission du virus. Nombreuses interventions ont ciblé le comportement individuel des PVVIH à prendre leur TAR, mais très peu d'entre elles ont visé la pratique professionnelle des infirmières alors qu'elles sont des acteurs clés dans les soins prodigués à ces personnes. Les infirmières ont une responsabilité sociale et professionnelle de respecter les normes de formation continue afin de développer de nouvelles compétences et de les maintenir à jour pour offrir des soins sécuritaires et de qualité à leur clientèle. Les technologies représentent une modalité prometteuse pour la formation numérique et la prestation des soins. Deux revues systématiques de revues systématiques ont été réalisées pour examiner les effets des technologies de l'information et des communications en santé de même que la formation numérique sur les soins infirmiers. Ce projet doctoral poursuit deux buts généraux : 1) Développer une simulation numérique ; 2) Évaluer quantitativement et qualitativement l'acceptabilité de la simulation auprès des infirmières. Deux objectifs ont permis de développer la simulation : 1.1) Explorer la pratique infirmière et ses défis dans l'accompagnement des PVVIH sous TAR ; 1.2) Décrire le processus de codéveloppement de la simulation et les leçons apprises. L'évaluation de la simulation a été répondue à l'aide de trois objectifs : 2.1) Mesurer les perceptions des infirmières quant aux éléments composant la simulation, sa qualité globale et l'acceptation de la technologie, le rôle de la simulation pour soutenir la pratique professionnelle et l'atteinte des objectifs d'apprentissage ; 2.2) Explorer l'expérience d'apprentissage ; 2.3) Comprendre comment la simulation numérique contribue au renforcement des habiletés relationnelles, à la progression et au transfert des apprentissages en pratique.

Une étude qualitative a permis d'explorer la pratique infirmière et ses défis. Parmi les défis identifiés, notons particulièrement le manque de ressources pour aider un patient dont la prise du traitement est sous-optimale. Ce défi a été transformé en opportunité d'apprentissage dans un scénario clinique simulant l'histoire d'un patient virtuel pour qui la prise du TAR est difficile. Une approche collaborative a permis le codéveloppement de cette simulation numérique, soutenue par l'entretien motivationnel. Une consultation infirmière-patient avec des schèmes de communication préprogrammés a été scénarisée pour favoriser l'application d'habiletés relationnelles auprès du patient virtuel.

L'apprentissage actif est illustré par des « *quiz*[1] » et des rétroactions qui permettent d'apprendre de ses erreurs.

L'évaluation de cette simulation a été réalisée à l'aide d'une étude mixte à devis convergent. Une étude préexpérimentale à groupe unique post-intervention a permis de décrire les perceptions de 27 infirmières quant à la simulation, à l'aide d'un questionnaire en ligne (80 énoncés). Cinq infirmières sur 27 ont participé à la composante qualitative, en partageant leur expérience d'apprentissage via un groupe de discussion en ligne. Une approche narrative a facilité l'intégration des résultats quantitatifs et qualitatifs pour enrichir la compréhension de ce qui a contribué à la progression des apprentissages. Les infirmières ont évalué favorablement l'acceptabilité de la simulation, dont sa qualité globale, l'acceptation de la technologie et les rôles de la simulation sur la pratique. Les infirmières perçoivent que la simulation permet de réfléchir globalement à leur pratique, d'améliorer leurs habiletés de communication et la qualité de la relation thérapeutique. Quatre thèmes illustrent l'expérience d'apprentissage : 1) Motivations à s'engager dans la recherche ; 2) Apprentissage dans un environnement réaliste, immersif, et de non-jugement ; 3) Utilité perçue de la simulation sur le plan des connaissances, de la réflexion, des habiletés relationnelles (importance de la communication, de l'écoute, de la présence) ; 4) Difficultés à s'engager dans la recherche. Les constats mixtes interprétatifs sont les suivants : 1) Le réalisme de la simulation donne l'impression d'avoir une pratique infirmière réelle et une expérience immersive ; 2) Une simulation flexible, perçue efficace et permettant le contrôle sur son apprentissage contribuent positivement à l'expérience ; 3) Conscientisation du soi et réflexion sur sa pratique relationnelle; 4) Consolidation des apprentissages et meilleure confiance en ses capacités.

Mots clés : technologies de l'information et des communications, étude qualitative, étude mixte, formation continue, infirmières, simulation numérique, patient virtuel, VIH.

[1] Nous reconnaissons que l'usage du mot « *quiz* » constitue un anglicisme. Par contre, conformément à la simulation dans laquelle nous référons couramment à ce terme, plutôt qu'à « jeu-questionnaire » par exemple, nous privilégions cette appellation tout au long du projet de thèse.

Abstract

People living with HIV (PLHIV) have to take antiretroviral treatment (ART) for the rest of their lives to control the viral load and prevent HIV transmission. While many interventions have targeted PLHIV's individual behaviour in taking their ART, very few have focused on the professional practice of nurses, even though they are key actors in the healthcare provided to PLHIV. Nurses have a social and professional responsibility to respect continuing education standards, to refresh their skills, and to acquire new ones so as to provide their clients with safe, quality care. Technology is a promising avenue for digital training and delivery of care. Two systematic reviews of systematic reviews were conducted to examine the effects of information and communication technologies as well as e-learning on nursing care. This doctoral project has two general goals: 1) Develop a virtual simulation; 2) Quantitatively and qualitatively assess the simulation's acceptability to nurses. Two objectives were achieved to reach the first goal (simulation development): 1.1) Explore nursing practice to help PLHIV adhere to ART, and the challenges faced by nurses; and 1.2) Describe the simulation codevelopment process and the lessons learned. The second goal (simulation assessment) was met by pursuing the following three objectives: 2.1) Measure the nurses' perceptions of the simulation's design elements, its overall quality and technology acceptance, the simulation's role in supporting the professional practice, and the achievement of the learning objectives; 2.2) Explore nurses' learning experience; and 2.3) Understand how the digital simulation can contribute to nurses' uptake of relational skills, learning progress, and transfer into practice.

A qualitative study was performed to explore the nursing practice and its challenges. Among the challenges identified, one was salient: the lack of resources to help patients whose treatment-taking was suboptimal. This challenge was turned into a learning opportunity in a clinical scenario simulating a virtual patient having difficulty taking their ART. A collaborative approach helped codevelop this virtual simulation, informed by motivational interviewing. A nurse-patient consultation with preprogrammed communication schemes was scripted to encourage the nurses to apply relational skills with the virtual patient. The active learning is supported by quizzes and feedback that help nurses learn from their mistakes.

A convergent mixed methods study was conducted to evaluate the simulation. A pre-experimental study with a one-group post-test design was used to describe 27 nurses' perceptions of the simulation through an online questionnaire (80 items). Five of the 27 nurses participated in the qualitative

component, sharing their learning experience in an online focus group. A narrative approach facilitated the integration of the quantitative and qualitative findings to better understand what contributed to learning progression. The nurses favourably assessed the simulation's acceptability, including its overall quality, technology acceptance, and role in supporting practice. They stated that the simulation made them reflect about their practice as a whole, and helped improve their communication skills and the quality of the therapeutic relationship. Four themes illustrate the learning experience: 1) Motivations to engage in the simulation-based research; 2) Learning in a realistic, immersive, and non-judgmental environment; 3) Perceived utility of the simulation regarding knowledge, reflection, and relational skills (importance of communicating, listening, being present); and, 4) Perceived difficulty in engaging in the simulation-based research. The mixed methods study's interpretative findings are as follows: 1) Influence of the simulation's fidelity on nurses' impression of getting real practice and of having an immersive learning experience; 2) Simulation's perceived flexibility, efficacy, and control over one's learning led to a positive learning experience; 3) Self-awareness and reflection in relational practice; and 4) Consolidation of the knowledge acquired and greater confidence in their abilities.

Keywords: information and communication technologies, qualitative study, mixed methods study, continuing education, nurses, virtual patient simulation, HIV

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[2] Les figures et les tableaux référencés dans les listes se rapportent à ceux qui sont présentés à l'extérieur des articles seulement.

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Liste des acronymes

ASFF	Approche de soins infirmiers fondés sur les forces
CANAC	Canadian Association of Nurses in HIV/AIDS Care
CÉR	Comité d'éthique de la recherche
CÉRUL	Comité d'éthique de la recherche de l'Université Laval
CHUM	Centre hospitalier de l'Université de Montréal
COCQ-sida	Coalition des organismes communautaires québécois de lutte contre le VIH/sida
CRCHUM	Centre de recherche du Centre hospitalier de l'Université de Montréal
EM	Entretien motivationnel
FIC	Formulaire d'information et de consentement
FRQS	Fonds de recherche du Québec santé
HFA	Heures de formation accréditées
IC	Intervalle de confiance
INACSL	International Association for Clinical Simulation and Learning
IRSC	Instituts de recherche en santé du Canada
MEES	Ministère de l'Éducation et de l'Enseignement supérieur
MSSS	Ministère de la Santé et des Services sociaux du Québec
OIIQ	Ordre des infirmières et infirmiers du Québec
PNMVH	Programme national de mentorat sur le VIH et les hépatites
PNMVS	Programme national de mentorat sur le VIH/sida
PVVIH	Personnes vivant avec le VIH
RRISIQ	Réseau de recherche en interventions en sciences infirmières du Québec
SRAP	Stratégie de recherche axée sur le patient
TAR	Traitement antirétroviral
TIC	Technologies de l'information et des communications
Sida	Syndrome de l'immunodéficience acquise humaine
VIH	Virus de l'immunodéficience humaine
UHRESS	Unité hospitalière de recherche, d'enseignement et de soins sur le sida

Liste des sigles

CHERRIES	CHEcklist for Reporting Results of Internet E-Surveys
CONSORT-EHEALTH	Consolidated Standards of Reporting Trials of Electronic and Mobile HEalth Applications and onLine TeleHealth
COREQ	Consolidated Criteria for Reporting Qualitative Studies
GRAMMS	Good Reporting of A Mixed Methods Study
ONUSIDA	Programme commun des Nations Unies sur le VIH/sida
UNAIDS	Joint United Nations Programme on HIV/AIDS
VIH-TAVIE	VIH-Traitement Assistance Virtuelle Infirmière et Enseignement

Liste des abréviations

c.-à-d.	c’est-à-dire
coll.	collaborateurs
cf.	se rapporter à
ex.	exemple

L'écriture déforme les choses, pas dans le sens négatif, mais le simple fait d'écrire distord la réalité, et l'emmène ailleurs, et moi j'aime pouvoir me laisser porter par ça, par cette force qu'a l'écriture de créer des choses qu'on n'avait pas forcément pensées avant de commencer à écrire, et qui émergent dans ce travail-là.
Interview Libération du 1 septembre 2017 — Propos recueillis par Claire Devarrieux — Alice Zeniter

Remerciements

N'est-ce pas une étape formidable que de pouvoir rédiger la partie « Remerciements » d'une thèse ? Cette aventure a été pour moi une source d'apprentissage incroyable sur moi-même, sur le processus de recherche, sur le travail d'équipe, sur l'utilisation stratégique de mots pour convaincre, argumenter, informer, diffuser, rendre intelligibles les choses complexes. Je ne sais pas ce que représente de courir un ultra-marathon, mais j'imagine que certaines similarités existent avec mon aventure doctorale. Toutes deux sont des épreuves de longue durée, qui demandent des ascensions « phénoménales », qui donnent parfois le vertige, qui sont sources de satisfaction et de fierté, avec des descentes obligées, un parcours rocailleux, douloureux à ses heures, qui fatiguent le corps et l'esprit. Il existe bien une ligne d'arrivée, quoique parfois le doute puisse s'installer au cours du cheminement. Mes principaux critères de réussite de cet ultra-marathon, que représente mon projet de thèse, se mesurent bien au-delà de l'épreuve en elle-même, bien au-delà de la « performance d'athlète olympique » ou d'une « productivité académique ». Ils se mesurent à partir d'un accomplissement digne de persévérance; celui d'avoir commencé et terminé le parcours. C'est là où « la gang de supporteurs » méritent des remerciements (sans fin) puisqu'ils ont tous rendu possible mon franchissement de la ligne d'arrivée, chacun à leur manière.

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Je ne peux passer sous silence l'apport des nombreuses autres personnes dans la réalisation de mon projet doctoral. Je commencerais par une personne qui m'a grandement épaulée au cours de mes années d'études :

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Avant-propos

La réalisation d'un projet de thèse se doit d'être ancrée dans des sujets, des thématiques et des approches qui nous passionnent, qui nous alimentent, puisqu'ils cohabitent avec nous pendant de nombreuses années. Ces intérêts initiaux ont d'abord émergé des expériences professionnelles de l'étudiante-chercheuse comme coordonnatrice de recherche. Les travaux de recherche auxquels elle a participé ciblaient notamment l'interface entre l'utilisation des technologies de l'information et des communications (TIC) en santé et la pratique infirmière auprès des personnes vivant avec le virus de l'immunodéficience humaine (PVVIH) qui prennent un traitement antirétroviral (TAR). L'étudiante-chercheuse travaille dans ce domaine depuis treize ans auprès des PVVIH et a participé, entre autres, au développement et à l'évaluation de VIH-TAVIE^{MC} (VIH-Traitement Assistance Virtuelle Infirmière et Enseignement); une intervention virtuelle infirmière visant à optimiser la prise du TAR (Côté et al., 2008; Côté, Godin, et al., 2015; Côte et al., 2011; Côté, Rouleau, et al., 2015). Elle y incarne d'ailleurs le rôle d'une infirmière virtuelle en déployant sa pratique de manière asynchrone par l'intermédiaire de capsules vidéo préenregistrées. Cette pratique virtuelle, fondée sur des savoirs empiriques, théoriques et expérientiels, vise à accompagner les PVVIH dans la consolidation d'habiletés d'autogestion pour optimiser la prise du TAR. Puisque l'intervention VIH-TAVIE^{MC} est destinée à changer le comportement individuel de prise de TAR des PVVIH, l'étudiante-chercheuse s'est ensuite demandé de quelle manière il était possible de renforcer la pratique professionnelle des infirmières[3].

Dans un premier temps, nous avons dressé un portrait très large des effets des TIC et de la formation en ligne sur les soins infirmiers. Pour y parvenir, deux revues systématiques de revues systématiques ont été réalisées pour établir un état des lieux sur cette thématique. Les résultats ont été rapportés dans les deux premiers articles de la thèse aux Chapitres 2 et 3 de la recension des écrits : "Impact of information and communication technologies on nursing care : Results of an overview of systematic reviews" (article 1, publié en avril 2017, Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson et Dubois, 2017) et "Effects of e-learning in a continuing education context on nursing care : Systematic review of systematic qualitative, quantitative, and mixed-studies reviews*"* (article 2, publié en octobre 2019, Rouleau, Gagnon, et al., 2019). Ils ont tous deux été publiés dans *Journal of Medical Internet Research.* Les protocoles de ces revues systématiques de revues systématiques ont aussi été publiés (Rouleau

[3] Dans l'ensemble de cette thèse, l'utilisation des mots féminins « infirmière » et « participante de recherche » comprend également le genre masculin. Ceci ne comporte aucun caractère ou jugement discriminatoire de quelque nature que ce soit, il permet uniquement d'alléger le texte.

et al., 2015; Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017), mais n'ont pas été inclus comme articles dans la thèse.

En parallèle à la conduite de ces revues systématiques de revues systématiques, les autres activités de recherche se sont poursuivies simultanément. Nous nous sommes penchées sur l'exploration de la pratique infirmière pour mieux comprendre les activités infirmières déployées auprès des PVVIH afin de les soutenir dans la prise du TAR, les défis rencontrés par ces infirmières dans leur pratique ainsi que les ressources qu'elles mobilisent. À partir de ces résultats qualitatifs, nous avons pu cibler et prioriser des besoins de formation de ces infirmières. Les résultats de cette étude qualitative sont présentés dans un troisième article de la thèse intitulé "Nursing practice to support people living with HIV with antiretroviral therapy adherence: A qualitative study " (article 3, publié en juillet 2019, Rouleau, Richard, et al., 2019) dans *Journal of the Association of Nurses in AIDS Care.* Au cours de l'analyse de ces données qualitatives, nous avons également rencontré un représentant de la compagnie SimforHealth (2020a), spécialisée en formation numérique pour la formation initiale et continue des professionnels de la santé. Cette compagnie développe des simulateurs sur écran qui permettent de représenter une situation clinique à l'aide de patients virtuels. Ces simulations sont hébergées sur la plateforme MedicActiv (SimforHealth, 2020b). En 2016, les simulateurs développés par cette compagnie visaient presque exclusivement la formation médicale; le domaine des soins infirmiers demeurait une niche à exploiter. L'idée d'établir un partenariat avec SimforHealth a été envisagée suite aux échanges avec cette compagnie et suite aux résultats de notre étude qualitative (*cf.* article 3). Dans cette étude, les infirmières éprouvaient de la difficulté à soutenir adéquatement les PVVIH qui n'adhéraient pas à leur traitement. Cette difficulté a généré chez elles un sentiment d'impuissance et d'échec, et le constat d'un manque de ressources pour les soutenir dans l'aide qu'elles peuvent apporter à leurs patients. Certaines infirmières utilisaient l'entretien motivationnel (EM) (Miller et Rollnick, 2013b) dans leur pratique et souhaitaient être mieux formées à cette approche. La solution proposée a été de développer un simulateur mettant en scène l'histoire d'un homme séropositif éprouvant des difficultés dans la prise de son traitement, situation interpellant la mobilisation des habiletés relationnelles cohérentes avec l'EM. Cette proposition a dès lors été très bien reçue par SimforHealth considérant que le potentiel d'applicabilité d'un futur simulateur pouvait être créé pour l'ensemble des professionnels de la santé et des étudiants. Le cœur de la simulation allait porter sur l'adoption des habiletés relationnelles de l'infirmière dans un contexte de prise de médicaments d'une

personne ayant une condition chronique de santé. L'histoire clinique du patient virtuel atteint du VIH ne joue qu'un rôle instrumental pour favoriser le rapprochement entre la théorie et la pratique.

En consultant la littérature, nous avons constaté que très peu d'évidences existent sur le type d'approche éducative que nous voulions développer afin de cibler les habiletés relationnelles des infirmières en contexte de formation continue. Nous avons donc entrepris le codéveloppement d'une simulation numérique basée, entre autres, sur l'une des approches préconisées par certaines infirmières de notre étude qualitative, soit l'EM. La simulation numérique devenait la modalité utilisée pour renforcer la pratique professionnelle des infirmières. Nous utilisons le terme « codéveloppement » pour définir l'approche collaborative qui a rendu possible la création de la simulation numérique. La méthode de codéveloppement de la simulation a fait l'objet d'un quatrième article, lequel a été publié dans *Journal of Medical Internet Research* sous le titre de " Codeveloping a virtual patient simulation to foster nurses' relational skills consistent with motivational interviewing: A situation of antiretroviral therapy nonadherence " (article 4, Rouleau et al., 2020).

Suite au codéveloppement de la version française de la simulation, nous avons évalué son acceptabilité auprès des infirmières. Considérant que la simulation est centrée sur les habiletés relationnelles, notre prémisse était que ces dernières pouvaient être transférables dans plusieurs contextes de pratique, indépendamment de la maladie qui affecte la clientèle suivie par les infirmières. Cette prémisse a, par conséquent, influencé notre stratégie de recrutement visant l'ensemble des infirmières du Québec plutôt qu'un groupe en particulier, et ce, afin d'obtenir un échantillon plus diversifié.

La simulation étant nouvellement conçue, différentes questions de recherche portant sur plusieurs facettes de l'acceptabilité ont été identifiées. C'est ainsi que l'intégration d'une composante quantitative et qualitative a été envisagée pour nous permettre de mesurer les perceptions des infirmières relatives aux éléments composant la simulation; sa qualité, son acceptation technologique, son rôle pour soutenir la pratique professionnelle et l'atteinte des objectifs d'apprentissage, en plus d'explorer l'expérience d'apprentissage des infirmières. Les résultats de cette étude mixte ont fait l'objet du cinquième article, lequel est en processus de révision dans la revue *BMC Nursing,* sous le titre suivant : " Virtual patient simulation to improve nurses' relational skills in a continuing education context: A convergent mixed-methods study (Rouleau et al., sous révision). "

Un conflit d'intérêts potentiel lié à l'entente de partenariat entre SimforHealth Canada, le Centre hospitalier de l'Université de Montréal et la chercheuse José Côté a été déclaré.

Le projet de thèse a été réalisé sous la direction de madame Marie-Pierre Gagnon (Ph.D) et la codirection de madame José Côté (infirmière, Ph.D). Un comité d'encadrement de la thèse a été constitué. Il est composé des deux directrices de thèse et de madame Lauralie Richard (infirmière, Ph.D).

Cette thèse se divise en dix chapitres et comprend cinq articles scientifiques dont la doctorante est la première auteure. Être première auteure signifie d'assumer le *leadership* de chaque article. La doctorante a conceptualisé le protocole des revues systématiques de revues systématiques et des études, a rédigé les versions initiales jusqu'aux versions finales, lesquelles ont été révisées et bonifiées par les directrices et par l'ensemble des coauteurs. Elle a également mené les diverses collectes de données, a analysé les données et interprété les résultats. Elle a aussi dirigé et contribué au développement du contenu clinique de la simulation numérique. Tout au long du travail de conceptualisation et de rédaction de cette thèse, incluant les articles scientifiques, la doctorante a reçu le soutien et l'accompagnement des directrices. À ceci s'ajoute la contribution de madame Richard, dont l'expertise en recherche qualitative a été mise à profit, particulièrement pour deux des cinq articles de la thèse (*cf.* articles 3 et 5) de même que pour les Chapitres 5 (Considérations méthodologiques) et 9 (Critères de qualité).

Les activités de dissémination scientifique et professionnelle liées exclusivement aux travaux de cette thèse se résument comme suit : sept articles scientifiques, 13 communications scientifiques et 11 communications professionnelles dans les milieux cliniques.

Introduction

Dans cette section, nous allons caractériser l'ensemble de la démarche du projet de thèse. Ensuite, nous définirons les grands concepts d'intérêt, indiqués en *italique,* autour desquels s'articule la thèse.

Nous qualifions l'ensemble de la démarche du projet de thèse comme étant émergente et pragmatique. Le pragmatisme est d'ailleurs discuté dans le Chapitre 4 comme outil de réflexion philosophique. Premièrement, nous décrivons l'émergence par des intérêts initiaux (ex. : technologies, formation, pratique infirmière) qui ont évolué et qui se sont transformés au fil du temps. Dans notre démarche émergente, nous avons saisi des opportunités. Le dénouement parfois inattendu des événements, comme c'est le cas de la rencontre avec SimforHealth, a donné lieu à la création d'une formation de qualité. Nous avons usé de beaucoup de créativité dans la confection de cette simulation. En effet, nous n'avions initialement que peu de repères pour transposer les habiletés relationnelles dans des échanges de communication préprogrammés entre une infirmière et un patient virtuels. Le caractère émergent réside également dans l'utilisation de méthodes qualitatives et mixtes (Hesse-Biber et Leavy, 2006; Morgan, 2006; Patton, 2015b) et dans le recours à des modalités « en ligne » pour réaliser la recherche. Nous avons traduit et adapté un extrait de *Halcolm's Methodology as Journey* rapporté dans Patton (2015b, p. 50) qui illustre bien notre approche émergente de recherche :

> Il y a les idées, concepts, intérêts, théories et méthodes de recherche avec lesquels nous débutons ; les idées naissantes. Ces idées de recherche émergent et évoluent au fur et à mesure que nous y pensons et que nous en parlons avec les autres. À certains moments, tôt pour les uns ou tard pour les autres, les idées se formalisent dans un ou des protocoles. La collecte de données et le travail de terrain se dévoilent : de nouvelles opportunités émergent et nous naviguons avec ces opportunités, les idées continuent d'évoluer. Ce n'est qu'une fois que ces idées sont implantées, mises en action, qu'elles deviennent actuelles. (Dans notre cas, ces idées sont devenues actuelles une fois que les synthèses de connaissances, que le processus de codéveloppement de la simulation et que les collectes de données se sont terminés). Ensuite, quand nous nous immergeons dans les analyses et dans le processus d'écriture, nous revoyons les données et la manière dont elles ont été créées, collectées ou générées : les idées implantées et traduites en action deviennent de plus en plus claires. Les méthodes et les idées formalisées seront connues réellement de manière rétrospective. Les descriptions rétrospectives de ce qui est arrivé réellement constituent les méthodes et idées actuelles.

Un objet de recherche d'intérêt qui est transversal à ce projet de thèse est celui entourant la *santé numérique* et la *formation numérique* (*cf.* articles 1 et 2). La *santé numérique* fait appel à l'utilisation d'outils, de services et de méthodes électroniques et informatiques pour rendre possible la prestation

des services de santé et pour favoriser une meilleure santé (Inforoute Santé du Canada, 2020). Pour illustrer les diverses fonctionnalités de la santé numérique et donc, des TIC qui la composent, nous nous sommes basées sur les écrits de Mair et al. (2009). Les TIC peuvent servir à acquérir, à emmagasiner et/ou à traiter des informations administratives ou cliniques, comme le permettent les systèmes de gestion de données médicales tels que le dossier de santé électronique. Les TIC permettent ensuite l'échange d'informations à des fins de diagnostic, de surveillance, de traitement, d'éducation et de prévention. Diverses TIC peuvent ainsi remplir ces fonctions, comme les systèmes de télécommunication, de télésanté et de télésurveillance. Les TIC soutiennent la pratique clinique fondée sur des lignes directrices, grâce à des outils d'aide à la décision informatisés (Mair et al., 2009). La *formation numérique* se définit largement comme l'acte d'enseigner et d'apprendre par le moyen des technologies. Il s'agit d'un terme parapluie qui englobe une variété d'approches éducatives, de concepts, de méthodes et de technologies. Les *patients virtuels* sont l'une des nombreuses modalités de formation qui peuvent être déployées grâce aux technologies numériques (Car et al., 2019).

La *formation continue* est un objet d'intérêt central au projet de recherche qui circonscrit le contexte de formation aux infirmières, et non aux étudiantes infirmières en formation initiale. La formation continue se définit comme : « un processus permanent, actif et soutenu dans lequel l'infirmière s'engage tout au long de sa vie professionnelle à acquérir, au moyen d'activités d'apprentissage, de nouvelles connaissances qui lui permettront de développer ses compétences et d'offrir à la population des soins et services de qualité (Ordre des infirmières et infirmiers du Québec, 2011, p. 8, OIIQ). » La formation continue représente l'une des composantes centrales du *développement professionnel* infirmier (Shinners et Graebe, 2020) dans lequel l'apprentissage, le changement de pratiques et l'optimisation des compétences professionnelles sont visés. Ultimement, des professionnels compétents sont garants de la protection du public, par la prestation de soins optimaux et de qualité (Harper et Maloney, 2017).

Un autre intérêt a pris racine dans la *pratique infirmière* d'accompagnement des PVVIH à la *prise du TAR*. Nous utilisons abondamment le terme *pratique infirmière*. Nous ne l'avons pas défini au préalable puisque l'objet du troisième article vise justement à explorer et à mieux comprendre cette pratique. Dans la littérature, nous retrouvons fréquemment l'appellation *« adhésion au traitement* » pour faire référence au seuil à partir duquel un patient prend un traitement tel que prescrit et qu'il suit les recommandations du prescripteur (Haynes et al., 2008). Ramirez-Garcia (2009) définit plutôt la *prise*

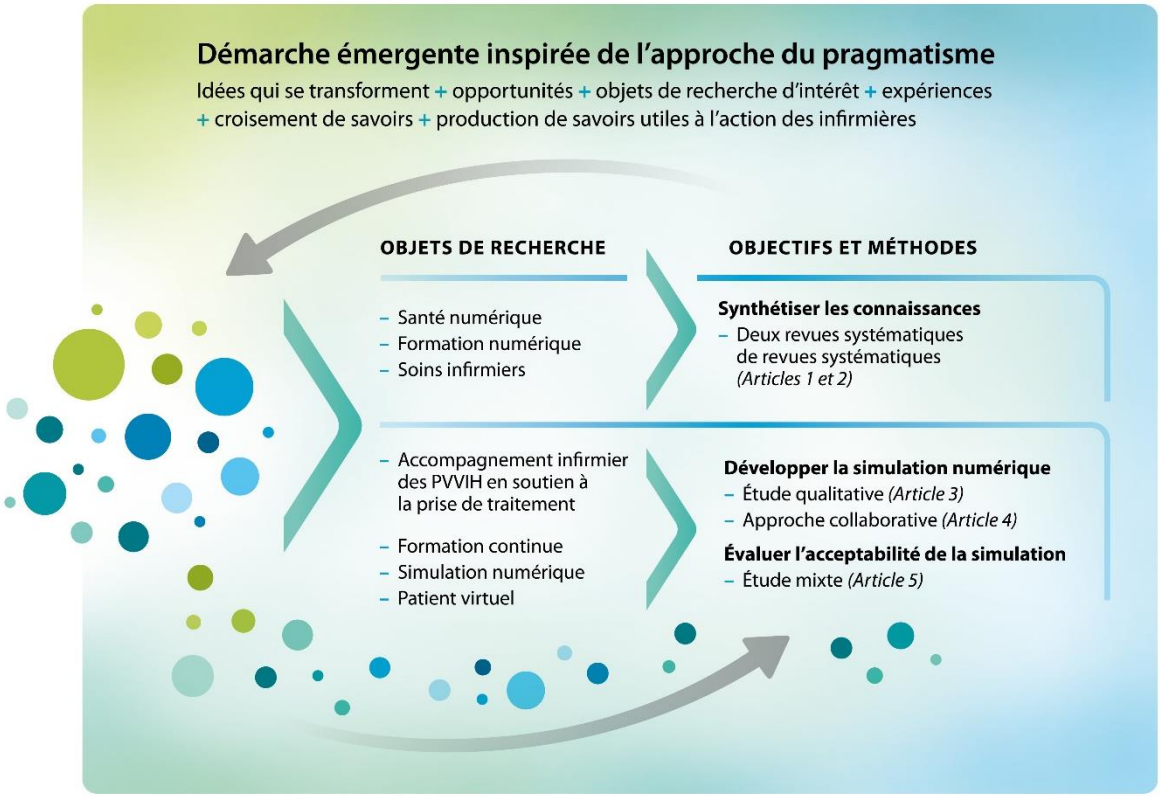
du TAR comme un processus d'apprentissage qui favorise l'engagement actif des PVVIH dans la recherche d'information et dans le développement des habiletés nécessaires à ce comportement. Ainsi, cette définition cible la *prise du TAR* comme un comportement qui s'apprend, s'éloignant ainsi d'une forme de jugement qui caractérise la personne comme étant « adhérente » ou « non-adhérente ». Dans cette optique, l'infirmière devient alors une partenaire de soins, une guide et une conseillère qui accompagne la personne dans ce processus d'apprentissage (Ramirez-Garcia, 2009). Nous privilégions « prise du TAR » lorsqu'il est question du projet de thèse, mais nous utilisons tout de même « adhésion », principalement pour refléter son emploi par les auteurs qui sont cités dans la thèse.

Finalement, pour répondre aux défis et aux besoins identifiés par les infirmières œuvrant auprès des PVVIH, nous avons codéveloppé une *simulation numérique* sur écran avec un *patient virtuel* en collaboration avec une équipe interprofessionnelle (*cf.* article 4). La création fine du contenu clinique et des éléments graphiques a été réalisée par une équipe de travail qui a combiné ses expertises pour mettre sur pied une simulation de qualité. Cette équipe de travail était composée de deux infirmières, détenant une expérience auprès des PVVIH, dans l'application de l'EM et dans le développement d'interventions numériques, et d'une gestionnaire de projet habilitée dans la création de simulateurs numériques. Une équipe interprofessionnelle a participé de manière ponctuelle à la validation des aspects de contenu et de présentation graphique. La *simulation numérique* consiste à recourir à diverses technologies pour permettre aux personnes d'apprendre de leurs erreurs dans un environnement sécuritaire dans lequel il n'y a aucune conséquence pour les vrais patients (Kaplonyi et al., 2017). Un *patient virtuel* peut se définir comme une représentation virtuelle d'un être humain, accessible sur un ordinateur dans une simulation interactive qui représente un cas clinique réel à des fins de formation ou d'évaluation des professionnels de la santé (Ellaway et al., 2006; Ellaway et al., 2008). Dans le cas qui nous intéresse, un *patient virtuel* a été créé, c'est-à-dire un personnage ou un avatar qui représente un être humain. Pour alléger le texte, nous utiliserons *simulation numérique* de manière inclusive pour englober *patient virtuel*.

Pour terminer, l'*acceptabilité* de la simulation numérique a été évaluée à l'aide d'une *étude mixte.* L'acceptabilité est un construit multifacette qui reflète l'étendue avec laquelle les personnes qui offrent ou reçoivent une intervention de soins de santé la considèrent comme étant appropriée, basée sur des réponses émotionnelles et cognitives vécues ou anticipées en réponse à l'intervention (Sekhon et al.,

2017). Une étude mixte est une approche de recherche dans laquelle il y a une intégration de : (a) questions de recherche quantitatives et qualitatives, (b) méthodes/devis quantitatives et qualitatives, (c) techniques pour collecter et analyser les données quantitatives et qualitatives, (d) des résultats quantitatifs et qualitatifs (Pluye et Hong, 2014). La démarche globale du projet de thèse est illustrée à la figure 1.

Figure 1. Démarche globale du projet de thèse



1 Chapitre 1. Contexte de l'étude

1.1 Préoccupation clinique comme point de départ : les personnes vivant avec le VIH sous traitement antirétroviral

En 2018, le Programme commun des Nations Unies sur le VIH/sida[4] (ONUSIDA, 2019) estimait que 37.9 millions de personnes vivaient avec le VIH à travers le monde. Au Canada, à la fin de 2016, le nombre de personnes diagnostiquées du VIH s'élevait à plus de 63 000 (Agence de la santé publique du Canada, 2018). L'ONUSIDA (2014, 2016, 2017) s'est engagé à mettre fin à l'épidémie d'ici 2030. Pour y parvenir, la cible du 90-90-90 est proposée pour 2020 : (a) 90% des PVVIH connaîtront leur statut sérologique ; (b) 90% des personnes ayant reçu un diagnostic de VIH recevront un TAR durable; (c) 90% des personnes sous traitement auront une suppression durable de leur charge virale. Au Canada, à la fin de 2016, le portrait de l'objectif 90-90-90 était le suivant pour les PVVIH : (a) 86 % connaissaient leur statut sérologique ; (b) 81 % des personnes diagnostiquées étaient sous TAR ; (c) 91 % des personnes traitées avaient une charge virale supprimée (Agence de la santé publique du Canada, 2018).

La prise du TAR, communément appelée « l'adhésion au traitement », est primordiale pour atteindre l'objectif thérapeutique d'une charge virale indétectable dans le sang. Les résultats d'une méta-analyse (Bezabhe et al., 2016) regroupant 43 études (27 905 PVVIH) dans 26 pays n'ont pas démontré de différences significatives sur le risque d'échec thérapeutique en fonction de différents seuils d'adhésion : ≥98–100%, ≥95%, ≥80–90. Dans cette méta-analyse, 63.4 % des PVVIH avaient une prise optimale du TAR, c'est-à-dire un taux minimal d'adhésion de 80 %. Conséquemment, une prise optimale du TAR réduit les risques : de progression de l'infection vers la phase du sida, de développement et de transmission de résistances au traitement et de transmission de l'infection (Bangsberg et al., 2006; Cohen et al., 2011; Montaner et al., 2014). La prise du TAR représente ainsi un enjeu de santé publique majeur. Il a été démontré qu'une charge virale indétectable maintenue en bas de 200 copies/ml durant une période consécutive de six mois comporte un risque négligeable de transmission sexuelle du VIH chez les couples sérodiscordants, c'est-à-dire pour les partenaires ayant des statuts sérologiques différents (Cohen et al., 2011; LeMessurier et al., 2018). Cette source de

[4] Syndrome d'immunodéficience acquise

connaissance a donné lieu à un mouvement connu et répandu mondialement nommé I=I, qui signifie « Indétectable égale Intransmissible » (Betancourt, 2018). Le traitement est maintenant reconnu comme un outil de prévention efficace et recommandé dans les lignes directrices internationales à titre de prophylaxie pré et post-exposition (World Health Organization, 2015).

Les avancées scientifiques ont fait en sorte que le TAR est plus simple (moins de comprimés) et mieux toléré, c'est-à-dire, avec moins d'effets secondaires qu'autrefois (Barroso et al., 2017). Pourtant, la prise du TAR sur une base quotidienne demeure un défi important pour les personnes vivant avec cette maladie chronique qu'est le VIH. La complexité d'une prise régulière s'explique bien au-delà des caractéristiques du traitement. Une métasynthèse regroupant 127 études qualitatives a été conduite pour identifier les expériences des PVVIH qui commencent un TAR et qui le maintiennent une fois la charge virale supprimée (Barroso et al., 2017). Les expériences de ces PVVIH ont été organisées selon la pyramide de Maslow (1970), à l'intérieur de laquelle les besoins universels en lien avec la prise du TAR ont été hiérarchisés. Par exemple, les besoins situés à la base de la pyramide, qui sont de nature physiologique et biologique (ex. : se loger, se nourrir), doivent être comblés avant que la personne n'aspire aux besoins des « paliers supérieurs », soit, les besoins de sécurité, suivis des besoins d'appartenance et d'amour, les besoins d'estime, les besoins cognitifs jusqu'aux besoins de transcendance (en haut de la pyramide). Concrètement, une personne qui prend un TAR doit avoir accès à de la nourriture (besoin physiologique) puisque bien souvent, le traitement doit être pris en mangeant. Pour avoir accès au TAR, la personne doit avoir suffisamment d'argent pour en faire l'achat. Les PVVIH qui se sentent accueillies par les professionnels de la santé, qui entretiennent une relation collaborative avec eux, dans un climat de non-jugement et de communication ouverte, sont des manifestations reflétant des besoins de sécurité, d'amour et d'appartenance. L'ensemble de ces besoins, comblés ou non, ont donc une influence sur l'engagement des PVVIH à prendre leur TAR. En résumé, la prise du TAR, « ce n'est pas juste la pilule » (Barroso et al., 2017). Les résultats de cette métasynthèse aident à situer la complexité du TAR et mettent en lumière que la qualité de la relation avec les professionnels de la santé représente l'un des besoins importants à combler qui vient influencer les PVVIH dans la prise du TAR.

1.2 Contributions infirmières dans cet accompagnement des personnes vivant avec le VIH dans la prise du traitement antirétroviral

Les infirmières sont des acteurs clés pour accompagner les personnes vivant avec des maladies chroniques (Forbes et While, 2009), comme le VIH (Dumitru et al., 2017), dans la gestion de leur condition. Une analyse qualitative de 18 manuels pédagogiques utilisés pour la formation en sciences infirmières a été réalisée pour examiner les représentations du VIH, des PVVIH et des soins infirmiers qui y sont véhiculées (Cator et Gagnon, 2018). Les résultats suggèrent que les manuels sont centrés en grande partie sur la dimension biomédicale entourant le VIH, les PVVIH et les soins infirmiers. Le rôle infirmier y est décrit notamment en matière de gestion des risques de transmission et de surveillance des symptômes, des résultats de laboratoire (dont la charge virale) et d'adhésion au TAR. Cette dimension biomédicale résonne avec ce que Gottlieb et Gottlieb (2014) surnomment comme étant une « approche de soins fondés sur les déficits », dont l'accent est mis sur les problèmes médicaux et sur l'état de santé. Dans cette approche, le plan de soins infirmiers est formulé à partir de ce qui doit être réglé. Évidemment, les infirmières œuvrant auprès des PVVIH ne peuvent faire abstraction de cette dimension biomédicale. Elles peuvent utiliser les pertes et les déficits pour formuler des forces de la personne et de sa famille (Allen et Warner, 2002). Autrement dit, les problèmes ou enjeux médicaux, les faiblesses et déficits ne sont pas ignorés : ils sont plutôt contrebalancés avec les forces de la personne/famille (Gottlieb, 2014). Nous référons ici à une « approche de soins infirmiers fondés sur les forces » (Gottlieb et Gottlieb, 2014). Dans cette perspective, la mission première des soins infirmiers est donc de promouvoir la santé en interpellant les capacités d'adaptation de la personne (Gottlieb et Rowat, 1987). Les soins infirmiers visent à impliquer la personne/famille dans ce processus d'apprentissage pour acquérir de nouvelles façons de vivre et d'être en santé (Allen, 1983). La santé est plus que l'absence de la maladie : elle est une manière de développer les forces de la personne - ses capacités, compétences et habiletés - pour maximiser son fonctionnement. Le rôle des infirmières consiste, entre autres, à découvrir et à utiliser les propres forces et les ressources de la personne pour l'aider à atteindre un état de santé supérieur (Gottlieb, 2014).

La gestion du TAR, c'est-à-dire l'initiation au traitement, le soutien et le suivi, s'inscrit comme l'une des compétences centrales des infirmières telles que décrites dans des lignes directrices internationales et canadiennes (Canadian Association of Nurses in HIV/AIDS Care, 2013a, CANAC; Dumitru et al.,

2017; Relf et al., 2011). De plus, des résultats probants suggèrent que des interventions menées par des infirmières ont des effets positifs sur la prise du traitement[5]. Les résultats d'une revue systématique incluant dix études primaires (dont sept incluent des PVVIH) suggèrent que toutes les stratégies employées par les infirmières, telles que le « *counseling »* personnalisé, la formation et les rappels, ont amélioré la prise de traitement des personnes vivant avec une maladie chronique, incluant les PVVIH (Van Camp et al., 2013). Parmi les cinq études dans lesquelles le pourcentage moyen d'adhésion était rapporté, les différences de moyennes standardisées étaient de +5.39 (1.70–9.07) (court terme) et +9.49 (4.68–14.30) (long terme), en faveur des groupes d'intervention. Parmi les études dans lesquelles l'adhésion était rapportée de manière dichotomique, les rapports de cote étaient de 1.55 (1.04–2.29) (court terme) et de 1.87 (1.35–2.61) (long terme). Plus long était le « *counseling »*, meilleurs étaient les résultats. Par ailleurs, un essai randomisé contrôlé (n=221 PVVIH) a été réalisé (de Bruin et al., 2017) pour comparer les effets d'une intervention menée par des infirmières qui mobilisaient une variété de stratégies d'autogestion (ex. : fixer un objectif d'adhésion, encourager l'auto-évaluation) à ceux d'une approche de soins usuelle. Les résultats ont démontré qu'aux trois temps de mesure post-intervention (5, 10 et 15 mois), la charge virale était 1.26 fois plus élevée (95% IC[6] 1·04–1·52) dans le groupe contrôle (moyenne marginale estimée de 44.5 copies/ml [95% IC 35.5–55.9]) que dans le groupe intervention (moyenne marginale estimée de 35.4 copies/ml [95% IC 29.9–42.0]).

Dans la littérature, nombreuses sont les interventions destinées directement aux PVVIH qui ciblent le changement de comportement individuel, soit la prise du TAR (Amir et al., 2018; Mbuagbaw et al., 2015). Pour appuyer notre propos sur l'abondance de cette littérature, Rooks-Peck et coll. (2019) ont répertorié 41 revues systématiques publiées entre 1996 et 2017 portant sur des interventions centrées sur les PVVIH, telles que la messagerie texte, les traitements directement observés (c'est-à-dire sous la supervision d'un professionnel de la santé ou d'un intervenant), les interventions comportementales (ex. : gestion de stress, EM) et les approches éducatives (ex. : stratégies d'autogestion). Malgré le rôle indéniable des infirmières et leurs contributions dans l'accompagnement des PVVIH sous TAR, il n'existe pas, à notre connaissance, d'intervention éducative visant à rehausser les habiletés des infirmières dans ce champ de pratique en formation continue. Mill et al. (2014) soulèvent que les opportunités de formation continue concernant les soins infirmiers liés au VIH demeurent limitées. Les

[5] Traitement est utilisé de manière interchangeable avec «médicaments ».
[6] IC : intervalle de confiance

professionnels de la santé, comme les infirmières, ont une responsabilité sociale et une obligation de respecter les normes professionnelles (Fleet et al., 2008) en matière de formation continue, quel que soit leur champ de pratique. Une offre de formation continue est donc une avenue souhaitable pour soutenir cette pratique d'accompagnement à la prise du TAR.

1.3 Utilisation des technologies comme modalité pour soutenir la formation continue

Les infirmières à la recherche d'opportunités de formation continue font face à des enjeux qui vont au-delà de la seule volonté de s'y engager et de participer. Les ressources humaines et financières dans les milieux de soins sont parfois restreintes, faisant en sorte que les contraintes de temps, de coûts liés aux formations, de temps de déplacement, de manque d'effectifs infirmiers, de surcharge de travail, de méconnaissance des opportunités de formation, peuvent représenter des barrières (Gallagher, 2007; Shahhosseini et Hamzehgardeshi, 2015). Le recours à la formation numérique est une solution possible pour atténuer ces barrières en brisant les frontières géographiques, en étant accessible de l'endroit et du moment déterminés par l'apprenant, en étant moins coûteuse, tout en permettant d'apprendre à son rythme (Clark et Mayer, 2016). Nous nous attardons à un type spécifique de formation numérique, soit celle de la simulation numérique avec un patient virtuel, pour les raisons énoncées précédemment.

Dans une revue systématique qualitative, 185 descriptions de patients virtuels ont été extraites pour cartographier les concepts y étant associés (Hege et al., 2016). Les patients virtuels sont décrits en lien avec leur caractère authentique (ou réaliste) et interactif. Ils sont des vecteurs pour offrir des rétroactions. Ils comprennent différents degrés de variabilité et d'adaptabilité. Par exemple, les patients virtuels peuvent être représentés dans divers scénarios cliniques (variabilité) et s'adapter aux besoins et aux connaissances de l'apprenant. Ils sont accessibles via plusieurs types de média et d'environnements (ex. : réalité virtuelle dans un environnement immersif en trois dimensions). Finalement, les patients virtuels se distinguent en fonction de leur format de conception, comme une approche de navigation linéaire ou par branchement. Kononowicz, Zary, Edelbring, Corral et Hege (2015) proposent, à partir d'une analyse de 330 articles en formation médicale, une classification de différents types de patients virtuels (ex. : programme de simulation ou mannequin de haute-fidélité, jeux avec patients virtuels, patients standardisés humains, scénario interactif), organisés selon des technologies (ex : monde virtuel, agent conversationnel, réalité hybride de simulation) et des

compétences distinctes (ex : connaissances, habiletés procédurales, communication, raisonnement clinique). En résumé, il existe une grande variabilité d'usages des « patients virtuels » au sein des simulations numériques.

Les patients virtuels contribuent de plus en plus à la formation des professionnels de la santé, si l'on se réfère au nombre de revues systématiques publiées dans le domaine (Bracq et al., 2019; Cant et Cooper, 2014; Consorti et al., 2012; Cook, Erwin, et al., 2010; Kononowicz et al., 2019; Peddle et al., 2016). La population incluse dans ces revues demeure en grande partie composée d'étudiants dans les professions en santé, dont ceux en médecine et en sciences infirmières. L'utilisation de la simulation, numérique ou non, est moins fréquemment documentée dans un contexte de formation continue auprès des infirmières (Cantrell et al., 2017; Cook, Erwin, et al., 2010; Jansson et al., 2013). Une revue parapluie (n=97) a été conduite par Cantrell et collaborateurs (2017) pour examiner les impacts des expériences d'apprentissage basées sur la simulation sur les résultats des apprenants en soins infirmiers (étudiantes et infirmières). La taille de l'effet de la simulation s'est avérée moindre chez les infirmières comparativement aux étudiantes dans la plupart des études rapportées, à l'exception de deux qui ont démontré des effets favorables pour les infirmières. Les auteurs ne précisent pas la taille de l'effet en question et n'ont pas réalisé de méta-analyse pour appuyer ces différences. Une hypothèse qui expliquerait que les effets de la simulation sont moindres auprès des infirmières repose possiblement sur les aspects relatifs aux contextes des milieux cliniques, comme les effectifs, le temps et les coûts. Ces aspects pourraient altérer l'expérience de la simulation dans la pratique, et conséquemment réduire son efficacité potentielle. Ces deux populations (étudiantes et infirmières) étant distinctes; la simulation pourrait les influencer différemment.

Dans une revue systématique (Hegland et al., 2017), incluant 15 essais randomisés, l'efficacité de tous types de simulation, numériques ou non, a été évaluée sur les connaissances et les habiletés des infirmières. Une analyse de sous-groupe (n=3 études) a permis de reconnaître une différence significative en faveur de la simulation numérique, avec une différence de moyenne standardisée de 1.06 (IC de 95 % entre −1.50 et −0.62) comparativement à d'autres types d'approches (ex. : simulation de haute-fidélité avec mannequin, CD-ROM interactif) pour améliorer les connaissances et les habiletés des infirmières. Par ailleurs, les résultats d'une revue intégrative (n=28 articles) soutiennent les retombées positives des patients virtuels sur les habiletés non techniques des étudiants en santé, comme le travail d'équipe, la communication et la prise de décisions (Peddle et al., 2016). Quant aux

résultats d'une méta-analyse incluant 51 essais randomisés (Kononowicz et al., 2019), l'utilisation des patients virtuels, comparativement à la formation traditionnelle – c'est-à-dire des approches non numériques comme les cours magistraux, les conférences et les discussions en groupe - est aussi efficace pour améliorer les connaissances des étudiants. Les patients virtuels seraient par contre plus efficaces pour rehausser les habiletés, comme le raisonnement clinique, les habiletés procédurales (ex. : réanimation cardio-respiratoire, examen physique de l'abdomen) et un mélange d'habiletés procédurales et de travail d'équipe.

1.4 Pertinence du projet doctoral

En premier lieu, l'importance du rôle infirmier pour soutenir les PVVIH dans la prise du TAR a été mise en évidence. L'un des moyens pour soutenir le développement professionnel et le maintien des compétences des infirmières tout au long de leur trajectoire de carrière passe par les activités de formation continue. Considérant que certaines barrières peuvent freiner la participation des infirmières aux activités de formation continue, nous proposons d'innover dans l'offre de formation continue qui leur est destinée. Nous soulevons le besoin de développer une simulation numérique qui s'adresse aux infirmières pour soutenir leur pratique professionnelle d'accompagnement de leur clientèle atteinte de maladies chroniques dans la gestion du traitement.

1.5 Buts et objectifs de la recherche

Ce projet de recherche poursuit deux grands buts : 1) Développer une simulation numérique ; 2) Évaluer quantitativement et qualitativement l'acceptabilité de cette simulation numérique auprès des infirmières dans un contexte de formation continue.

Le premier but, soit le développement de la simulation, se divise en deux objectifs de recherche : 1.1) Explorer et mieux comprendre la pratique infirmière d'accompagnement des PVVIH dans la prise de leur TAR, les défis rencontrés et les ressources mobilisées (*cf.* article 3) ; 1.2) Décrire le processus de codéveloppement de la simulation numérique, l'intervention en elle-même (dont le contenu), de même que les défis et les stratégies utilisées (*cf.* article 4).

Le deuxième but évaluatif englobe ces trois objectifs : 2.1) Mesurer quantitativement les perceptions des infirmières concernant les éléments de la conception pédagogique de la simulation, la qualité globale du système et l'acceptation de la technologie, le rôle de la simulation pour soutenir la pratique professionnelle des infirmières et l'atteinte des objectifs d'apprentissage ; 2.2) Explorer qualitativement l'expérience d'apprentissage des infirmières basée sur la simulation ; 2.3) Comprendre comment la simulation numérique contribue au renforcement des habiletés relationnelles, à la progression des apprentissages des infirmières et à leur transfert en pratique.

2 Chapitre 2. Recension des écrits – Volet 1

Une phase préliminaire et parallèle au projet de thèse s'est effectuée en faisant un état des lieux sur les effets des TIC en santé et de la formation numérique sur les soins infirmiers. Deux revues systématiques de revues systématiques ont ainsi été réalisées de manière concurrente à la recherche doctorale. Les résultats obtenus de ces deux revues de revues ont permis de « diagnostiquer » l'éventail des effets positifs et négatifs de ces technologies sur plusieurs indicateurs des soins infirmiers. Les résultats sont donc informatifs pour situer l'état des connaissances à l'interface des technologies et des soins infirmiers. Ces résultats synthétisés n'ont toutefois pas permis de cibler, par exemple, les différentes TIC et les approches de formation numérique, de même que leurs composantes, qui étaient les plus efficaces pour déterminer le choix d'une technologie à privilégier dans le cadre de notre projet. Les articles 1 et 2 font état de la recension des écrits du projet de thèse.

2.1 Article 1. Impacts of information and communication technologies on nursing care: Results of an overview of systematic reviews[7]

2.1.1 Résumé

Les TIC sont une modalité de prestation des soins de santé courante chez les infirmières et peuvent influencer leur pratique, modifier leurs manières de planifier, prodiguer, documenter et d'assurer le suivi des soins. Nous avons entrepris une revue systématique de revues systématiques quantitatives, qualitatives et mixtes pour tracer un portrait de ces indicateurs des soins infirmiers qui sont influencés par l'utilisation des TIC. Le Cadre de performance des soins infirmiers (Dubois et al., 2013) a été adopté pour analyser les données et pour interpréter les résultats en fonction d'une perspective systémique, regroupant à la fois les ressources infirmières, les services/processus infirmiers de même que les résultats sensibles aux soins infirmiers (condition et santé des patients). L'article 1 fait état des résultats d'une synthèse rigoureuse de 22 revues systématiques dans lesquelles 19 indicateurs relatifs aux soins infirmiers sont influencés par les TIC.

[7] Rouleau, G., Gagnon, M.-P., Côté, J., Payne-Gagnon, J., Hudson, E. & Dubois, C.-A. (2017). Impact of information and communication technologies on nursing care: Results of an overview of systematic reviews. *Journal of Medical Internet Research*, 19(4), e122. https://doi.org/10.2196/jmir.6686

2.1.2 Abstract

Background: Information and communication technologies (ICTs) are becoming an impetus for quality health care delivery by nurses. The use of ICTs by nurses can impact their practice, modifying the ways in which they plan, provide, document, and review clinical care.

Objective: An overview of systematic reviews was conducted to develop a broad picture of the dimensions and indicators of nursing care that have the potential to be influenced by the use of ICTs.

Methods: Quantitative, mixed-method, and qualitative reviews that aimed to evaluate the influence of four eHealth domains (eg, management, computerized decision support systems [CDSSs], communication, and information systems) on nursing care were included. We used the Nursing Care Performance Framework (NCPF) as an extraction grid and analytical tool. This model illustrates how the interplay between nursing resources and the nursing services can produce changes in patient conditions. The primary outcomes included nurses' practice environment, nursing processes, professional satisfaction, and nursing-sensitive outcomes. The secondary outcomes included satisfaction with ICTs according to nurses' and patients' perspectives. Reviews published in English, French, or Spanish from January 1, 1995 to January 15, 2015 were considered.

Results: A total of 5515 titles or abstracts were assessed for eligibility and full-text papers of 72 articles were retrieved for detailed evaluation. It was found that 22 reviews published between 2002 and 2015 met the eligibility criteria. Many nursing care themes (ie, indicators) were influenced by the use of ICTs, including time management; time spent on patient care; documentation time; information quality and access; quality of documentation; knowledge updating and utilization; nurse autonomy; intra- and interprofessional collaboration; nurses' competencies and skills; nurse-patient relationships; assessment, care planning, and evaluation; teaching of patients and families; communication and care coordination; perspectives of the quality of care provided; nurses and patients satisfaction with ICTs; patient comfort and quality of life related to care; empowerment; and functional status.

Conclusions: The findings led to the identification of 19 indicators related to nursing care that are impacted by the use of ICTs. To the best of our knowledge, this was the first attempt to apply NCPF in the ICTs' context. This broad representation could be kept in mind when it will be the time to plan and to implement emerging ICTs in health care settings.

Trial registration: PROSPERO International Prospective Register of Systematic Reviews: CRD42014014762;
http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42014014762 (Archived by WebCite® at http://www.webcitation.org/6pIhMLBZh)

Keywords: information and communication technology; eHealth; telehealth; nursing care; review, overview of systematic review

2.1.3 Introduction

Background

The use of information and communication technologies (ICTs) for health, referred to as eHealth (Eng, 2001; World Health Organisation, 2016) represent a means to support health care delivery (Carrington et Tiase, 2013). These technologies change how nurses plan, deliver, document, and review clinical care; this will only continue as technology advances. The processes whereby nurses receive and review diagnostic information, make clinical decisions, communicate and socialize with patients and their relatives, and implement clinical interventions will be fundamentally modified with further integration of ICTs into nursing practice (Institute of Medicine, 2011; Monteiro, 2016).

There is a wide range of ICTs used for supporting and providing health care. Mair et al. (2009) suggested four general domains of eHealth that include a variety of ICTs: management systems, communication systems, computerized decision support systems (CDSSs), and information systems. Management systems allow for the acquisition, storage, transmission, and display of administrative or clinical activities related to patients, such as electronic health records (EHRs) or electronic medical records (EMRs). Communication systems can be used for diagnostic, management, counseling, educational, or support purposes. They can be implemented to facilitate communication between health professionals or between health professionals and patients. There are a wide range of communication systems, varying from email and mobile phones to telemedicine and telecare systems. CDSSs are automated systems accessible from various devices, such as computer, mobile phone, or personal digital assistants (PDAs). They support decision-making for health professionals and assist them in practicing within clinical guidelines and care pathways. Information systems, such as Web-based resources and eHealth portals, refer to the use of Internet technology to access health-related information sources.

To support complex and diversified practices and interventions in nursing, myriad ICTs can be adopted, though not without challenges. Some ICTs, such as EHRs and computerized nursing care plans, facilitate access to patient information and help to document and plan nursing care (Sullivan, 2015). However, with the use of these technologies, nurses are expected to change the way they document patient care by shifting from paper-based records to electronic systems. The features (eg, copy and paste, electronic interface, drop-down menus) of electronic nursing documentation may affect critical thinking and accuracy of documentation (Kossman et Scheidenhelm, 2008). Telehealth technologies are another example, which include a wide range of ICTs such as remote patient monitoring, videoconferencing, and computer-mediated communications (Nagel et Penner, 2016). In the case of remote patient monitoring (telemonitoring), nurses must be able to process a large quantity of data from the system (eg, vital signs, symptoms) and then use clinical decision skills to respond properly to each patient's condition (Barrett, 2012). In order to discern cues within the interactions via technological modalities, specific communication skills remain essential, that is, active listening, facilitating conversation, questioning, redirecting, and verifying (Greenberg, 2009; Purc-Stephenson et Thrasher, 2010; Romero et al., 2012).

ICTs are becoming an impetus for quality health care delivery by nurses. It is thus relevant to study the role of nurses in the clinical use of ICTs (Carrington et Tiase, 2013) as well as the impacts of ICTs on nursing practices (de Veer et al., 2011). The use of any type of ICT to provide direct or indirect care to patients may transform nurses' day-to-day practice (Carrington et Tiase, 2013). In some systematic reviews, different types of ICTs have been reviewed, for instance, EHRs (Stevenson et al., 2010), nursing computerized records systems (Urquhart et al., 2009), or CDSSs (Anderson et Willson, 2008). In general, nursing practice or nursing care was not well-defined in those reviews, and there was no conceptual framework enabling reflection on the way ICTs could influence indicators of nursing care. To overcome this gap, we used a broad and comprehensive conceptualization of nursing care based on the Nursing Care Performance Framework (NCPF) (Dubois et al., 2013) to embrace a multidimensional perspective of nursing care. The NCPF is composed of three distinct but interrelated subsystems: nursing resources, nursing services, and patients' conditions. It is defined as "the capacity demonstrated by an organization or an organizational unit to acquire the needed nursing resources and use them in a sustainable manner to produce nursing services that effectively improve patients' conditions (Dubois et al., 2013, p. 6)."

However, an integrated body of knowledge was lacking with respect to the effects of ICTs on nursing care, because of the heterogeneity of ICTs used in the literature as well as the poor conceptualization of nursing care. We conducted an overview of systematic reviews to develop a broad picture of the indicators of nursing care that have the potential to be enhanced or constrained by the use of ICTs. The use of an overview is an interesting starting point from which to compare and contrast outcomes of separate reviews (Smith et al., 2011) regarding the positive, negative, and neutral effects of ICTs on nursing care.

Objectives

We conducted an overview of systematic reviews to systematically summarize the evidence that comes from qualitative, quantitative, and mixed-method systematic reviews regarding the effects of ICTs on nursing care.

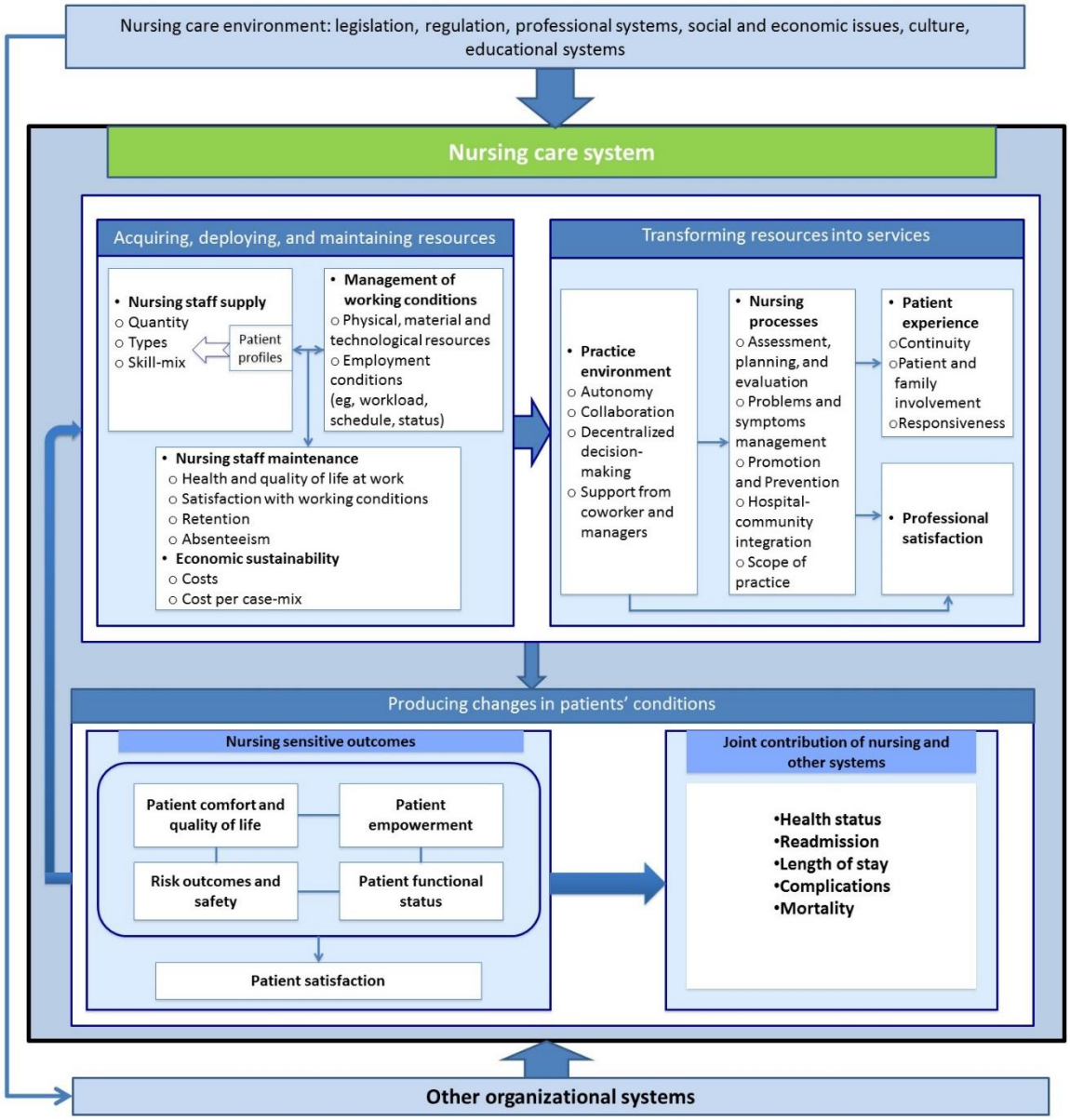
Nursing Care Performance Framework

In order to illustrate how ICTs interventions influence nursing care and impact health outcomes, an organizational model was used (Dubois et al., 2013). The NCPF represents a synthesis of the most recent developments in the field and is part of leading initiatives aiming to conceptualize nursing care performance. Conceptualization of nursing care performance is based on a system perspective that builds on system theory (Reid et al., 2005), Donabedian's earlier works on health care organization (1972), and Parsons' theory of social action (1960).

This model, illustrated in Figure 1, is composed of 14 dimensions and 51 indicators and shows how the interplay of three nursing subsystems (resources, processes or services, and patients' outcomes) can operate to achieve three key functions: (1) acquiring, deploying, and maintaining nursing resources; (2) transforming nursing resources into nursing services; and (3) producing changes in patients' conditions in response to the nursing services provided ("nursing-sensitive outcomes"). The first function refers to the human and material resources needed to provide effective nursing care, such as nursing staff supply, working conditions, staff maintenance, and economic sustainability. The second function encompasses nurses' practice environments (eg, nurse autonomy; collaboration), nursing processes (eg, assessment, care planning, and evaluation; problems and symptom management), and nurses' professional satisfaction, and patient experience. The desirable end result of the interactions between nursing staff and nursing processes is to improve patients' conditions. The third function is

then described as the positive changes that can be detected among patients (also called "nursing-sensitive outcomes").

Figure 1. Nursing Care Performance Framework.



The 51 indicators capture the content currently supported by the scientific literature and cover all major areas of nursing care performance. More than a simple list of indicators, the NCPF provides an integrative and systemic framework that has been used in recent studies to analyze various dimensions of nursing care (Rapin et al., 2015; VanFosson et al., 2016). The NCPF has been used, for example,

to structure a scoping review undertaken to identify indicators that are sensitive to ambulatory nursing (Rapin et al., 2015). The results showed the capacity of NCPF to be extended and applied to ambulatory nursing care and furthermore, five new indicators have been added to the framework. The authors of the NCPF have suggested that further studies should be conducted to assess the implementation of the framework in different contexts of nursing care (Dubois et al., 2013). This overview constitutes a first attempt to use and apply the NCPF to structure and analyze the indicators of nursing care that are influenced by ICTs. We expect that using the NCPF will confirm existing indicators, add new indicators specific to the context of ICTs, and eventually modify existing indicators.

In this overview, our main interest was to extract data related to nurses. For instance, if results of a systematic review were exclusively on patient outcomes without describing nursing resources, services, or processes, the review was excluded. However, we considered nursing sensitive outcomes (ie, patients' outcomes) as long as they could be related to ICTs use by nurses.

2.1.4 Methods

Overview and Eligibility Criteria

The protocol of this overview has been registered on PROSPERO (CRD42014014762) and published elsewhere (Rouleau et al., 2015). We followed the Cochrane Collaboration methodology (Becker et Oxman, 2011) and other relevant works in this domain (Smith et al., 2011; Worswick et al., 2013) to develop the overview. The scope was formulated using PICOS [participants, interventions, comparisons, outcomes, study design] (Centre for reviews and dissemination, 2009; O'Connor et al., 2011). All types of qualitative, mixed-method, and quantitative reviews, published in French, English, or Spanish from January 1, 1995 and that aimed to evaluate the influence of ICTs (four eHealth domains) used by nurses on nursing care were eligible. The inclusion of reviews using multiple methodological approaches is justified by the possibility of broadening the understanding of the impact of ICTs on nursing care. The populations of interest were registered nurses (RN), nurses in training, nursing students, or patients receiving care from qualified RN through the medium of ICTs. The interventions targeted were the use of ICTs covered in the four eHealth domains suggested by Mair et al (2009): (1) management systems; (2) communication systems; (3) CDSSs; and (4) information systems. The following ICTs were excluded: (1) nurse management systems, which are purely administrative and designed for the management of human resources and working conditions (eg, scheduling) and nursing staff maintenance (such as retention); (2) educational systems, for example,

e-learning initiatives used for the training of nursing students, unless they are applied to direct patient care; and (3) telephone systems, because according to most definitions of ICTs (Bashshur et al., 2009; Gagnon et al., 2012), they are not digital technologies and cannot support the electronic capture, storage, processing, and exchange of information. Further details of the inclusion criteria for the selection of systematic reviews are described in Table 1.

Table 1. Inclusion criteria for the selection of systematic reviews.

Criteria	Description of inclusion criteria
Type of reviews	All types of qualitative, mixed-method, and quantitative reviews that aimed to evaluate the influence of ICTs[a] (four eHealth domains) used by nurses on nursing care, which stated a methodology (a "Methods" section) with explicit eligibility criteria, had systematic research strategies to identify selected reviews and provided a systematic presentation and summary of the characteristics and outcomes of the included reviews (O'Connor et al., 2011).
Publication type	Reviews published in French, English, or Spanish from January 1, 1995.
Population	RN[b], nurses in training, nursing students, or patients receiving care from qualified RN through the medium of ICTs.
Intervention: ICTs covered by four eHealth domains	Four eHealth domains were considered in the overview (Mair et al., 2009): management systems, communication systems, computerized decision support systems, and information systems. ICTs embody all digital technologies that support the electronic capture, storage, processing, and exchange of information, in order to promote health, prevent illness, treat disease, manage chronic illness, and so on (Bashshur et al., 2009; Gagnon et al., 2012).
Management systems	*Management systems* are computer-based systems used for acquiring, storing, transmitting, and displaying patient administrative or health information from different sources. They can support administrative or clinical activities. Electronic health records (EHRs) and personal health records (PHRs) are examples of management systems.
Communication systems	Telecommunication systems are employed when users are distant in space and/or time. This kind of communication takes place in a synchronous or an asynchronous way, between health professionals, or between health professionals and patients or caregivers. It involves a targeted sharing of information between specific individuals, or individuals who play distinct roles for diagnostic, management, counseling, educational, or support purposes. There are a wide range of communication systems, from email and mobile phones to telemedicine and telecare systems.
Computerized decision support systems (CDSSs)	Refer to an automated computer-based system that aims to support health professionals in practicing within clinical guidelines and care pathways. These systems are usually operated in real-time and involve decision support that comes from artificial intelligence (eg, a software program).
Information systems	Are defined by the use of Internet technology to attain access to different information resources, such as health and lifestyle information. The information remains general,

	and it is not tailored to specific individual needs. Web-based resources and eHealth portals for retrieving information are some types of information systems.
Comparisons	Usual care, any other ICT, and other types of interventions.
Outcomes	The primary outcomes included nursing resources, nurses' practice environment, nursing processes or scope of practice, professional satisfaction, and nursing-sensitive outcomes (eg, patient outcomes, such as risk outcomes and safety, patient comfort, and quality of life related to care). The secondary outcomes included nurses' and patients' satisfaction with ICTs.

[a]ICTs: information and communication technologies.

[b]RN: registered nurse.

Search Strategy

A medical librarian developed and conducted the search strategies, drawing on other reviews of similar topics and using well-established search filters where appropriate. We searched publications in English, French, or Spanish in the following electronic databases from January 1, 1995: Cochrane Database of Systematic Reviews (until January 15, 2015); Epistemonikos (until December 25, 2014); PubMed (until December 8, 2014); Embase (until January 7, 2015); Web of Science (until January 9, 2015); and Cumulative Index to Nursing and Allied Health Literature (CINAHL) (until December 25, 2014).

Structured search strategies were developed using the thesaurus terms of each database (eg, Medical subject heading - MeSH - for PubMed) and using free text, targeting the "title" and "abstract" fields. The strategies were then adapted to the other databases. The results of each database search were collected in a single reference database, and duplicate citations were removed. The specific search strategies for databases are presented in Multimedia Appendix 1.

Selection of Reviews

Two reviewers (GR, JPG) independently screened the title and abstract of the papers in order to assess their eligibility. References that did not meet the preestablished inclusion criteria were excluded. Full-text copies of publications were retrieved and were assessed by the same two reviewers. Any discrepancies were resolved through discussion. A third reviewer was available for arbitration when consensus was not reached.

Data Extraction and Management

Three reviewers (GR, JPG, and EH) were involved in the data extraction and management process. Information on each review was independently extracted by two of the reviewers. Any disagreement arising during the data extraction process was discussed among the two reviewers. The third reviewer was involved in case of disagreement.

Characteristics of included reviews were extracted and summarized: objectives, type of review, number of included studies, search dates, population, setting, eHealth domain, types of general and specific ICTs, examples of included interventions, comparisons, primary and secondary outcomes, review limitations, and authors' conclusions. A data extraction form was developed based on the NCPF (Dubois et al., 2013) and the dimensions of the actual scope of nursing practice (D'Amour et al., 2012). The data extraction grid was modified during the extraction process by adding dimensions or categories of results. To facilitate teamwork between the three reviewers (GR, JPG, and EH) in performing the data extraction, we used a shared file in Google Sheets. Reviewers communicated with each other through Google Sheets and added comments on the extraction when needed. The three reviewers reviewed the completed data extraction grid to eliminate discrepancies and errors.

Methodological Quality Assessment of Included Reviews

The three reviewers (GR, JPG, and EH) were involved in the methodological quality assessment of the reviews that met the eligibility criteria, using the assessment of multiple systematic reviews (AMSTAR) tool (Shea et al., 2007; Shea et al., 2009). Two reviewers assessed each review independently, and disagreements were discussed. The third reviewer was available for arbitration when needed. AMSTAR is an 11-item checklist from which reviewers assign one point when the criterion is met. AMSTAR items provide an assessment of methodological criteria such as the comprehensiveness of the search strategy and whether the quality of included studies was evaluated and accounted for (Weir et al., 2010). AMSTAR characterizes quality at three levels: 8-11 is high quality (ie, minor or no methodological limitations), 4-7 is medium quality (ie, moderate methodological limitations), and 0-3 is low quality (ie, major methodological limitations)(Sharif et al., 2013).

In this overview, we included different types of systematic reviews, that is, quantitative reviews (randomized and nonrandomized designs), mixed-method synthesis reviews, and qualitative reviews. AMSTAR is used primarily for quantitative reviews using randomized controlled trial (RCT) design.

When undertaking an overview, challenges encountered are the assessment of limitations (risk of bias) as well as the quality of evidence in systematic reviews (Lunny et al., 2016; Pieper et al., 2012). There were no reporting guidelines on assessing methodological quality of mixed-method and qualitative reviews at the time of the overview. We decided to apply AMSTAR to all reviews in order to use the same criteria for quality assessment, although this had limitations (ie, inappropriateness of applying some criteria to mixed-methods and qualitative reviews).

Data Synthesis

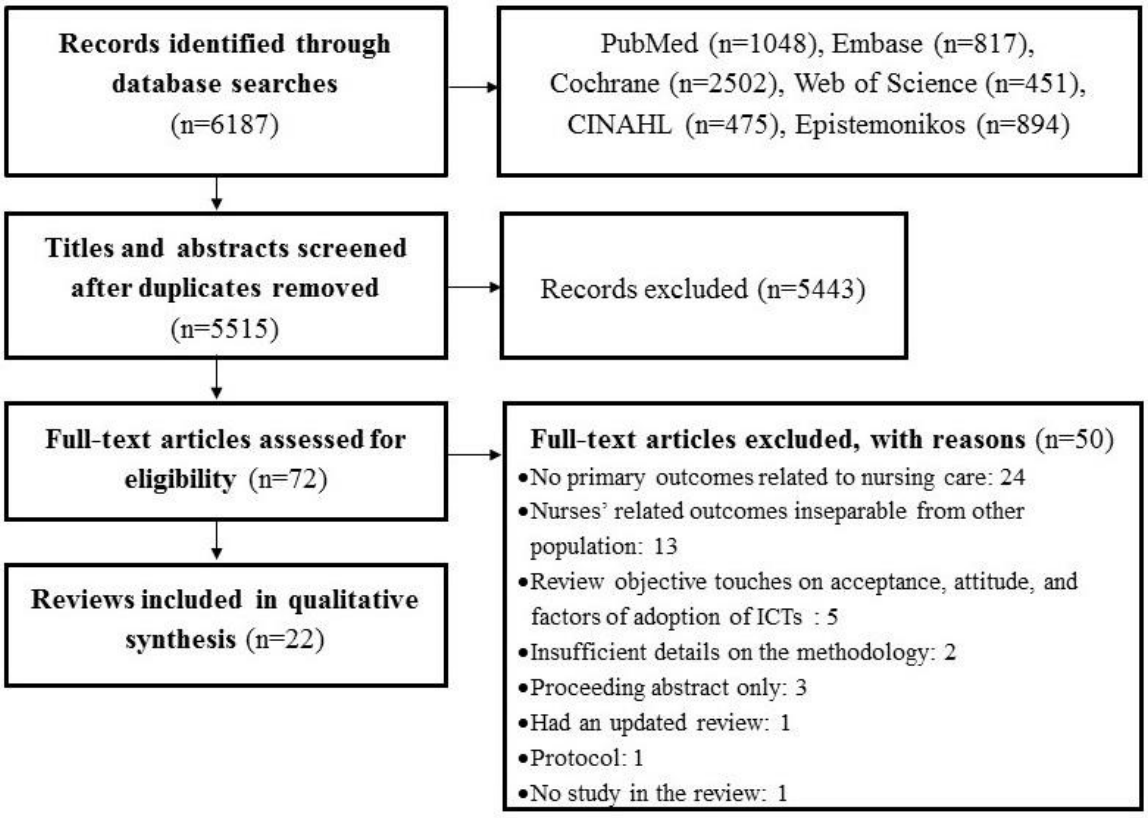
A statistical meta-analysis of outcomes was not possible because the included studies were too heterogeneous. We therefore conducted a narrative synthesis, which is defined as an approach of summarizing and explaining outcomes from multiple studies by employing the use of words and text (Popay et al., 2006). The core characteristic of a narrative synthesis is the adoption of a "textual approach to the process of synthesis to 'tell the story' of the outcomes from the included studies" (Popay et al., 2006, p. 5). We categorized the reviews into subgroups according to the type of intervention and their effects (positive, negative, or no effect) on a specific dimension of nursing care (eg, practice environment, nursing processes, professional satisfaction, and nursing-sensitive outcomes).

2.1.5 Results

Description of the Reviews

A total of 6187 titles or abstracts were identified. After removing duplicate references, 5515 titles or abstracts were assessed for eligibility. Full-text papers of 72 articles were retrieved for detailed evaluation. It was found that 22 reviews published between 2002 and 2015 met the eligibility criteria. The list of these included reviews is presented in Multimedia Appendix 2. Twelve reviews used a mixed-method synthesis approach, nine used a quantitative approach, and one used a qualitative approach (meta-ethnography). Fifty reviews were excluded because they did not present primary outcomes related to nursing care (n=24), or because outcomes related to nurses were indistinguishable from other populations (n=13). In Multimedia Appendix 3, details are provided regarding the primary reasons for exclusion and the full references of the excluded articles. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) study flow diagram (Liberati, 2009) are illustrated in Figure 2 to show the overall process of review selection.

Figure 2. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) study flow diagram.



The general characteristics (ie, type of reviews, search dates, target population, and health care settings) of the included reviews are presented in Multimedia Appendix 4. The review objectives, limitations, and main conclusions are synthesized in Multimedia Appendix 5. The eHealth domains covered were management systems (n=14), communication systems (n=7), and CDSSs (n=10). No reviews dealt with information systems. Five reviews included more than one eHealth domain (Bowles et Baugh, 2007; Carrington et Tiase, 2013; Finkelstein et al., 2012; Free et al., 2013; McKibbon et al., 2011). Articles reviewing management systems included the following ICTs: electronic medical or health or patient records, computer-based nursing records or computerized nursing care planning, and regional health care information system. The ICTs covered in the communication systems were email, mobile phone, bedside communication tool or bedside terminals, iPod technology to assist in educational conferences, and telemedicine or telehealth with the use of videophone or videoconferencing. The CDSSs covered were medication management technology—e-prescribing, electronic medication administration record systems, computerized provider order entry (CPOE), bar-

code medication administration (BCMA) —and PDAs. These eHealth services can be categorized as belonging to more than one domain (Mair et al., 2009), depending on their components. Details about eHealth domains, examples of included interventions, and comparisons are presented in Multimedia Appendix 6.

Assessment of Review Quality

The AMSTAR tool was used to assess the methodological quality of all reviews. Four reviews, mostly quantitative ones, had high quality (scores: 8-9); nine had medium quality (scores between 4 and 7), and nine scored low quality (between 0 and 3). AMSTAR scoring for each review is presented in Table 2. We adapted the interpretation of two criteria (#7 and #9) of the AMSTAR tool to assess the quality of mixed-method and qualitative reviews. For the criteria 7—reporting and assessment of scientific quality of the included reviews—we answered "yes" if authors mentioned having assessed and documented quality of quantitative reviews, and if they acknowledged clearly the difficulty of assessing qualitative or mixed-methods reviews. For criteria 9, entailing the inappropriateness of methods used to combine findings, we answered "yes," based on the decision rules developed by Kitsiou, Paré and Jaana (2015): "reviews' authors made a statement regarding the inappropriateness of pooling data (eg, highlighted issues about heterogeneity or variability between the studies), that is, the authors summarized and synthesized the available evidence narratively according to a defined analysis plan and/or using appropriate qualitative methods and techniques (eg, construction of common rubrics, content analysis, tabulation, groupings, and clustering)." Regarding criteria 10, about the assessment of publication bias, it seems that empirical evidence on this topic in qualitative research is very limited (Lewin et al., 2015). We presume that this is the same reality regarding the mixed-method reviews.

Table 2. Assessment of multiple systematic reviews (AMSTAR) scoring.

References	Type of reviews or designs	AMSTAR score
Free (2013)	Quantitative (RCT[a])	9 (high)
Mador (2009)	Quantitative (various designs)	9 (high)
Urquhart (2009)	Cochrane review—quantitative (RCT+1 other design)	8 (high)
McKibbon (2011)	Mixed	8 (high)
Nieuwlaat (2011)	Quantitative (RCT)	7 (medium)
Mickan (2014)	Quantitative (RCT)	6 (medium)
Finkelstein (2012)	Mixed	6 (medium)
Randell (2007)	Quantitative (RCT)	5 (medium)
Georgiou (2013)	Quantitative (various designs)	5 (medium)
Dowding (2015)	Quantitative (various designs)	5 (medium)
Poissant (2005)	Quantitative (various designs)	4 (medium)
Husebo (2014)	Mixed (integrative)	4 (medium)
Jones (2002)	Mixed (integrative)	4 (medium)
Meissner (2014)	Qualitative (meta-ethnography)	3 (low)
Bowles (2007)	Mixed	3 (low)
Anderson (2008)	Mixed	3 (low)
Maeenpa (2009)	Mixed	2 (low)
NGuyen (2014)	Mixed	2 (low)
Stevenson (2010)	Mixed	2 (low)
Bartoli (2009)	Mixed	1 (low)
Carrington (2013)	Mixed	1 (low)
Kelley (2011)	Mixed (integrative)	0 (low)

[a]RCT: randomized controlled trial.

Dimensions of Nursing Care That Are Influenced by Information and Communication Technologies

The results (see Figure 3) will be presented in association with the NCPF: the function, the dimension, and the theme (which correspond or not to a particular indicator in the framework). Table 3 presents the frequency of extracted data per dimensions, themes, and ICTs.

Figure 3. Presentation of results

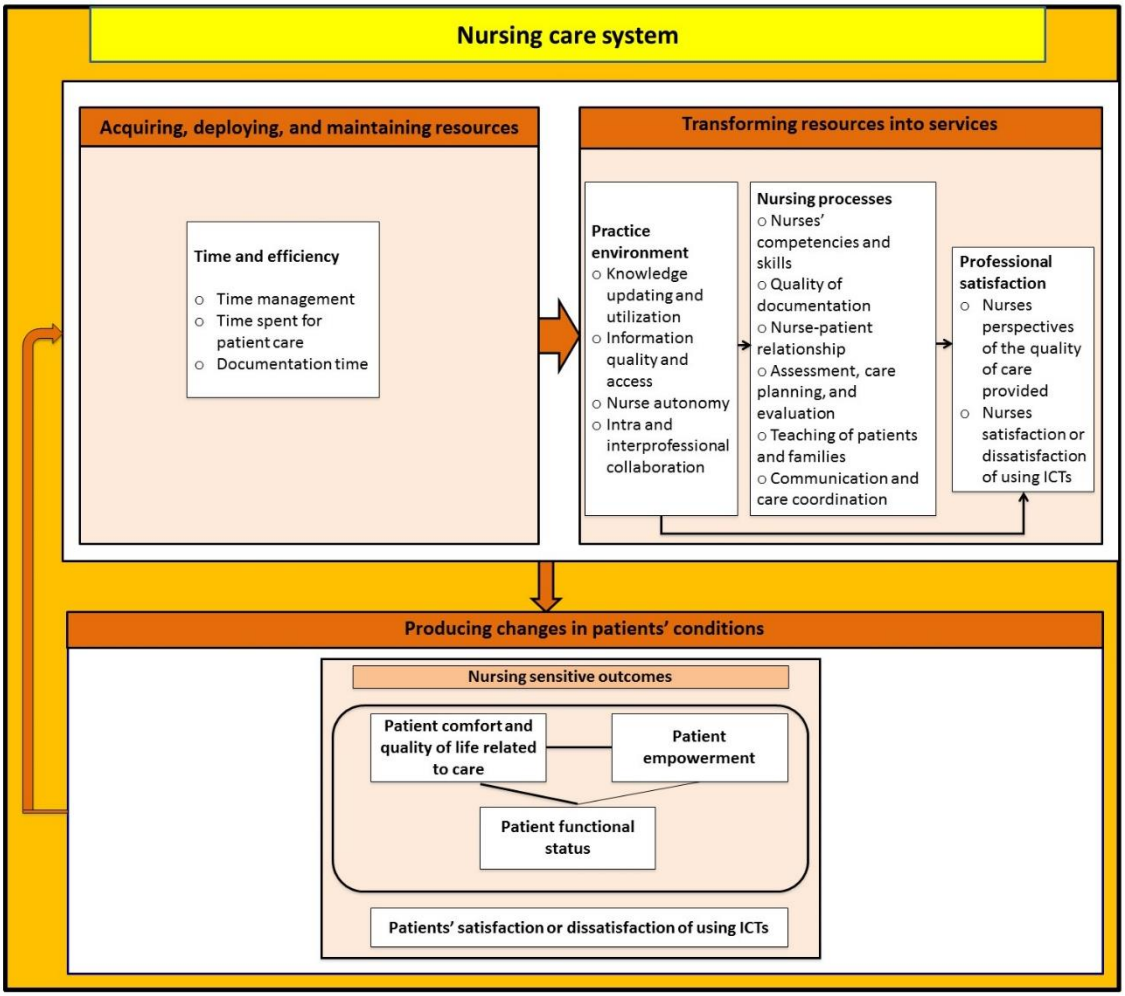


Table 3. Frequency extracted data.

Dimension	Themes (Number of reviews) (**Types of eHealth domain**)	Positive effects of ICTs[a]	Negative effects of ICTs	No effect	Total
Time and efficiency		20	17	7	44
	Time management (4) (MS[b], CS[c], CDSS[d])	2	1	1	4
	Time spent for patient care (7) (MS, CS, CDSS)	4	5	3	12
	Documentation time (7) **(MS[e])**	14	11	3	28
Nurses' practice environment		19	5	1	25
	Knowledge updating and utilization (3) (CS, CDSS)	3	0	1	4
	Information quality and access (5) (**MS[f],** CDSS)	11	2	0	13
	Nurse autonomy (1) (**CS[e]**)	1	0	0	1
	Intra and interprofessional collaboration (6) (**MS[f],** CS, CDSS)	4	3	0	7
Nursing processes		30	12	3	45
	Nurses competencies-skills (4) (MS, CDSS)	9	1	1	11
	Nurse-patient relationship (3) **(CS[e])**	4	0	0	4
	Quality of documentation (7) (**MS[f],** CS)	6	4	1	11
	Assessment, care planning and evaluation (10) (MS, CS, CDSS)	13	8	2	23
	Teaching of patients and families (4) (**CS[f],** CDSS)	5	0	0	5
	Communication and care coordination (2) (CS, MS)	2	0	0	2
Professional satisfaction		29	18	1	48
	Nurses' perspectives of the quality of care provided (6) (MS, CS, CDSS)	15	2	0	17
	Satisfaction or dissatisfaction of nurses using ICTs (10) MS, CS, CDSS)	14	16	1	31
Nursing sensitive outcomes		28	5	5	38
	Patient comfort and quality of life related to care (7) (CS, CDSS)	7	0	1	8
	Empowerment (4) (**CS[f]**, MS)	6	0	1	7
	Functional status (3) (**CS[e]**)	3	0	1	4
	Satisfaction or dissatisfaction of patients of using ICTs (5) (CS, MS)	12	5	2	19

[a]ICTs: information and communication technologies.

[b]MS: management systems.

[c]CS: communications systems.

[d]CDSSs: computerized decision support systems.

[e]One eHealth domain covered exclusively a particular theme.

[f]Majority of one eHealth domain covered a particular theme.

Function 1: Acquiring, Deploying, and Maintaining Resources

Time and Efficiency

Overall, 11 reviews (Bowles et Baugh, 2007; Georgiou et al., 2013; Kelley et al., 2011; Mador et Shaw, 2009; McKibbon et al., 2011; Meissner et Schnepp, 2014; Nguyen et al., 2014; Nieuwlaat et al., 2011; Poissant et al., 2005; Stevenson et al., 2010; Urquhart et al., 2009) had results related to time, that is, time management (time consumed or time saved resulting the use of ICTs); time spent for patient care; and documentation time.

Time Management

Four reviews (Bowles et Baugh, 2007; McKibbon et al., 2011; Nieuwlaat et al., 2011; Poissant et al., 2005) targeting CDSSs, communication, and management systems had findings on "time management" in a general way: one review showed no effect (Nieuwlaat et al., 2011), another showed negative effects (McKibbon et al., 2011), and two reported positive effects (Bowles et Baugh, 2007; Poissant et al., 2005). In Nieuwlaat et al's review (2011), results demonstrated that nurses perceived that conventional care compared with CDSSs were equally time-consuming (no effect). The other review reported that reminder systems were time-consuming (McKibbon et al., 2011). The results in the Poissant et al. (2005) review revealed that the use of EHRs has been shown to reduce the time devoted to the verbal transmission of information at the end-of-shift. Consequently, this caused a change in the workflow, which may have been a strong incentive for nurses to become efficient users of the system. In the Bowles and Baugh (2007) review, the effect of telehomecare was also reported positively in terms on "saving time."

Time Spent for Patient Care

Almost one-third of the reviews (7/23) (Georgiou et al., 2013; Kelley et al., 2011; Mador et Shaw, 2009; McKibbon et al., 2011; Meissner et Schnepp, 2014; Nguyen et al., 2014; Urquhart et al., 2009) outlined positive (Mador et Shaw, 2009; Meissner et Schnepp, 2014; Nguyen et al., 2014; Urquhart et al., 2009) and negative effects (Georgiou et al., 2013; Kelley et al., 2011; McKibbon et al., 2011; Meissner et Schnepp, 2014), as well as no effect (Georgiou et al., 2013; McKibbon et al., 2011; Nguyen et al., 2014) of CDSSs, management systems, and communication systems on time spent for patient care. Nurses are sometimes concerned that using electronic nursing documentation or the BCMA for documenting and for administering medication might take away or reduce time for patient care (McKibbon et al.,

2011; Meissner et Schnepp, 2014). Conversely, other reviews including communication systems (eg, telehomecare) and management systems (eg, EHRs) found that time spent for patient care has significantly improved (Mador et Shaw, 2009; Meissner et Schnepp, 2014; Nguyen et al., 2014; Urquhart et al., 2009) and particularly, nurses using EHRs spent more time with patients in assessment, education, and communication (Nguyen et al., 2014).

Documentation Time

Nurse documentation time was reported in seven reviews (Kelley et al., 2011; Mador et Shaw, 2009; McKibbon et al., 2011; Meissner et Schnepp, 2014; Poissant et al., 2005; Stevenson et al., 2010; Urquhart et al., 2009) touching on management systems, such as EHRs, e-prescribing system, and critical care information system (CCIS). Effects of these ICTs on documentation time were mixed within and across the reviews: six reviews demonstrated positive effects (Kelley et al., 2011; Mador et Shaw, 2009; Meissner et Schnepp, 2014; Poissant et al., 2005; Stevenson et al., 2010; Urquhart et al., 2009), six demonstrated negative effects (Kelley et al., 2011; Mador et Shaw, 2009; McKibbon et al., 2011; Poissant et al., 2005; Stevenson et al., 2010; Urquhart et al., 2009), and three demonstrated no effect (Kelley et al., 2011; Mador et Shaw, 2009; McKibbon et al., 2011). Negative results showed that nurses spent more time documenting when they used management systems and the positive results showed the contrary: documentation time diminished with ICTs. The time saved for documenting was sometimes reallocated for patient care and had positive outcome on the improvement of health care (Stevenson et al., 2010). Otherwise, when the task of documenting took much more time, nurses had less time to spend with patients (Kelley et al., 2011).

Function 2: Transforming Resources into Services

Nurses' Practice Environment

Knowledge Updating and Utilization

Three reviews found positive effects (Anderson et Willson, 2008; Bowles et Baugh, 2007; Husebo et Storm, 2014) of CDSSs and communication systems on knowledge updating and utilization, whereas one review found no effect (Anderson et Willson, 2008). CDSSs are useful tools to increase knowledge and information use, and translate outcomes from research into practice by improving nurses' compliance with established guidelines (Anderson et Willson, 2008). The potential of communication

systems (eg, telehomecare or telehealth) to transfer nursing knowledge was also reported (Bowles et Baugh, 2007; Husebo et Storm, 2014).

Information Quality and Access

The eHealth domain that was the most covered in relation to information quality and access was management systems, covered in four reviews (Kelley et al., 2011; Maenpaa et al., 2009; McKibbon et al., 2011; Nguyen et al., 2014), followed by CDSSs in two reviews (Anderson et Willson, 2008; McKibbon et al., 2011). One review documented the improvement of information quality as perceived by doctors and nurses after the implementation of EHRs (Nguyen et al., 2014), and the results of five reviews highlighted information access (Anderson et Willson, 2008; Kelley et al., 2011; Maenpaa et al., 2009; McKibbon et al., 2011; Nguyen et al., 2014). Management systems and CDSSs had positive impact in three reviews (Kelley et al., 2011; Maenpaa et al., 2009; McKibbon et al., 2011) on information access regarding patient issues, clinical data, medication information or profile, and other information (policies, guidelines, drug resources, patient files). Nurse practitioners felt that CDSSs could assist them with patient care when data is easily accessible with the use of the technology (McKibbon et al., 2011). The negative impacts were pointed out in two reviews (Kelley et al., 2011; Nguyen et al., 2014) that cited the results of the same primary study (Darbyshire, 2004), that is, nurses could not retrieve the information perceived as essential for patient care within the electronic nursing documentation system.

Nurse Autonomy

Only one review mentioned nurse autonomy as a positive effect. In this review (Bartoli et al., 2009), nurses were expected to handle most cases autonomously and to refer to doctors only in exceptional cases when using the tele-triage system designed to monitor chronic heart failure patients remotely.

Intra- and Interprofessional Collaboration

Four reviews highlighted positive (Anderson et Willson, 2008; Bartoli et al., 2009; Dowding et al., 2015; Free et al., 2013) effects regarding intra- and interprofessional collaboration, one showed negative effect (McKibbon et al., 2011) and one reported no effect (Kelley et al., 2011) with the use of CDSSs (Anderson et Willson, 2008), communications (Bartoli et al., 2009; Free et al., 2013), and management systems (Dowding et al., 2015; Kelley et al., 2011; McKibbon et al., 2011). Reviews including CDSSs reported improved communication between members of the interdisciplinary team (Anderson et

Willson, 2008), such as between nurses and surgeons (Free et al., 2013), better and more trustworthy relationships between nurses and doctors by using telehomecare systems (Bartoli et al., 2009), and more frequent collaboration between members of the health care team when using management systems (ie, clinical dashboards) (Dowding et al., 2015). In one review, results showed that electronic nursing documentation systems negatively affected collaborative working relationships between nurses and physicians (Kelley et al., 2011).

Nursing Processes

Nurses' Competencies and Skills

Four reviews that encompassed CDSSs and management systems showed that they had a positive influence on these domains of nurses' competencies and skills: decision support or decision-making (Anderson et Willson, 2008; McKibbon et al., 2011; Meissner et Schnepp, 2014), observation skills (Meissner et Schnepp, 2014), clinical judgment (Anderson et Willson, 2008; Meissner et Schnepp, 2014), and critical thinking (Kelley et al., 2011). Additionally, due to some features of CDSSs and management systems (eg, readability of data, remote accessibility of data, better quality of patients' records, presence of reminders, or automatic alerts), these ICTs supported clinical judgment and decision-making (McKibbon et al., 2011; Meissner et Schnepp, 2014). Conversely, some features of the ICTs not previously available on paper, such as copy and paste, drop-down menus, and check boxes, affected the nurses' capacity to employ critical thinking regarding their patients (Kelley et al., 2011). Finally, the results presented in Anderson and Willson (2008) review showed no effect of CDSSs on the knowledge or clinical decision-making of nurses associated with pressure ulcer prevention.

Quality of Documentation

Positive effects on documentation quality were highlighted in six reviews (Carrington et Tiase, 2013; Kelley et al., 2011; McKibbon et al., 2011; Meissner et Schnepp, 2014; Nguyen et al., 2014; Stevenson et al., 2010); five on these reviews encompassed management systems. Negative effects were reported in three reviews (Kelley et al., 2011; Meissner et Schnepp, 2014; Stevenson et al., 2010), and another review documented no effect (Finkelstein et al., 2012). Results from the Stevenson et al review (2010): nurses reported that EHRs did not reflect their practice and reported that it was "incapable of capturing much of what they believed was crucial in nursing care." With regards to psychological care, nurses also reported issues with fitting complex caring practice into systems that are not intended to accommodate it, for example, when providing emotional and psychological support. Since EPRs lack

sensitivity, they cannot capture "the being there stuff," for example, caring for a dying patient by sitting on their bedside and holding their hand. Two reviews (Meissner et Schnepp, 2014; Stevenson et al., 2010) stated that when the quality of documentation is improved, quality of care and patient safety can be fostered since it allows a complete overview of the patient's situation (Meissner et Schnepp, 2014).

Nurse-Patient Relationship

In three reviews, use of communication systems (virtual visits using videophones, telehomecare, telehealth) positively impacted nurse-patient relationships. Reviews mentioned the potential of ICTs to provide a pathway for communication (Jones et Brennan, 2002), create new types of bonds with patients (Bowles et Baugh, 2007), establish trust through the videoconference system, and create a sense of connection [from the patients' perspective] (Husebo et Storm, 2014).

Assessment, Care Planning, and Evaluation

Impacts of CDSSs, management, and communication systems were mixed, that is, positive effects were mentioned in seven reviews (Anderson et Willson, 2008; Bowles et Baugh, 2007; Finkelstein et al., 2012; Jones et Brennan, 2002; Meissner et Schnepp, 2014; Mickan et al., 2014; Stevenson et al., 2010), negative effects were mentioned in five reviews (Finkelstein et al., 2012; Free et al., 2013; Husebo et Storm, 2014; Stevenson et al., 2010; Urquhart et al., 2009), and no effect was documented in two reviews (Jones et Brennan, 2002; Urquhart et al., 2009). For example, a handheld computer-based support system for preference-based care planning led to a higher consistency between patient preferences and nursing care plan priorities (Anderson et Willson, 2008). An "email intervention" cited in the Finkelstein et al (2012) review led to a more comprehensive heart failure and medication adherence assessment by nurses being recorded. EHRs contain templates that guide nurses for assessment and help them identify problems (Meissner et Schnepp, 2014). The mixed review by Stevenson et al (2010) revealed negative impacts of EHRs regarding poor care plans updates, the difficulty of individualizing care plans within the systems, and the difficulty of capturing a broad picture of the patient within the electronic personal record. Similarly, the Urquhart et al review (2009) showed that computerized nursing care planning compared with manual planning led to (1) no effect between groups regarding planning; and (2) negative effects, because planned tasks were not carried out as expected for nurses using ICTs.

Teaching of Patients and Families

Four reviews reported teaching benefits: three with the use of communication systems (Finkelstein et al., 2012; Husebo et Storm, 2014; Jones et Brennan, 2002) and one with CDSSs (McKibbon et al., 2011). For example, virtual visits simplified teaching and information sharing with patients and thus became a way to transfer knowledge (Husebo et Storm, 2014). Also, patients had clearer instructions on discharge and on their medication administration at home as reported by nurse practitioners (McKibbon et al., 2011).

Communication and Care Coordination

Two reviews found that communication systems had positive impacts on delivering continuous and coordinated care, on the prevention of preventing relapses into poor health (Husebo et Storm, 2014), and on improving communication about resident care (Meissner et Schnepp, 2014).

Professional Satisfaction

Nurses' Perspectives of the Quality of Care Provided

In six reviews, positive effects (Bowles et Baugh, 2007; Finkelstein et al., 2012; Husebo et Storm, 2014; Jones et Brennan, 2002; McKibbon et al., 2011; Meissner et Schnepp, 2014) of CDSSs, management, and communication systems were reported: improvement of quality of care and patient safety; nurses' perceptions that BCMA reduce medication errors and improve medication administration processes (McKibbon et al., 2011); and the provision of comprehensive and adaptive care related to the patients' needs with the help of telehealth used with elders (Jones et Brennan, 2002). In four reviews (McKibbon et al., 2011; Meissner et Schnepp, 2014; Nguyen et al., 2014; Stevenson et al., 2010), negative results were discussed: EHRs do not improve patient care as perceived by nurses (Nguyen et al., 2014); and patients do not receive necessary care because the quality of residents' records is lacking (Meissner et Schnepp, 2014).

Satisfaction or Dissatisfaction of Nurses Using ICTs

The results in ten reviews, targeting the three eHealth domains, found that nurse satisfaction was mixed: nine reviews reported positive effects (Anderson et Willson, 2008; Bowles et Baugh, 2007; Finkelstein et al., 2012; Husebo et Storm, 2014; Kelley et al., 2011; McKibbon et al., 2011; Meissner et Schnepp, 2014; Nguyen et al., 2014; Nieuwlaat et al., 2011), eight reported negative effects (Bowles et Baugh, 2007; Husebo et Storm, 2014; Kelley et al., 2011; McKibbon et al., 2011; Meissner et

Schnepp, 2014; Nguyen et al., 2014; Nieuwlaat et al., 2011; Stevenson et al., 2010), and one reported no effect (McKibbon et al., 2011). Results pertained to overall acceptance of ICTs and their satisfaction was described in general ways, such as "nurses were satisfied with ICTs." There were also elements associated with ICTs, such as system navigability (eg, complexity, ease of use, user-friendliness, and flexibility), nurses' attitudes, concerns about patients' privacy, and perceived benefits or inconveniences. Some nurses found EHRs to be irrelevant for practice (Nguyen et al., 2014).

Function 3: Producing Changes in Patients' Condition

Nursing-Sensitive Outcomes

Patient Comfort and Quality of Life Related to Care

The positive effects of CDSSs and communication systems on comfort and quality of life related to care (Anderson et Willson, 2008; Bowles et Baugh, 2007; Carrington et Tiase, 2013; Finkelstein et al., 2012; Husebo et Storm, 2014; Jones et Brennan, 2002; Randell et al., 2007) were described in terms of patient outcomes: fewer number of wetting occurrences (Anderson et Willson, 2008), reduction of malnourished patients (Carrington et Tiase, 2013; Randell et al., 2007), the reduction of pain and anxiety (Bowles et Baugh, 2007), better quality of life (Finkelstein et al., 2012), and lower burden related to care (Jones et Brennan, 2002). One review reported little improvement on quality of care with the use of telehomecare (Bowles et Baugh, 2007).

Empowerment

Four reviews (Bowles et Baugh, 2007; Finkelstein et al., 2012; Husebo et Storm, 2014; Urquhart et al., 2009) highlighted empowerment as a positive effect of communication systems. One management system showed no effect (Urquhart et al., 2009). Some examples of positive impacts include diabetic patients, who felt that the telehomecare empowered them (Bowles et Baugh, 2007) and had positive results in terms of diabetes management with an eHealth application (Finkelstein et al., 2012). One review also cited videoconferences for conducting nursing virtual visits as tools to increase patients' abilities to manage self-care (Husebo et Storm, 2014).

Functional Status

In three reviews (Finkelstein et al., 2012; Husebo et Storm, 2014; Jones et Brennan, 2002), the results regarding the effects of communication systems on functional status (eg, physical, cognitive, psychosocial functional capacity) were discussed in a positive way. Computer use (in a telehealth

context) and elders' self-esteem have been positively associated (Jones et Brennan, 2002). In another review (Husebo et Storm, 2014), the results showed that communication systems (eg, virtual visits using videoconference) decreased loneliness and melancholia, enhanced psychosocial and social activity, and aided memory among home-dwelling elders. In the Finkelstein et al (2012) review, the results revealed that the health status of patients among groups did not differ with the use of communication systems.

Satisfaction or Dissatisfaction of Patients of Using ICTs

Patients' satisfaction with ICTs was documented in five reviews that demonstrated positive effects (Bowles et Baugh, 2007; Finkelstein et al., 2012; Husebo et Storm, 2014; Jones et Brennan, 2002; Nguyen et al., 2014), three that showed negative effects (Husebo et Storm, 2014; Jones et Brennan, 2002; Nguyen et al., 2014), and two that showed no effect (Jones et Brennan, 2002; Nguyen et al., 2014). Patient results indicated their degree of satisfaction or dissatisfaction with ICTs; their acceptance, acceptability, and receptiveness of their usage of ICTs; and their appreciation for being able to schedule videoconferences about topics of their choice (Bowles et Baugh, 2007; Husebo et Storm, 2014; Nguyen et al., 2014). The results were presented in terms of usefulness (or uselessness); perceived and actual benefits or advantages, such as accessibility and flexibility (Husebo et Storm, 2014); ease of use, usability, complexity; and the degree to which the ICTs were well-designed and functioned fully (Finkelstein et al., 2012; Jones et Brennan, 2002; Nguyen et al., 2014). Some patients were confident in using ICTs (Bowles et Baugh, 2007), whereas others were concerned about the confidentiality of their health information (Nguyen et al., 2014). Results from the Husebo and Storm (2014) review indicate that patients who had visual contact with nurses through communication systems felt cared for and perceived a sense of connection.

Summary Description of eHealth Domains Related to Specific Themes

On the basis of the content of Table 3, we propose a summary description of which eHealth domains cover specific themes of nursing care.

Management Systems

The only eHealth domain reported to influence the documentation time was management systems, such as electronic nursing documentation (Kelley et al., 2011), CCIS (Mador et Shaw, 2009), CPOE, eMAR (McKibbon et al., 2011), and EHRs (Poissant et al., 2005). The other themes reported with these

systems were time spent on patient care; time management; information quality and access, intra and interprofessional collaboration; quality of documentation; nurses' competencies and skills; assessment, care planning, and evaluation; nurses' perspectives of the quality of care provided; empowerment; and satisfaction of nurses and patients using ICTs.

Communication Systems

Communication systems was the only eHealth domain found to be applicable to the themes of nurse-patient relationship, autonomy for nurses in their role, and patients' functional status. These themes were also discussed related to communication systems: teaching patients and families, knowledge update and utilization; collaboration; quality of documentation; assessment, care planning and evaluation; communication and care coordination; nurses' perspectives of the quality of care provided; satisfaction of nurses and patients using ICTs; patient comfort and quality of life related to care; and patients' empowerment.

Computerized Decision Support Systems (CDSSs)

CDSSs are mentioned in nurse's practice environment themes (3/4): knowledge updating and utilization; information quality and access; and intra- and interprofessional collaboration. Regarding the nurses' competencies and skills, CDSSs are involved with decision-making processes. Some other themes discussed in relation to CDSSs are assessment, care planning, and evaluation; teaching of patients and families; nurses' perspectives of the quality of care provided; satisfaction of nurses and patients using ICTs; and patient comfort and quality of life related to care.

2.1.6 Discussion

Summary of Main Results

This overview allowed a broad understanding of the dimensions of nursing care influenced by using ICTs for providing care. Regarding the primary outcomes of interest, the themes that were most frequently reported are documentation time; assessment, care planning and evaluation; nurses' perspective of the quality of care provided; information quality; and access and time spent for patient care. For secondary outcomes, satisfaction or dissatisfaction of nurses and patients using ICTs was frequently mentioned.

Discussion of Results With Respect to the First Function of the NCPF

In relation to the first function of the NCPF (*acquiring, deploying, and maintaining nursing resources*), many reviews outlined outcomes linked to "time." The use of ICTs affected time management, time spent for patient care, and documentation time. This theme could also refer to a dimension of the NCPF called *maintenance and economic sustainability of the nursing staff* (Dubois et al., 2013). Sustainability refers to the importance of having quality resources at the lowest cost. This dimension highlights productivity and the necessity to optimize the outputs produced from a given set of inputs; in other words, to minimize the amount of nursing tasks, materials, and equipment without sacrificing the quality of nursing services. The "time" dimension can be understood in terms of how ICTs can impact staff, productivity, optimization of the staff's time management, and resources utilization. We do believe that time is an interesting outcome related to the resources of the overall structure (nursing staff), but it does not reflect directly on how ICTs can transform or support what nurses do (nursing activities or interventions) within their actual scope of practice. Considering our results, we do not believe that further research should focus on "time" in order to better understand the effects of ICTs on nursing care (and specifically, on nursing processes).

This review did not explore other dimensions and indicators related to the first function of the NCPF, such as nursing staff supply. These dimensions include quantity and quality indicators. As an example, it would be interesting to explore whether the availability of ICTs in specific health care settings impacts the quantity of nurses needed to perform nursing services.

Another relevant topic would be to probe whether ICTs act as facilitator or motivator to enhance nurses' working conditions, or serve as a barrier that inhibits them. To what extent can ICTs create favorable conditions that attract nurses and reinforce stability in the workforce? A systematic review was undertaken on the effect of ICTs on retention and recruitment of health care professionals (Gagnon et al., 2011). The results revealed that, in 9 out of the 13 studies, ICT use demonstrated a positive, though often indirect, influence on recruitment and retention. The influence of ICTs on retention of nurses was also examined in a qualitative study (Gagnon et al., 2013). The results highlighted various impacts of ICTs on nurse retention (ie, little or no impact, unclear impact, or indirect positive impact).

Discussion of Results With Respect to the Second Function of the NCPF

The three dimensions corresponding to the second function, *transforming nursing resources into nursing services*, are nurses' practice environment, nursing processes, and professional satisfaction. The themes "knowledge updating and utilization" and "communication and care coordination" were not explicitly described in the NCPF and we used them from the instrument of "actual scope of nursing practice" (D'Amour et al., 2012). The indicator "scope of practice" is included in the nursing processes of the NCPF, but there are no explicit underlying subindicators.

The "information quality and access" theme was analyzed as an effect of ICTs on nurses' practice environment. In other words, ICTs are seen as a potential way to support nursing work by allowing them to get access to various sources of information and clinical data. The theme "quality of documentation" is not part of the nurses' practice environment because it is linked to what nurses do as activities.

The capacity of nurses to deliver nursing interventions is intimately and consistently linked with organizational processes that capture the nursing practice context and mediate its outcomes (Aiken et al., 2001; Sidani et al., 2004). These processes, defined as interventions, support nursing work and sustain a professional environment (Lake, 2002). We hypothesize that, if nurses have access to a comprehensive set of information about patients, this would trickle down on nursing processes, such as quality of documentation, assessment, care planning, and evaluation. It would also impact communication and care coordination to benefit patient outcomes.

A surprising result is the following: only one review mentioned nurse autonomy in relation to the use of technology (Bartoli et al., 2009). It would be interesting to know more about questions such as: How can we define "autonomy" in a context in which nurses use or are exposed to ICTs to provide nursing care? How can ICTs support or influence nurse autonomy? Can ICTs be a required training tool in nurses' practice environments to support their own autonomy?

The NCPF model reflects the deployment of nurses' full scope of practice, including assessment, planning, and evaluation; problem and symptom management; health promotion and illness prevention; care coordination; and discharge planning, which are conceptualized through interventions and processes in the model.

From a healthcare provider perspective, these processes grasp the technical elements of care and reflect the extent to which staff are capable of using and mobilizing their competencies to deploy their entire scope of practice. These processes demonstrate the capability of nurses to engage the needs of patients (Dubois et al., 2013). Our results show that, in reference to the processes described in the NCPF, few such processes have been described in the studies included in this overview. However, assessment, care planning, and evaluation are the most cited themes in the nursing processes dimension, followed by teaching of patients and families and, finally, by communication and care coordination. Despite these outcomes, it would be helpful to conduct primary studies on how ICTs could influence or support other nursing processes, such as problem and symptom management, health promotion and illness prevention, and discharge planning.

Nurses' professional satisfaction is conceived as the result of nursing processes. Our results revealed two facets of this satisfaction: nurses' perspective of the quality of care provided and nurses' satisfaction or dissatisfaction using ICTs. The NCPF included additional indicators that were not mentioned in the included reviews to capture the nurses' professional satisfaction: having the time to do their job and the enjoyment derived from it.

Discussion of Results With Respect to the Third Function of the NCPF

We believe that nursing-sensitive outcomes, which are the "patient outcomes," are underrepresented in our overview because of our inclusion criteria that focused on reviews of the impact or effect of ICTs on nursing resources and services. Thus, patient outcomes were only considered if nursing outcomes were reported. This means that we included patients' outcomes as primary outcomes as long as they fell within the usage of ICTs by nurses, and then, when outcomes related to the second function of the NCPF (nursing services and processes) were reported. Dubois and colleagues (2015) undertook a systematic work including three literature reviews to identify the priority indicators in evaluating the nursing contribution to quality of care. The results revealed that the most frequently examined nursing sensitive outcomes are pressure ulcers, medication administration errors, urinary infections by catheter, and falls. These indicators are located in the "risk outcomes and safety" dimension of the NCPF. Despite this, there are several systematic reviews on the effects of ICTs on patients' outcomes (Agboola et al., 2015; Lima et al., 2016; Raaijmakers et al., 2015; Singh et al., 2016). However, these

reviews do not necessarily explore the impact of ICTs on nursing services and processes (second function of the NCPF) when considering patients' outcomes.

Strengths and Potential Biases

There are many strengths of this overview. First, it employed a comprehensive search strategy, which was developed and implemented by a medical librarian. Second, data extraction and quality assessment were conducted by three reviewers working independently. Third, the data extraction process was done with the use of the NCPF, which supported the organization and the analysis of results. This framework supported reflection on the way ICTs could influence specific aspects of nursing care. Some new, redefined, or adapted dimensions and indicators have been suggested in the framework: time management, time spent for patient care and documentation time, information quality and access, documentation quality, knowledge updating and utilization as part of the nurses practice environment, communication and care coordination, and nurse and patient satisfaction or dissatisfaction regarding their use of ICTs. Fourth, one of the authors of the NCPF (CAD) challenged the analysis and interpretation of the results. Some debriefing meetings were held to discuss the way the themes were presented related to their organization in the NCPF (under specific subsystems, dimensions, and indicators).

There are also limitations to this overview. First, as mentioned by other authors (Cheung et al., 2012; Worswick et al., 2013), we were limited by the information provided by the review authors. The granularity of details available was limited and some information was lacking regarding both the description of ICTs (eg, their features, components, contexts of use, and area of practice) as well as findings regarding the dimensions of nursing care influenced by ICTs. Therefore, it was not possible to make significant conclusions about how a specific ICT influenced one or many indicators (themes) of nursing care, and it was challenging to categorize these extracted findings (impacts of ICTs) within the NCPF. A comprehensive description of interventions (ICTs) would have been helpful. Further research could be done to gain knowledge about how a specific ICT used in a certain area of practice can impact on one or many dimensions and indicators of nursing care.

Third, the nature of the topic was not easy to capture in the reported data of systematic reviews. It was difficult to establish if nurses experienced changes in their practice with the use of ICTs, or if instead they believed that ICTs would change their practice and work environment without really experiencing

these transformations. Some outcomes related to the use of ICTs are reported in terms of "barriers." However, it is not always clear if it is a barrier to use ICTs or an effect or impact of having used them. Systematic reviews on the determinants of nurses' acceptance and use of ICTs are plenty (Gagnon et al., 2012; Gephart et al., 2015; McGinn et al., 2011; Young et al., 2011), but do not inform on the real effects of ICTs on nursing practice.

Fourth, we used AMSTAR to assess methodological quality of qualitative and mixed-method reviews even if this tool was not developed for types of reviews other than quantitative using mainly RCT designs. The results of this work should be interpreted with caution. Although it provides a broad perspective on the phenomenon of interest, the main shortcoming of a review of systematic reviews is the heterogeneity in terms of population, interventions (types of ICTs), types of reviews, and the variety of outcomes, which might lead to the possibility of biased conclusions. For further research and methodological development in this domain, we strongly recommend a consolidated tool to evaluate the quality of different types of reviews on a common scale. The results of the assessment of methodological quality of mixed-method and qualitative reviews must be interpreted with caution, considering that AMSTAR is not used and designed for that purpose. In fact, some criteria do not fit the specificities of other types of reviews because there are no gold standards or guidelines allowing us to perform this task. Consequently, mixed-method and qualitative reviews started with a lower score, which cannot lead to a judgment about the likely bias and methodological limitations inherent in the majority of reviews summarized in Table 2.

Finally, this overview draws a picture of the reality of ICTs that covered a period extended from 2002 to the start of 2015. The emerging or novel ICTs that have been published from 2015 until now could not be captured.

Differences Between Protocol and Overview

As stated in the protocol (Rouleau et al., 2015), one of the objectives was to explore whether specific categories of ICTs (management systems, communication systems, CDSSs, or information systems) could have an impact on nursing care. As mentioned earlier, the heterogeneity of reviews and the lack of granularity regarding extracted data or information were some reasons why we could not pursue the initial objective.

When we planned this overview, we were particularly interested in the dimensions of nursing care inherent to the second and the third function of the NCPF, which are nurses' practice environments, nursing processes, professional satisfaction (second function or subsystem), and nursing-sensitive outcomes (third function or subsystem). Throughout the data extraction process, we realized that some outcomes, particularly those related to the time and efficiency, were frequently mentioned. We then decided to extract these results based on their frequency and their impact on the nursing care.

2.1.7 Authors' Conclusions

To the best of our knowledge, this is the first attempt to draw a broad understanding and a schematization of specific dimensions and indicators of nursing care influenced by ICTs. Using the NCPF was useful to illustrate the way ICTs can impact 3 subsystems (nursing resources, nursing services or processes, and nursing sensitive outcomes or patients' outcomes), 5 dimensions, and 19 themes corresponding to the NCPF indicators. Findings of this overview are a good starting point from which we could deepen our conceptualization on the way nursing care system performance can be affected by ICTs. According to a systemic perspective, it is plausible to believe that the adoption and implementation of ICTs in the nursing care system must be addressed under a multidimensional perspective, considering that the 3 subsystems are interrelated. If nurses use ICTs to support their interventions, and the impacts of such ICTs are positive or negative on the work they do, this could possibly reverberate on patient outcomes. We have to keep this broad representation in mind when it will be the time to plan and to implement emerging ICTs in health care settings.

Takeaways Messages

Using the NCPF was relevant to draw a broad, multidimensional, and a system-based perspective on the dimensions and indicators of nursing care that can be impacted by ICTs.

ICTs have mixed impacts on 19 indicators related to nursing care: documentation time, time spent for patient care, time management, knowledge updating and utilization, information quality and access, nurse autonomy, intra- and interprofessional collaboration, nurses competencies-skills, nurse-patient relationship, quality of documentation, assessment, care planning and evaluation, teaching of patients and families, communication and care coordination, nurses' perspectives of the quality of care provided, patient comfort and quality of life related to care, empowerment, functional status, and satisfaction or dissatisfaction of nurses and patients using ICTs.

Management systems, including, for instance, electronic nursing documentation system, CCIS, CPOE, eMAR, and EHRs, have been discussed exclusively with the theme “documentation time” (in the included reviews).

Communication systems have been described exclusively regarding nurse-patient relationship, autonomy for nurses in their role, and patients’ functional status (eg, physical, cognitive, and psychosocial functional capacity).

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Authors’ Contributions

GR conceived and designed the overview with input from MPG and JC. GR informed the search strategy and performed the search, with the help of a health librarian. GR, JPG, and EH were responsible for data extraction. GR, MPG, JC, JPG, EH, and CAD have been involved in data analysis and interpretation of results. GR, MPG, JC, JPG, EH, and CAD were engaged in the drafting of this manuscript and they all read and approved the final manuscript.

Conflicts of Interest

None declared.

Abbreviations

ADE: adverse drug event
ADL: activities of daily living
AMSTAR: assessment of multiple systematic reviews
APN: advanced practice nurse
BCMA: bar-coded medication administration
CCIS: critical care information system
CDSSs: computerized decision support systems

CINAHL: Cumulative Index to Nursing and Allied Health Literature
COPD: chronic obstructive pulmonary disease
CPIS: computerized patient information systems
CPOE: computerized provider order entry
CS: communication systems
D-RHIS: disease-specific regional health care information systems
ECG: electrocardiogram
ED: emergency department
EHR: electronic health record
eMAR: electronic medication administration record systems
EMR: electronic medical record
EPR: electronic personal record
ES-NIS: expert system nursing information system
EWS: early warning score
HCPs: health care providers
HIT: health information technology
ICTs: information and communication technologies
ICU: intensive care unit
I-RHIS: integrated regional health care information systems
IT: information technology
LOS: length of stay
MeSH: Medical subject heading
MMIT: medication management health information technology
MS: management systems
NCPF: nursing care performance framework
NHS: National Health Service
ORA: organization risk analyzer
PCC: patient-centered care
PDA: personal digital assistant
PHR: personal health record
PICOs: participants, interventions, comparisons, outcomes and studies
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analysis
RCT: randomized controlled trial
RHIO: regional health care information organization
RHIS: regional health care information system
RN: registered nurse
SMS: short message service
TDMD: therapeutic drug monitoring and dosing
WAP: wireless application protocol

Multimedia Appendix 1. Search strategies

PubMed

Search	Query	Results
#57	(#56 and #52)	1,048
#56	(#10 and #55)	9,698
#55	(#11 or #12 or #13 or #14 or #15 or #16 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #33 or #34 or #35 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44)	103,615
#54	(#10 and #52 and #53)	1,400
#53	(#11 or #12 or #13 or #14 or #15 or #16 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #33 or #34 or #35 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44)	178,564
#52	(systematic[sb] OR meta-analysis[pt] OR meta-analysis as topic[mh] OR meta-analysis[mh] OR meta analy*[tw] OR metanaly*[tw] OR metaanaly*[tw] OR met analy*[tw] OR integrative research[tiab] OR integrative review*[tiab] OR integrative overview*[tiab] OR research integration*[tiab] OR research overview*[tiab] OR collaborative review*[tiab] OR collaborative overview*[tiab] OR systematic review*[tiab] OR technology assessment*[tiab] OR technology overview*[tiab] OR "Technology Assessment, Biomedical"[mh] OR HTA[tiab] OR HTAs[tiab] OR comparative efficacy[tiab] OR comparative effectiveness[tiab] OR outcomes research[tiab] OR indirect comparison*[tiab] OR ((indirect treatment[tiab] OR mixed-treatment[tiab]) AND comparison*[tiab]) OR Embase*[tiab] OR Cinahl*[tiab] OR systematic overview*[tiab] OR methodological overview*[tiab] OR methodologic overview*[tiab] OR methodological review*[tiab] OR methodologic review*[tiab] OR quantitative review*[tiab] OR quantitative overview*[tiab] OR quantitative synthes*[tiab] OR pooled analy*[tiab] OR Cochrane[tiab] OR Medline[tiab] OR Pubmed[tiab] OR Medlars[tiab] OR handsearch*[tiab] OR hand search*[tiab] OR meta-regression*[tiab] OR metaregression*[tiab] OR data synthes*[tiab] OR data extraction[tiab] OR data abstraction*[tiab] OR mantel haenszel[tiab] OR peto[tiab] OR der-simonian[tiab] OR dersimonian[tiab] OR fixed effect*[tiab] OR "Cochrane Database Syst Rev"[Journal:_jrid21711] OR "health technology assessment winchester, england"[Journal] OR "Evid Rep Technol Assess (Full Rep)"[Journal] OR "Evid Rep Technol Assess (Summ)"[Journal] OR "Int J Technol Assess Health Care"[Journal] OR "GMS Health Technol Assess"[Journal] OR "Health Technol Assess (Rockv)"[Journal] OR "Health Technol Assess Rep"[Journal])	316,978
#44	(smartphone or smart phone)	1,295
#43	Cellular Phone[mesh]	5,014
#42	Medical Order Entry Systems[mesh]	1,493
#41	Health Records, Personal[mesh]	718
#40	Reminder Systems[mesh]	2,244

#39	Health Information Systems[mesh]	299
#38	Decision Support Systems, Clinical[mesh]	4,838
#37	Electronic Mail[mesh]	1,866
#35	Computers, Handheld[mesh]	2,323
#34	web-based intervention*	401
#33	(web site* or website*)	18,625
#29	(sms or short message service)	5,156
#28	pda*	10,805
#27	personal digital assistant*	898
#26	ict	3,494
#25	("information and communication technolog*")	12,717
#24	information technolog*	13,553
#23	telecare	2,508
#22	(ehealth or e-health)	20,101
#21	telehealthcare	62
#20	telehealth	18,529
#19	Public Health Informatics	3,883
#16	Electronic Health Record*	9,904
#15	Telenursing	210
#14	(Telemedicine or tele medicine or tele-medicine)	18,314
#13	remote communication*	37
#12	Remote Consultation*	3,709
#11	Decision Making, Computer-Assisted/nurs*	925
#10	(#1 or #2 or #3 of #4 or #5 or #6 or #7 or #8 or #9)	732,152
#9	Nurs*	731,812
#8	Nursing [Subheading]	116,730
#7	Nursing Diagnosis [Mesh]	3,841
#6	Nursing Care [Mesh]	118,176
#5	Evidence-Based Nursing [Mesh]	2,184
#4	Advanced Practice Nursing [Mesh]	834
#3	Nursing Assessment[MeSH Major Topic]	12,306
#2	Nurse's Role[MeSH Major Topic]	15,805
#1	Nurse's Practice Patterns[MeSH Major Topic]	783

CINAHL

Search	Query	Results
#43	#41 AND #42	475
#42	(TI (systematic* n3 review*)) or (AB (systematic* n3 review*)) or (TI (systematic* n3 bibliographic*)) or (AB (systematic* n3 bibliographic*)) or (TI (systematic* n3 literature)) or (AB (systematic* n3 literature)) or (TI (comprehensive* n3 literature)) or (AB (comprehensive* n3 literature)) or (TI (comprehensive* n3 bibliographic*)) or (AB (comprehensive* n3 bibliographic*)) or (TI (integrative n3 review)) or (AB (integrative n3 review)) or (JN "Cochrane Database of Systematic Reviews") or (TI (information n2 synthesis)) or (TI (data n2 synthesis)) or (AB (information n2 synthesis)) or (AB (data n2 synthesis)) or (TI (data n2 extract*)) or (AB (data n2 extract*)) or (TI (medline or pubmed or psyclit or cinahl or (psycinfo not "psycinfo database") or "web of science" or scopus or embase)) or (AB (medline or pubmed or psyclit or cinahl or (psycinfo not "psycinfo database") or "web of science" or scopus or embase)) or (MH "Systematic Review") or (MH "Meta Analysis") or (TI (meta-analy* or metaanaly*)) or (AB (meta-analy* or metaanaly*))	79,479
#41	(#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10) AND (#39 AND #40)	10,745
#40	#1 OR #2 OR #3 OR#4 OR #5 OR #6 OR #7 OR #8 OR #9	96,152
#39	(#11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38)	299,359
#38	TX smartphone or smart phone	4,676
#37	MH Wireless Communications	9,143
#36	MH Electronic Order Entry	2,262
#35	MH Medical Records, Personal	740
#34	MH Computers, Hand-Held	3,094
#33	MH Reminder Systems	1,743
#32	MH Health Information Systems	1,782
#31	MH Decision Support Systems, Clinical	2,649
#30	MH Electronic Mail	4,453
#29	TX web-based intervention*	7,779
#28	TX (web site* or website*)	132,221
#27	TX (sms or short message service)	9,272
#26	TX pda*	4,038
#25	TX personal digital assistant*	4,637
#24	TX ict	4,674

#23	TX information and communication technolog*	40,595
#22	TX information technolog*	135,116
#21	TX telecare	2,511
#20	TX (ehealth or e-health)	5,190
#19	TX telehealthcare	86
#18	TX telehealth	6,574
#17	TX Public Health Informatics	9,436
#16	TX Electronic Health Record*	39,897
#15	TX Telenursing	1,857
#14	TX (Telemedicine or tele medicine or tele-medicine)	12,775
#13	TX remote communication*	10,314
#12	MH Remote Consultation	1,166
#11	MH Decision Making, Computer Assisted	1,021
#9	MH Nursing Diagnosis	3,726
#8	MH Nursing Care	16,328
#7	MH Nursing Practice, Evidence-Based	7,644
#6	MH Advanced Nursing Practice	7,886
#5	MH nursing assessment	15,029
#4	MH nursing role	41,332
#2	MM "Practice Patterns"	6,282
#1	MJ Practice Patterns	6,377

Cochrane

Search	**Query**	**Results**
#21	DARE, Cochrane Reviews, HTA	2,502
#20	#1 and #19	4,332
#19	#2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18	20,774
#18	smartphone or smart phone	162
#17	web-based intervention*	1,679
#16	web site* or website*	5,009
#15	sms or short message service	684
# 14	pda*	604
#13	personal digital assistant*	230

#12	ict	230
#11	information and communication technolog*	931
#10	information technolog*	9,143
#9	telecare	290
#8	ehealth or e-health	381
#7	telehealth*	371
#6	Public Health Informatics	93
#5	Electronic Health Record*	7,326
#4	Telenursing	37
#3	Telemedicine or tele medicine or tele-medicine	1,607
#2	remote communication*	302
#1	nurs*	27,166

Embase

Search	Query	Results
#50	#39 and #49	817
#49	#40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48	245,837
#48	comparative near/3 (efficacy or effectiveness)	20,459
#47	meta next/1 regression* or metaregression*	3,768
#46	met next/1 analy* or metanaly* or technology next/1 assessment* or hta or htas or technology next/1 overview* or technology next/1 appraisal*	25,758
#45	'mantel haenszel' or peto or 'der simonian' or dersimonian or fixed next/1 effect* or latin next/1 square*	19,314
#44	handsearch* or (hand and search*)	13,339
#43	data next/1 synthes* or data next/1 extraction* or data next/1 abstraction*	20,456
#42	integrative near/3 (review* or overview*) or collaborative near/3 (review* or overview*) or pool* near/3 analy*	16,729
#41	quantitative near/3 (review* or overview* or synthes*) or research near/3 (integrati* or overview*)	21,348
#40	'systematic review'/exp or 'meta-analysis'/exp	137,848
#39	#10 and #38	27,532
#38	#11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37	299,928
#37	smartphone or smart next/1 phone	1,714
#36	'cellular phone'/exp	8,515

#35	'medical order entry systems'/exp	17,424
#34	'health records, personal'/exp	147,252
#33	'reminder systems'/exp	1,521
#32	‘health information systems'/exp	14,489
#31	'decision support systems, clinical'/exp	13,324
#30	‘electronic mail'/exp	10,032
#29	'computers, handheld'/exp	13,685
#28	'web based' next/1 intervention*	469
#27	website* or web next/1 site*	24,402
#26	sms or 'short message service'	6,528
#25	pda*	19,566
#24	'personal digital' next/1 assistant*	1,348
#23	ict	5,592
#22	communication next/1 technolog*	2,884
#21	information next/1 technolog*	24,938
#20	ehealth*	1,619
#19	telecar*	2,831
#18	telehealth*	3,240
#17	'public health informatics'	289
#16	'electronic health record'	3,421
#15	telenursing	226
#14	telemedicine or 'tele medicine'	17,460
#13	remote next/1 communication*	42
#12	remote next/1 consultation*	240
#11	'decision making, computer-assisted'/exp	13,324
#10	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9	824,943
#9	nurs*	824,501
#8	'nursing'/exp	339,695
#7	'nursing diagnosis'/exp	3,662
#6	'nursing care'/exp	30,587
#5	'evidence based nursing'/exp	2,268
#4	'advanced practice nursing'/exp	979
#3	'nursing assessment'/exp	28,476
#2	'nurse attitude'/exp	33,230

#1	'nursing practice'/exp	3,503

Epistemonikos

Query	Results
(nurs* AND tele* OR information technolog* OR communicati* technolog* or ICT or emr or ehr or electronic health record* or electronic medical record*)	894

Web of Science

Search	Query	Results
# 25	#24 AND #21	451
# 24	#23 OR #22	Approximately 651,677
# 23	TOPIC: (systematic review)	Approximately 306,063
# 22	TOPIC: (meta-analysis or metaanalysis or meta analysis)	Approximately 423,202
# 21	#20 AND #1	Approximately 18,415
# 20	#19 OR #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 OR #7 OR #6 OR #5 OR #4 OR #3 OR #2	Approximately 635,643
# 19	TOPIC: (smartphone or smart phone)	Approximately 13,177
# 18	TOPIC: (Electronic Mail)	Approximately 10,054
# 17	TOPIC: (web site* or website*)	Approximately 119,442
# 16	TOPIC: (sms or short message service)	Approximately 19,538
# 15	TOPIC: (pda*)	Approximately 47,576
# 14	TOPIC: (personal digital assistant*)	2,732
# 13	TOPIC: (ict)	Approximately 28,076
# 12	TOPIC: (information and communication technolog*)	Approximately 57,260
# 11	TOPIC: (information technolog*)	Approximately 342,198
# 10	TOPIC: (telecare)	977

# 9	TOPIC: (ehealth or e-health)	Approximately 8,021
# 8	TOPIC: (telehealth)	Approximately 6,320
# 7	TOPIC: (telehealth)	Approximately 6,320
# 6	TOPIC: (Public Health Informatics)	Approximately 5,530
# 5	TOPIC: (Electronic Health Record*)	Approximately 36,111
# 4	TOPIC: (Telenursing)	252
# 3	TOPIC: (Telemedicine or tele medicine or tele-medicine)	Approximately 33,391
# 2	TOPIC: (remote communication*)	Approximately 20,406
# 1	TOPIC: (nurs*)	Approximately 1,020,251

Multimedia Appendix 2. List of included reviews.

Anderson, J. A., & Willson, P. (2008). Clinical decision support systems in nursing: Synthesis of the science for evidence-based practice. *Computers, Informatics, Nursing: CIN, 26*(3), 151-158. https://doi.org/10.1097/01.NCN.0000304783.72811.8e

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Dowding, D., Randell, R., Gardner, P., Fitzpatrick, G., Dykes, P., Favela, J., Hamer, S., Whitewood-Moores, Z., Hardiker, N., Borycki, E., & Currie, L. (2015). Dashboards for improving patient care: Review of the literature. *International Journal of Medical Informatics, 84*(2), 87-100. https://doi.org/10.1016/j.ijmedinf.2014.10.001

Finkelstein, J., Knight, A., Marinopoulos, S., Gibbons, M. C., Berger, Z., Aboumatar, H., Wilson, R. F., Lau, B. D., Sharma, R., & Bass, E. B. (2012). *Enabling patient-centered care through health information technology. Evidence report/technology assessment no. 206.* (AHRQ Publication No. 12-E005-EF). Prepared by Johns Hopkins University Evidence-based Practice Center under Contract No. 290-07-10061-I7.

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., Patel, V., & Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: A systematic review and meta-analysis. *PLoS Medicine, 10*(1), e1001363. https://doi.org/10.1371/journal.pmed.1001363

Georgiou, A., Prgomet, M., Paoloni, R., Creswick, N., Hordern, A., Walter, S., & Westbrook, J. (2013). The effect of computerized provider order entry systems on clinical care and work processes in emergency departments: A systematic review of the quantitative literature. *Annals of emergency medicine, 61*(6), 644-653. https://doi.org/10.1016/j.annemergmed.2013.01.028

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Maenpaa, T., Suominen, T., Asikainen, P., Maass, M., & Rostila, I. (2009). The outcomes of regional healthcare information systems in health care: A review of the research literature. *International Journal of Medical Informatics, 78*(11), 757-771. https://doi.org/10.1016/j.ijmedinf.2009.07.001

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Mickan, S., Atherton, H., Roberts, N. W., Heneghan, C., & Tilson, J. K. (2014). Use of handheld computers in clinical practice: A systematic review. *BMC Medical Informatics and Decision Making, 14*, 56. https://doi.org/10.1186/1472-6947-14-56

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Multimedia Appendix 3. Excluded articles and reasons for exclusion.

No outcomes related to nursing practice (no primary findings)	Nurses-related findings inseparable from other healthcare professionals	Had an updated review	Proceeding abstract only (no full review found)	Protocol only (no full review found)	No study in the review	Insufficient details on methodology (doubt on systematization)	Review objective carries on acceptance, attitude and factors of adoption of ICT
Akesson 2007	Arditi 2012	Currell 2003	Clark 2010	Koivunen 2014	Martin 2008	Bakken 2006	Brewster 2013
Anderson 2012	Bassi 2010		MacLure 2011			Merksouris 1995	Gagnon 2012
Atherton 2012	Dorr 2007		MacLure 2014a				Huryk 2010
Chipps 2012	Jennett 2003						McGinn 2011
Clark 2013	Kawamoto 2005						Young 2011
Currell 2000	Keane 2009						
Du 2013	Kukreti 2014						
Durieux 2008	Lindberg 2013						
Gagnon 2010	MacLure 2014b						
Hemens 2011	McGowan 2009						
Holroyd-Leduc 2011	McKibbon 2012						
Inglis 2010	Pearson 2009						
Johansson 2010	Vedel 2013						
Lluch 2011							
Nguyen 2015							
Osborn 2010							
Pappas 2012							
Roine 2001							
Roshanov 2011							
Sant'Anna Vargas 2013							
Sawmynaden 2012							
Shojania Kaveh 2009							
Wei 2011							
Yu 2012							

Appendix 3. References of excluded reviews

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Chipps, J., Brysiewicz, P., & Mars, M. (2012). Effectiveness and feasibility of telepsychiatry in resource constrained environments? A systematic review of the evidence. *African Journal of Psychiatry, 15*(4), 235-243. https://doi.org/10.4314/ajpsy.v15i4.30

Clark, R. A., Inglis, S. C., McAlister, F. A., Ball, J., Lewinter, C., Cullington, D., Stewart, S., & Cleland, J. G. F. (2010). Results from a systematic review and meta-analysis of remote (non-invasive) monitoring in 8,323 heart failure patients on length of stay, quality of life, knowledge, compliance and satisfaction. *European Heart Journal*(Supplement 9), S51-S52. https://doi.org/10.1093/eurheartj/ehq287

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Multimedia Appendix 4. General characteristics of included reviews.

Review	Type of review	Design of included studies	Number of studies	Search dates	Target populations (n)	Health care settings
Anderson (2008)	Mixed	Various, including qualitative, experimental, quasi-experimental, and nonexperimental	17	Not reported	Nurses	Emergency department (ED), oncology nursing, in-hospital clinic, long-term care, neonatal unit, critical care
Bartoli (2009)	Mixed	Various including quantitative and qualitative (no specific designs were mentioned)	17 from 40 full-text articles	1996-2008	Patients (1236) ; nurses (23)	Not specified
Bowles (2007)	Mixed	Various, including prospective, pre- and posttest, group case control, observational, descriptive, randomized trial, intervention group only, pilot study, longitudinal, quasi-experimental, retrospective chart review	19	1995-2005	*For those numbered:* patients (1554), nurses (26)	Home care

Carring-ton (2013)	Rapid review (mixed)	Various, including qualitative, quantitative, and mixed-methods	80	August 1, 2011 to August 1, 2012	Nurses and nurse managers	Hospital; community; online; education, ambulatory; home health; long-term care
Dowding (2015)	Rapid review (quanti-tative)	Various, including before- after study, usability study, cluster randomized controlled trial (RCT), noncompa-rative study, time series analysis	11	November 1996 to December 2012	Patients (20), nurses (not numbered), clinical staff (175), mental health professionals (21), primary care physicians (72), clinicians (258), radiologists (47), anesthesists (29), pharmacists (51)	Primary care practices
Finkelstein (2012)	Mixed	Various, including quantitative (eg, RCT), qualitative, and usability studies	327	Unspecified to July 31, 2010	Physicians, patients, nurses, providers (clinic staff, clinicians), pharmacists	Home health care; clinic; primary care health center; hospital
Free (2013)	Quantitative	Controlled trials	42	January 1990 to September 2010	*For those numbered:* medical students (361), residents (356), physicians (80), second- year baccalaureate nursing students (36), nurse anesthesists (4), undergraduate nurses (87), nursing coordinators (16), nurses (71), patients (3767),	Acute care hospital ; clinic

					patient scans (42), volunteers (62)	
Georgiou (2013)	Quantitative	Various including: pre-post design, prospective studies, RCT, time series studies	22	January 1990 to May 2011	*For those numbered:* patients (32182); physicians (126); nurses (26)	ED
Husebo (2014)	An integrative review (mixed)	Various including RCT, descriptive, qualitative, longitudinal study, quasi-experimental with qualitative data, cross-sectional study	12	January 2003 to April 2013	Elderly patients aged 65 years and over (548), nurses (57), professionals caregivers (4), family users (8)	Home health care
Jones (2002)	Integrated review	Various including retrospective review, randomized prospective trial, cross-over design, pair wise comparison, randomized field experience, qualitative	18	1966-2001	Nurses, adult clients of a medical ambulatory clinic (152), patients (188), elderly (68, home care patients), residents long- term facility (120), patients receiving telenursing (22), caregivers of Alzheimer (102)	Medical ambulatory clinic, home care, long-term care facility, psychiatry service
Kelley (2011)	Integrative	Various, including descriptive and cross- sectional designs	24	Articles published over the past 30 years	Nurses	Hospital settings

Mador (2009)	Quantitative	Various including pre- and posttest, prospective observational analysis, RCT, comparative observational design, meta-analysis	12	1937-2008	Nurses, physicians, ward secretaries, respiratory therapists, and technologists	Intensive care unit (ICU)
Maenpaa (2009)	Mixed	Various, including survey research, case study, evaluation or constructive evaluation studies, and multimethods triangulation	24	1966-2008	*For those numbered:* participants (262), health professionals (318), patients (324), nurses (41), physicians (1390), potential users (250),administra-tors (8), managers (12), representative of federally qualified clinic (1), local public health officials (2).	Community health centers, health departments and hospitals, provider organizations, academic health centers, and community health information exchange organi-zations.
McKibbon (2011)	Mixed	Various, including RCT, cohort, case-control, observational, and qualitative studies	789	Fall 2009 to Summer 2010.	Physicians, pharmacists, nurses, junior students, residents, respiratory technicians, health care providers, clinicians, physician assistants, midwives, staff, patients, hospital administrators	Ambulatory care; hospital; ambulatory clinic; acute care; American pediatric hospital; long-term care; elderly home care

Meissner (2014)	Meta-ethnography	Qualitative	7	January 2000 to January 2013	Administrators, director of nursing, nurses, charge nurses, personal carers	Residential aged care facilities
Mickan (2014)	Quantitative	RCT	7	2001-2013	physicians and residents, nursing students, RN[a], patients	Clinic, ED, med-surg wards
Nguyen (2014)	Mixed	Various including single and multiple case studies, survey, ethnography, focus group, secondary data analysis, mixed-methods, longitudinal.	98	2001-2011	Clinicians (34, doctors and nurses), doctors only(27), doctors and other nonclinical participants (4), nurses and nonclinical participants (12), management and/or administration only (8), patients only (5), organizations (4), IT[b] providers and staff	Tertiary care, secondary care, primary care, long-term care facilities
Nieuwlaat (2011)	Quantitative	RCT	33	In previous review: until September 2004; current review: extended search until Jan 2010	Patients (24,627), physicians, advanced practice nurses (APN), physician assistants, pharmacists, other health professionals	Academic centers, hospital outpatients or inpatients, primary care, community-based and subspecialty clinic
Poissant (2005)	Quantitative	Various, including RCT, posttest control studies, one-group pre- and posttest designs.	23	1990-2004	Physicians, nurses (215)	Home, hospital, clinic

Randell (2007)	Quantitative	RCT	9	Up to April 2005. The search was rerun in May 2006.	Nurses (100 and more), patients (more than 24,000)	Primary care, National Health Service (NHS), ICU
Stevenson (2010)	Mixed	Various, including descriptive, cross-sectional, pre- and postquasi-experimental, qualitative	5	2000-2009	Midwives, nurses, nursing assistants, project managers (326)	Acute or inpatient care settings
Urquhart (2009)	Quantitative (Cochrane)	8 RCT; 1 controlled before and after study	9	Update of 2000 and 2003 review; searched up to the end of 2007	Patients and nurses (1846 in total)	Nursing wards, long-term care facility, psychiatric department, ICU

[a]RN: registered nurse.

[b]IT: information technology.

Multimedia Appendix 5. Review objectives, limitations, and main conclusions.

Review	Review objectives	Review limitations stated by authors	Review authors' conclusions
Anderson (2008)	To present a synthesis of the research literature on the state of nursing science regarding the development, use, and application of clinical decision support systems for the implementation of evidence-based practice in nursing.	None stated	There is a significant knowledge gap on nurse use of CDSSs[a]. Additional theoretical models for the development and testing of CDSSs in nursing are needed to inform and guide nurses on prevention, patient education, and self-management interventions.
Bartoli (2009)	To identify telemedicine services for patients affected by chronic obstructive pulmonary disease (COPD): (1) which telemedicine applications and related organizational models have been adopted for these patients; and (2) the impact of these applications.	None stated	Telemedicine assumes and entails significant changes in work processes. Its adoption resulted in the reconfiguration of existing practices and sociomaterial relationships.
Bowles (2007)	To present a summary and critique of the published empirical evidence about the effects of telehomecare on older adult patients with chronic illness.	None stated	Homecare using communication and monitoring technology is feasible and acceptable to patients and providers and seems to improve outcomes among patients with chronic illness.
Carrington (2013)	To present the findings of a nursing informatics literature review, highlight those publications seen as most influential in the last year and identify common topics and emerging themes in nursing informatics published research.	This review was for a limited period of time. By limiting the literature search to "nursing informatics" and "informatics" as umbrella terms, there is a strong likelihood that additional research articles were not included.	Design, implementation, and evaluation of nursing technologies show promise in nursing efficiencies that may impact patient safety and health care cost.

Dowding (2015)	To provide a comprehensive overview of the current state of evidence for the use of clinical and quality dashboards in health care environments.	Gray literature and studies in languages other than English were not considered. Process of assessing papers was accelerated. Search strategy lacked specificity.	Implementing clinical and/or quality dashboards which provide constant access to information can improve adherence to quality guidelines and may help improve patient outcomes.
Finkelstein (2012)	To review the evidence regarding: (1) Outcomes of health information technology (HIT) applications that address components of patient-centered care (PCC); (2) identifying barriers and facilitators to implementation; (3) defining gaps in our knowledge about these HIT applications that address PCC; and (4) identifying their specific value to consumers, their families, clinicians, and developers of this technology.	Wide heterogeneity of included articles prevented the possibility to perform a meta-analysis. Few studies described the effects of HIT implemented to enable PCC on cost and provider efficiency, and even fewer have done so in a high-quality manner.	Positive effects of PCC-related HIT intervention on: health care process outcomes, disease-specific clinical outcomes (diabetes mellitus, heart disease, cancer), responsiveness to the needs and preferences of patients, shared decision-making, patient-clinician communication, and access to medical information.
Free (2013)	To quantify the effectiveness of mobile technology-based interventions delivered to health care providers or to support health care services, on any health or health care service outcome.	13 trials did not provide sufficient data to calculate effect estimates. Factors influencing heterogeneity of effect estimates included low trial quality and they were not statistically explored. Few trials reporting the same outcomes.	Trials report modest benefits for clinical diagnosis and management support outcomes. SMS[b] reminders have modest benefits on attendance. Service providers should consider implementing SMS appointment reminders.
Georgiou (2013)	To examine evidence of the effect of computerized provider order entry (CPOE) on clinical care and work processes in the ED[c].	Heterogeneous nature of studies, and metrics used to measure performance precluded formal meta-analyses. Potential for publication bias.	Implementation of CPOE systems does not decrease direct patient care time for physicians or nurses, does decrease medication errors, improves laboratory turnaround time, and can influence numbers of laboratory orders but has inconsistent effects on total ED length of stay (LOS).

			CDSS was shown to consistently improve guideline compliance.
Husebo (2014)	To review the published research on care content and utilization of virtual visits, in particular how old patients and the health care providers use a virtual visit and how they experience it.	The variety of terms used and the interdisciplinary character of the field of home telehealth. Sampling and comparison of heterogeneous studies might lead to biased conclusions.	Virtual visits have the advantages of enhanced social inclusion for the elderly patient and also providing support and guidance in self-management of medication. Virtual visits with ordinary in-person visits could help postpone admission to long-term facilities or the need for substantial in-home care.
Jones (2002)	To examine the impact of telehealth on the clinical nursing of elders and answer two questions: (1) To what extent do telehealth applications support essential components of nursing care of elders? (2) To what extent do telehealth applications support the professional dimensions of gerontological nursing practice?	Due to the preponderance of demonstration and feasibility reports, the dearth of experimental investigations, and the heterogeneous nature of the few studies identified, statistical summarization was not attempted.	Telehealth interventions have the potential to improve nursing care of elders because they provide equivalent approaches to assess physical and psychological state; are acceptable, may prove less costly than face-to-face interventions; and can be delivered in a manner that is timely and convenient.
Kelley (2011)	To examine the relationship between electronic nursing documentation and the quality of care provided to hospitalized patients.	Several studies used descriptive cross-sectional designs, which limit the ability to determine causation. Studies used different instruments to measure nurses' attitudes or perceptions, which limit the comparison of findings.	Research gaps remain across the constructs of quality (structure, process, outcomes), and whether electronic nursing documentation improves quality of care provided to hospitalized patients remains unknown.

Mador (2009)	To provide a comprehensive review of the published empirical literature on the impact of a critical care information system (CCIS) on time spent documenting and in direct patient care by staff in the Intensive Care Unit (ICU).	Lack of reliance on self-reported or questionnaire-based data and on interrater reliability. No discussion on within- and between-group differences. All papers were from developed countries and a low number of papers available insert bias.	It is important that a definition of staff activities be developed and validated so that this can be standardized. The impact of a CCIS on the amount of time that health care providers (HCPs) spend charting and in direct care remains unclear.
Maenpaa (2009)	To find out how health information systems have been investigated, what has been investigated, and what are the outcomes?	The quality and scope of the analyzed literature. Studies reviewed by one researcher. Difficulty in classifying the studies according to purpose. The review only covered studies in English.	Regional health information system (RHIS) improved clinical data access, timely information, and clinical data exchange and improvement in communication and coordination. There was also inadequate access to patient relevant clinical data.
McKibbon (2011)	To review the evidence on the impact of health information technology (HIT) on all phases of the medication management process.	Literature was heterogeneous; standard definitions are lacking. Majority of research was based on observational methods, often with opportunity for bias. Substantial deficiencies in reporting data.	Nonphysician groups value different aspects of medication management health IT (MMIT), have diverse needs, and use systems differently. Most studies evaluated changes in processes and outcomes of: use, usability, and knowledge, skills, and attitudes. Most showed moderate to substantial improvement with implementation of MMIT.
Meissner (2014)	To explore staff experiences within the process of the implementation of computer-based nursing records.	Different settings across studies: this limit the ability to generalize the findings. Timing of data collection was different in all studies, which could mean that experiences may differ.	Staff experience IT as a benefit when it simplifies their daily working routines. When IT complicates them, it is experienced as a burden. The staff experience differs according to duties and responsibilities.

Mickan (2014)	To synthesize high-quality evidence to answer the question: Does health care professionals' use of handheld computers improve their access to information and support clinical decision making at the point of care?	Heterogeneity of studies makes synthesis difficult. There is reason to be concerned about publication bias given the sparse reporting of negative findings.	HCPs use of handheld computers can improve their clinical decision-making through improved information seeking and adherence to clinical guidelines. Handheld computers show promise for real-time access to and analysis of clinical information.
Nguyen (2014)	To review EHR[d] implementations around the world and report findings on benefits and issues associated with EHR implementation.	Lack of well-defined conceptual frameworks for evaluation in various papers. There is a range of sociotechnical theoretical frameworks used in different papers.	The potential of technology to improve clinical documentation quality, increase administration efficiency, lead to better quality, safety, and coordination of care. Negative impacts: changes to workflow and work disruption.
Nieuwlaat (2011)	To determine if CCDSSs improve processes of care or patient outcomes for therapeutic drug monitoring and dosing (TDMD).	Incomplete data for evaluation of the CCDSS effects. Variety of drugs and health care settings were included. These factors combined made it problematic to pool results. Risk for publication bias of positive RCTs, which could cause overestimation of efficacy.	CCDSSs have potential for improving process of care for TDMD. More potent CCDSSs need to be developed, should be evaluated by independent researchers using cluster randomization and primarily assess patient outcomes related to drug efficacy and safety.
Poissant (2005)	To examine the impact of EHRs on documentation time of physicians and nurses and to identify factors that may explain efficiency differences across studies.	Papers included in this review cover a 10-year time period during which technology was rapidly evolving.	Nurses are more likely than physicians to gain time efficiency by using a computer system to document patient information. This could be explained by the fact that nurses and physicians they document different types of information.

Randell (2007)	To examine the effect of CDSSs on nursing performance and patient outcomes.	Heterogeneity in the way the interventions work, protocols on which they are based, and the decision tasks they support. Risk of contamination was a concern in four studies.	The introduction of CDSSs may not lead to a positive outcome; further studies are needed in order to identify contexts in which CDSSs use is most effective. Future studies should seek to explore the significance of each component for nursing performance and patient outcomes.
Stevenson (2010)	To examine nursing documentation in relation to how nurses experience using the EPR[e] in everyday clinical practice in acute or inpatient ward settings.	The small number of studies limits the reliability. There is a limited number of studies on nurses' experience of EPRs in ward settings. Further studies may have been found if the search had been extended to cover a longer period.	Nurses were dissatisfied with EPRs because they did not support everyday clinical practice and were not user-friendly. The nursing documentation software in the EPRs requires a design which is integrated into the clinical workflow and functions optimally in clinical practice.
Urquhart (2009)	To establish the beneficial and adverse effect of nursing record systems on nursing practice and patient outcomes. To establish gaps in knowledge and identify areas for further research, both in nursing and in informatics.	Poor methodological quality of studies. Blinded assessment of the outcomes was not reported. Truncation in the presentation of data and results for publication of all studies has caused some difficulty in assessment.	The identified studies provide no evidence of any measurable difference, in nursing practice or patient outcomes, between the use of one kind of nursing record system or another.

[a]CDSSs: computerized decision support systems.

[b]SMS: short message service.

[c]ED: emergency department.

[d]EHR: electronic health record.

[e]EPR: electronic personal record.

Multimedia Appendix 6. eHealth domains, interventions, and comparisons.

Review	eHealth domain (intervention)	Type of general and specific ICTs[a]	Examples of included interventions (particularly those used by nurses)	Examples of comparison interventions
Anderson (2008)	CDSSs[b]	Email discussions, handheld computer, pocket preceptor, expert system nursing information system (ES-NIS), PDA[c], telephone advice line with CDSSs, Web-based decision support tool	Examples included clinical decision-making model and novice clinical reasoning model that provides novice nurses with the decision support assistance of an experienced preceptor; wound and skin intelligence system based on clinical practice guidelines; computerized algorithmic decision support; pressure ulcer prevention and management system to assist nurses with individualized guideline-based treatment for patients who have, or are risk for, pressure ulcers.	In-hospital clinic; APN[d]; nurse eliciting patient preference and usual care
Bartoli (2009)	Communication systems	Telemonitoring, telenursing	No specific example	Not specified
Bowles (2007)	Management and communication systems,	Telemanagement, telemonitoring, telecare, telehealth, telemedicine, telehomecare, interactive video technology, electronic health records (EHR)	Examples include physiologic home monitoring and telemanagement on chronic heart failure outcomes; telehomecare to monitor conditions, reinforce patient teaching and compliance, and to support patient and family; heart failure	Usual care; no intervention; hybrid care (telehomecare and traditional)

			management program through an in-home telehealth communication device; telehealth intervention used to reduce secondary conditions among people with spinal cord injury.	
Carrington (2013)	Management systems, communication systems, CDSSs	Sensor-monitored activity, EHR, electronic medical records (EMR), bedside communication tool, clinical care classification system, continuity of care record, organization risk analyzer (ORA)	Examples include sensors monitoring elderly activity; ORA to explore the relationship of nursing unit communication to patient safety and quality outcomes; interoperable set of diagnosis for use in patient problem list in the EHR to support interoperability; using the clinical care classification system for costing acute care nursing.	Not specified
Dowding (2015)	Management systems	Clinical dashboard, dashboard with EMR, radiology dashboard with picture archiving and communication systems, ventilator management dashboard, adverse drug event (ADE) dashboard	Examples include ventilator management dashboard, presented as a screensaver and accessible with or without EMR with indicators for each patient for each element of ventilator management bundle	EMR, usual care

Finkelstein (2012)	Management systems, communication systems, CDSSs	Email, telemedicine, EMR, videophone, video-based home telehealth, clinical reminders	Examples include email reminder highlighting heart failure recommendations, or an augmented intervention of email plus additional prompts, educational material, and outreach by a nurse specialist; smoking advice by nurses and anesthesiologists in a preoperative clinic; clinical decision support system for depression; Web chat for the public to contact a nurse for any kind of health problem.	Usual care, no email, no intervention, nursing patient assessment using paper
Free (2013)	Communication systems; CDSSs	Mobile telephone, PDA, computer-based scoring system, handheld CDSS; portable media player	Examples include enhancing nursing students' pharmacological knowledge during clinical practice; determining whether nursing medication errors could be reduced and nursing care provided more efficiently; comparing the proportion of obesity-related diagnoses in clinical encounters documented by nurses using a PDA-based log with and without obesity decision support feature.	No access to PDA; paper version of same resources; manual scoring and timing; own knowledge and beliefs; textbooks found on unit and calculator; clinical log with height and weight; obesity-related diagnoses from a pick-list of diagnoses for "weight-related condition;" plan of care items from pick-list; paper-based teleforms; consultation of the early warning score (EWS) weightings; usual communication procedure

Georgiou (2013)	Management systems, CDSSs	CPOE[e], clinical information systems, nursing documentation system	Examples include effects of implementing CPOE and nursing documentation on provider workflow; effect of implementing clinical information systems on processes of care and outcomes in the ED[f]; integration of clinical decision support into an existing ED CPOE system; effect of CPOE combined with a bar-code system on the specimen labeling process; effect of CPOE on pediatric ED care providers' allocation of time	Not specified
Husebo (2014)	Communication systems	Virtual visits by using videophones and real-time audiovisual communication devices	Examples include virtual visits delivered by videophone were used for observations of the patients' condition, prevention of social isolation and increase in social activities, medication safety, support and monitoring of a chronic medical condition.	Usual care; standard care, videoconference and monitoring; conventional methods on wound home care; telephone service or standard unmonitored medication compliance service.
Jones (2002)	Communication systems	Telehomecare visits, telephone nursing interventions, interactive computer networks, interactive video nursing, interactive video technology, videoconference	Examples include interactive video nursing assessment of cardiac heart failure, wound management using interactive video technology, videoconferencing for the assessment of cognitive functioning	Physical assessments conducted in traditional face-to-face modes
Kelley (2011)	Management systems	EHR, electronic nursing documentation	No specific example	N/A[g]

Mador (2009)	Management systems	Critical care information systems (CCIS)	Electronic medical record (EMR), which is a computerized patient charting system, which has been specifically designed for use in ICU.	Paper-based documentation
Maenpaa (2009)	Management systems	Regional health care information system (RHIS), regional health care information organization (RHIO), disease-specific regional health care information systems (D-RHIS), and integrated regional health care information systems (I-RHIS).	Examples include D-RHIS—exemplary scenario of thyroid disease care in an integratedsetting; I-RHIS—electrocardiogram (ECG) or angio processing and management system; Wireless application protocol (WAP)–based system for data transmission from the patient's and from the clinician's side.	Not specified
McKibbon (2011)	Management systems; CDSSs	MMIT[h], e-prescribing applications, electronic medication administration record systems (eMAR), EHRs and EMRs, personal health records (PHRs), health information systems, hospital information systems, CPOE, bar-coded medication administration (BCMA), pharmacy-based HIT, PDAs, patient decision support systems.	Examples include MMIT applications as electronic systems that (1) collect, process, or exchange health information about patients; (2) are integrated with existing health IT systems such as EHR or EMR systems; and (3) provide advice or suggestions on issues or decisions related to medication management.	Not specified.
Meissner (2014)	Management systems	Computer-based nursing records, clinical information systems, EHR,	No specific example	N/A

		bedside EMR, electronic documentation		
Mickan (2014)	CDSSs	PDA with or without CDSS	Examples include PDA with rule for gastrointestinal risk assessment when prescribing NSAIDS[i]; PDA with angina diagnosis software. PDA with CDSS for obesity diagnosis; PDA with CDSS for pulmonary embolism.	PDA without rule for gastrointestinal risk assessment when prescribing NSAIDS; conventional care; PDA without CDSS for obesity diagnosis; PDA used for data collection only; paper-based guideline material.
Nguyen (2014)	Management systems	EHR	No specific example	N/A
Nieuwlaat (2011)	CDSSs	CDSSs used for TDMD	CDSSs (computer-assisted insulin protocol) recommended insulin dosing and glucose monitoring to achieve glucose control in patients in intensive care units.	A strict glycemic control protocol for intravenous insulin infusion. All insulin adjustments were made by nurses. Conventional and usual care: Subcutaneous insulin is administered for blood glucose levels.
Poissant (2005)	Management systems	EHR, central station desktops such as computerized nursing documentation system, PDA, bedside terminals	The PDA was used to enter data on an activity of daily living (ADL) assessment tool and was used as an independent device with no data exchange at the time of data entry. IT were used for documentation (ie, all notes, orders, and referrals that are part of the care plan of a patient and documented in a patient's medical chart).	Paper charting

Randell (2007)	CDSSs	CDSSs	Warfarin dosage adjustment calculated using CDSSs; glucose regulation by ICU nurses using CDSSs; telephone triage and advice with CDSSs	Warfarin dosage adjustment calculated by nurse-specialist without CDSSs; patients requesting same day appointment triaged by practice nurses supported by clinical protocols; Glucose regulation by ICU nurses using paper-based guidelines; standard care
Stevenson (2010)	Management systems	EPR	Examples include computerized patient information systems (CPIS) for clinical information; EHRs for documentation in nursing	Not specified
Urquhart (2009)	Management systems	Nursing record systems	Examples included computerized care-planning system incorporating standardized nursing nomenclature, the system was used for recording care as well as for care planning; intensive care information system	Paper-based documentation system, paper-based care plans, paper nursing care planning system

[a]ICTs: information and communication technologies.

[b]CDSSs: computerized decision support systems.

[c]PDA: personal digital assistant.

[d]APN: advanced practice nurse.

[e]CPOE: computerized provider order entry.

[f]ED: emergency department.

[g]N/A: not applicable.

[h]MMIT: medication management health information technology

[i]NSAIDS: nonsteroidal antiinflammatory drugs.

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3 Chapitre 3. Recension des écrits – Volet 2

3.1 Article 2. Effects of e-learning in a continuing education context on nursing care: Systematic review of systematic qualitative, quantitative, and mixed-studies reviews[8]

3.1.1 Résumé

Dans ce deuxième article, nous avons reproduit la méthodologie d'une revue systématique de revues systématiques. Nous étions intéressées à résumer les résultats de revues systématiques qualitatives, quantitatives et mixtes sur les effets de la formation numérique sur les soins infirmiers. La formation numérique n'étant pas couverte dans la revue de revue précédente (*cf.* article 1), nous avons ciblé spécifiquement ce type d'intervention. Les « effets » pouvaient être de diverses natures, c'est-à-dire qu'ils référaient à l'ensemble des retombées de la formation numérique telles que vécues, perçues et mesurées par et auprès des infirmières. L'intention initiale, comme prévue au protocole (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017), était d'utiliser le Cadre de performance des soins infirmiers (Dubois et al., 2013) pour analyser et présenter les résultats. Considérant la teneur des résultats, nous avons plutôt privilégié un modèle d'évaluation couramment utilisé en formation, soit celui de Kirkpatrick (2006).

3.1.2 Abstract

Background: E-learning is rapidly growing as an alternative way of delivering education in nursing. Two contexts regarding the use of e-learning in nursing are discussed in the literature: (1) education among nursing students and (2) nurses' continuing education within a life-long learning perspective. A systematic review of systematic reviews on e-learning for nursing and health professional students in an academic context has been published previously; however, no such review exists regarding e-learning for registered nurses in a continuing education context.

[8] Rouleau, G., Gagnon, M.-P., Côté, J., Payne-Gagnon, J., Hudson, E., Dubois, C.-A. & Bouix-Picasso, J. (2019). Effects of e-learning in a continuing education context on nursing care: Systematic review of systematic qualitative, quantitative, and mixed-studies reviews. *Journal of Medical Internet Research*, 21(10), e15118. https://doi.org/10.2196/15118

Objective: We aimed to systematically summarize the qualitative and quantitative evidence regarding the effects of e-learning on nursing care among nurses in a continuing education context.

Methods: We conducted a systematic review of systematic qualitative, quantitative, and mixed-studies reviews, searching within four bibliographic databases. The eligibility criteria were formulated using the population, interventions, comparisons, outcomes, and study design (PICOS) format. The included population was registered nurses. E-learning interventions were included and compared with face-to-face and any other e-learning interventions, as well as blended learning. The outcomes of interest were derived from two models: nursing-sensitive indicators from the Nursing Care Performance Framework (eg, teaching and collaboration) and the levels of evaluation from the Kirkpatrick model (ie, reaction, learning, behavior, and results).

Results: We identified a total of 12,906 records. We retrieved 222 full-text papers for detailed evaluation, from which 22 systematic reviews published between 2008 and 2018 met the eligibility criteria. The effects of e-learning on nursing care were grouped under Kirkpatrick's levels of evaluation: (1) nurse reactions to e-learning, (2) nurse learning, (3) behavior, and (4) results. Level 2, nurse learning, was divided into three subthemes: knowledge, skills, attitude and self-efficacy. Level 4, results, was divided into patient outcomes and costs. Most of the outcomes were reported in a positive way. For instance, nurses were satisfied with the use of e-learning and they improved their knowledge. The most common topics covered by the e-learning interventions were medication calculation, preparation, and administration.

Conclusions: The effects of e-learning are mainly reported in terms of nurse reactions, knowledge, and skills (ie, the first two levels of the Kirkpatrick model). The effectiveness of e-learning interventions for nurses in a continuing education context remains unknown regarding how the learning can be transferred to change practice and affect patient outcomes. Further scientific, methodological, theoretical, and practice-based breakthroughs are needed in the fast-growing field of e-learning in nursing education, especially in a life-learning perspective.

Trial Registration: International Prospective Register of Systematic Reviews (PROSPERO) CRD42016050714; https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=50714

Keywords: continuing education; e-learning; nurses; nursing care; systematic review of systematic reviews

3.1.3 Introduction

Background

E-learning is rapidly growing as an alternative way of delivering education (Lahti et al., 2014; Vaona et al., 2018). Nicoll et al (2018) used the term *technology-enhanced learning* and stated that "it is a means by which learners can be provided with enhanced or transformed educational experiences." Many other terms have been used synonymously and interchangeably to designate e-learning, such as computer-assisted learning, online learning, or Web-based learning (Sinclair et al., 2016). For the purpose of this paper, we will use *e-learning* as an umbrella term to entail a variety of electronic, digital, or mobile devices used to support learning (De Caro et al., 2016). Clark and Mayer (2016) specify elements about the *what*, *how*, and *why* of e-learning. The *what* includes content and instructional methods. The *how* encompasses elements such as the format (eg, asynchronous and webinars) and the use of multimedia (eg, video, animation, and printed words). The *why* is about, for instance, the achievement of learning objectives and/or the performance of skills applied in a workplace context.

In the literature targeting the use of e-learning in nursing, two populations and contexts are discussed. The first one is education among nursing students (eg in Voutilainen et al., 2017) who participate in educational programs mainly offered in academic settings. For instance, undergraduate nursing students have to develop entry-level competencies to meet the practice expectations required in getting their registered nurse (RN) licensure in order to "provide safe, competent, compassionate, and ethical nursing care in a variety of practice settings" (Canadian Nurses Association, 2015). The second context is continuing education (CE), also called continuing professional development (Légaré et al., 2015) or continuing competency (Canadian Nurses Association, 2015), targeting a life-long learning perspective and staff development (eg, Knapp et Byers, 2008). RNs have to meet CE expectations to be eligible to renew their licensure and registration each year, with the goals of acquiring new competencies, maintaining the acquired ones, enhancing their practice, and keeping their skills relevant and up-to-date (Canadian Nurses Association, 2015). We refer here to CE programs that are applicable in workplace settings. The use of e-learning by nurses in a CE context is the one that retained our attention (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017) for two main reasons: much more attention has been given to nursing students than to RNs (De Caro et al., 2014;

De Caro et al., 2016) and this CE context will be informative to lay the groundwork for a wider research project.

A previous systematic review of systematic reviews (SRSRs) of e-learning for nursing and health professional students in an academic context has been conducted (De Caro et al., 2014; De Caro et al., 2016). The findings show that e-learning is equivalent to traditional learning. However, e-learning has proven to have large effects compared to no intervention in health professions (Cook et al., 2008). To the best of our knowledge, we found no SRSRs about e-learning used by RNs in a CE context.

Objective

We aimed to systematically summarize the qualitative and quantitative evidence that comes from systematic qualitative, quantitative, and mixed-studies reviews regarding the effects of e-learning on nursing care among nurses in a CE context.

3.1.4 Methods

The protocol was registered in the International Prospective Register of Systematic Reviews (PROSPERO) (number: CRD42016050714) and was published elsewhere (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017).

Design

We conducted a systematic review (SR) of systematic qualitative, quantitative, and mixed-studies reviews with the intent of generating new insights and understanding. This method allowed us to bring together, summarize, and enhance accessibility of existing evidence (Hunt et al., 2018). We combined outcomes from various types of SRs and synthesized qualitative and quantitative evidence. This type of synthesis is useful in identifying existing e-learning interventions used by RNs in their workplace settings and in describing the range of outcomes of interest measured, documented, and informed by the Nursing Care Performance Framework (NCPF).

We used the Cochrane Collaboration methodology (O'Connor et al., 2011) and other relevant works in this domain (Pollock et al., 2018; Pollock et al., 2016) to structure and report the SRSRs.

Nursing Care Performance Framework

We planned to use the NCPF to guide our synthesis. The NCPF is based on Henriksen et al's work (2008), which depicts a conception of nursing care as a complex, whole entity; this entity is encompassed by many interrelated and interdependent subsystems and components that are logically coordinated and oriented toward the achievement of optimal outcomes for patients (Dubois et al., 2013). The NCPF is a systemic and organizational model aimed to measure the performance of nurses in the health care system through a set of indicators sensitive to various aspects of nursing care. The rationale for using the NCPF was based on our previous work (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson et Dubois, 2017). We conducted an SRSRs of the effects of information and communications technologies on nursing care. We then categorized these effects based on the following nursing care subsystems pertaining to the NCPF: nursing care structure (eg, nursing staff supply and profiles, work conditions, and nursing staff stability), nursing services (eg, professional practice environment, nursing processes, and interventions), and patient outcomes (eg, patient functional status and care safety). Our first intent in this current SRSRs was to use the NCPF for guidance and as a starting point for data extraction and analysis, while remaining open to the emergence of new data (ie, outcomes) that were not part of the framework. We expected to get a comprehensive portrait of how dimensions and indicators of nursing care, as developed in the NCPF, could be influenced by the use of e-learning interventions in a nursing CE context. In other words, we identified, from the NCPF, a pre-established range of possible outcomes and indicators related to nursing care, for which data would be sought in this SRSRs (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017).

Eligibility Criteria

The scope was formulated using the population, intervention, comparison, outcomes, and study design (PICOS) format (Centre for reviews and dissemination, 2009; O'Connor et al., 2011). Eligibility criteria are presented in Table 1.

Table 1. Eligibility criteria.

SR[a] components	Inclusion criteria	Exclusion criteria
Population	RNs[b], according to the professional legislation of each country	Undergraduate nursing students in an academic context
Intervention	E-learning (ie, use of electronic, digital, or mobile devices to support learning) used in a continuing education context	Any type of simulation with a physical mannequin
Comparison	Face-to-face learning, any other e-learning intervention, or blended learning	N/A[c]
Outcomes	Primary outcomes: effects of e-learning on nursing care, including (1) nursing resources (eg, working conditions, nursing staff supply, and staff maintenance) and (2) nursing services (eg, nurses' practice environments, nursing processes and interventions, and professional satisfaction) Secondary outcomes: Effects of e-learning on patient outcomes (eg, patients' empowerment, comfort, and quality of life)	N/A
Study design	Systematic qualitative, quantitative, and mixed-studies reviews published in French, English, or Spanish	Grey literature and non-SR, such as literature reviews

[a]SR: systematic review.
[b]RN: registered nurse.
[c]N/A: not applicable.

Search Strategy and Selection Criteria

We searched for articles that were published between January 1, 2006, and January 26, 2017, in the following electronic databases: PubMed, Embase, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Joanna Briggs Institute (JBI). We updated the search strategy to include articles published between January 1, 2017, and November 11, 2018. The search strategy time frame was partially informed by the work of de Caro et al (2014; 2016), who conducted an SRSRs on a similar topic. They performed search strategies on articles published between 2003 and 2013. Included SRs were published between 2008 and 2013. We extended our search strategy to include articles published from 2006 onward to capture SRs that could have been missed in previous work.

We developed a structured search strategy that was validated by a health information specialist. We used the thesaurus terms from each database and used free text to target the *title* and *abstract* fields. An example of the search strategy in PubMed has been presented elsewhere (Rouleau, Gagnon, Côté,

Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017). For the JBI database, we hand searched the whole database for relevant literature. We collected the results of each database search in EndNote reference manager, version X7.7.1 (Clarivate Analytics) and we removed duplicate citations. Furthermore, we hand searched for relevant SRs, contacted authors to find other relevant works in this domain, and consulted the reference lists of included SRs.

Selection of Systematic Reviews

We used DistillerSR (Evidence Partners), a Web-based SR software, to perform the screening and selection of SRs as well as the data extraction. A group of three reviewers (GR, JPG, and EH) independently screened the title and abstract of the papers in order to assess their eligibility. Each paper was reviewed twice, by two of the three reviewers. When consensus was not reached, arbitration was done with the third review author who was not involved in the selection of a specific SR. After the first round of screening, we retrieved full-text copies of publications that met the pre-established inclusion criteria and we assessed them twice.

Methodological Quality Assessment of Included Systematic Reviews

The methodological quality assessment is defined as the critical appraisal of each SR and the extent to which authors of each SR met the highest possible standards in conducting and reporting their research process. Methodological quality also refers to risk of bias (ie, deviations of findings from the truth); flaws in design, conduct, analysis, and/or reporting can be the cause of these deviations (Pollock et al., 2018).

Methodological quality was done independently by two reviewers (GR and JBP) using two critical appraisal tools in order to cover a wider and complementary range of criteria: Assessment of Multiple Systematic Reviews (AMSTAR) 2 (Shea et al., 2017) and Risk Of Bias In Systematic Reviews (ROBIS) (Whiting et al., 2016). AMSTAR 2 is a 16-item instrument that provides detailed and comprehensive assessment of SRs that include randomized or nonrandomized studies of health care interventions. ROBIS contains 21 signaling questions divided into three phases:

1. The assessment of relevance (optional).
2. The identification of concerns with the review process, in which bias can be introduced from within four domains:
    a. Study eligibility criteria.

b. Identification and selection of studies.
c. Data collection and study appraisal.
d. Synthesis and findings.

3. Overall judgment about risk.

These tools are best suited for quantitative SRs and were not designed for systematic qualitative and mixed-studies reviews. However, because there was no consensus on how to assess methodological quality of qualitative and mixed-studies reviews at the time we began the SRSRs, we used both tools: AMSTAR 2 and ROBIS. Any disagreements that arose between the reviewers during the methodological quality assessment process were resolved through discussion.

Data Extraction

A team of three authors (GR, JPG, and EH) conducted data extraction. Each paper was extracted independently by two of the three reviewers. We extracted the following data: (1) general characteristics of the SRs (eg, purpose, type of SR, number of primary studies included, populations, and settings); (2) details about e-learning interventions, comparisons, and the use of theories (ie, in the development and evaluation processes); and (3) outcomes, including their nature (ie, qualitative and/or quantitative) and direction (ie, positive, negative, or no effect). We used the adapted version of the NCPF (Dubois et al., 2013) as a guide to extract outcomes. The dual extraction of outcomes data is particularly important, since these data are directly used in synthesizing the evidence that informs the conclusions of the review (Whiting et al., 2016).

As recommended by Higgins et al (2019), all the steps mentioned before (ie, selection of SRs, methodological quality assessment, and data extraction) were done by two authors working independently in order to minimize the risk of making mistakes and of being influenced by a single person's biases. In total, four authors were involved in performing these steps (GR, JPG, EH, and JBP).

Data Synthesis

The first author (GR) performed a qualitative thematic synthesis using a data-based convergent synthesis design (Creswell, 2014; Pluye et Hong, 2014). We qualified quantitative data by using a narrative synthesis to describe the effect of e-learning on nursing care. We transformed the numerical data in specific themes and subthemes. This approach in conducting the data synthesis was chosen considering the mixed nature of evidence (ie, qualitative and quantitative) and the exploratory lens of this SRSRs. Two reviewers (EH and JPG) were involved in validating the data synthesis.

Overlap in Systematic Reviews

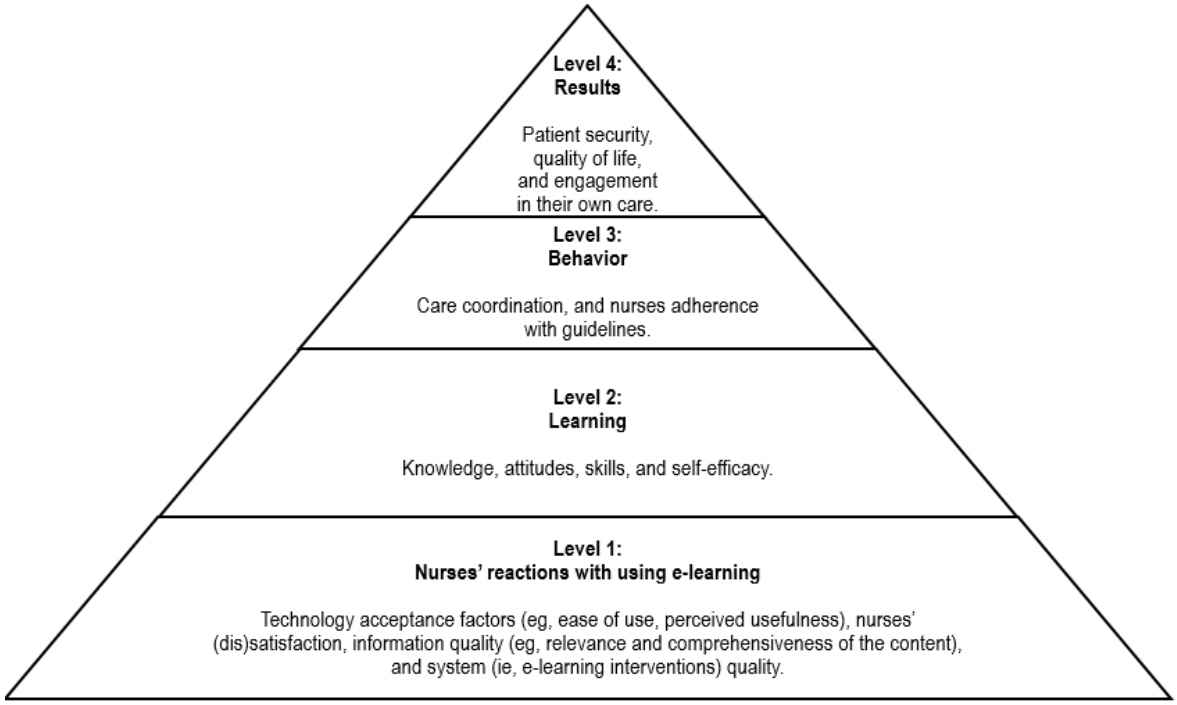
As mentioned in the protocol (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017), one of the challenges encountered when conducting SRSRs is the identification of overlap in SRs (Pieper et al., 2014; Pollock et al., 2019a, 2019b) ie, "when the primary studies included within the SRs had multiple related publications that were referenced differently across SRs")(Pollock et al., 2019b, p. 8). Authors of SRSRs need to closely examine the content of the SRs and their included primary studies to accurately assess the extent and nature of the overlap. The ways of managing overlap in SRs depend on the purpose of the SRSRs and the method of data analysis (Pollock et al., 2018). Pollock et al (2018) suggest that when the purpose of the SRSRs is to present and describe the body of knowledge that comes from SRs, it may be appropriate to include the results of all relevant SRs, regardless of the overlap across primary studies. Considering the exploratory lens of our SRSRs and our intent to draw a broad picture of the effects of e-learning interventions used by nurses in a CE context, we created a citation matrix (Pollock et al., 2018)(see Multimedia Appendix 1) to visually represent the overlap between primary studies within included SRs. The implications of these overlaps do not have consequences on, for example, overestimating the effects of e-learning interventions that would bias recommendations to use a specific intervention over the others. The purpose of this SRSRs is not prescriptive and is not intended to inform or guide decision making, policy, or practice recommendations.

Deviation From the Protocol

As previously mentioned, we used the NCPF to extract and classify the outcomes but we did not use it, as we had planned, to synthesize data regarding the effects of e-learning on nursing care. Indeed, this framework offers a broad perspective of the nursing care system, considering the diversity of nursing-sensitive indicators that are centered on structure and resources, nursing services and processes, and patient outcomes. However, most of these indicators do not reflect the current state of knowledge deriving from the effects of e-learning reported in the literature. These effects are rather circumscribed around nurses' level of satisfaction, knowledge, or skills acquisition, which fit more with the Kirkpatrick model (2006). This model proposes four distinct levels as a sequence of ways to evaluate the effectiveness of an educational program: (1) reactions, (2) learning, (3) behavior, and (4) results. Level 1 (ie, reactions) is about nurses' satisfaction with e-learning interventions. Level 2 (ie, learning) refers to the extent to which nurses change or improve attitudes, knowledge, skills, and/or

self-efficacy as a result of attending the e-learning interventions (Kirkpatrick et Kirkpatrick, 2006). Level 3 (ie, behavior) is the extent to which nurses' learning has been translated into their postlearning behavior or their clinical performance (Légaré et al., 2015). Level 4 (ie, results) can be seen as patients' health outcomes resulting from the influence of e-learning interventions on nurses' behavior changes, which was adapted from Légaré et al (2015) ; this level can also be seen as other outcomes, such as costs (Kirkpatrick et Kirkpatrick, 2006). In Figure 1, the Kirkpatrick model is presented, supported by some concrete examples provided by Shen et al (2017).

Figure 1. The Kirkpatrick model.



Other frameworks could have been selected to extract and synthesize data, including the Expanded Outcomes Framework (Moore et al., 2009) or the Jeffries simulation model (2005), since the *outcomes* component of the latter model can be potentially applicable to e-learning. However, we chose the Kirkpatrick model because it is well documented and extensively used in many educational contexts, including e-learning in the CE context (Militello et al., 2014; Shen et al., 2017). The Kirkpatrick model needs to be presented in some detail so the reader can immediately associate the study's findings and assess the results. Also, the choice of the Kirkpatrick model out a pool of similar models needs to be explained and justified as to its relevance and fit to the study.

Once we performed the first extraction using the NCPF, the data were read several times by three authors (GR, EH, and JPG). The first author built a thematic tree based on the reading of all material through line by line coding (ie, the inductive part) and based on existing works (Dubois et al., 2013; Kirkpatrick et Kirkpatrick, 2006) (ie, the deductive part). This SRSRs was then guided by these two models (Dubois et al., 2013; Kirkpatrick et Kirkpatrick, 2006) at different points in time: the use of the NCPF was preplanned, and the use of the Kirkpatrick model was decided during the process of data analysis and synthesis. The presentation of findings are supported by the four levels of evaluation (Kirkpatrick et Kirkpatrick, 2006).

Finally, we did not calculate the corrected covered area (Pieper et al., 2014) in order to measure the actual degree of overlap in the SRSRs. We simply illustrated the overlap in a matrix (see Multimedia Appendix 1), as explained earlier.

3.1.5 Results

Search Results and Eligibility of Systematic Reviews

The overall process of SR selection is illustrated with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (Liberati, 2009) (see Figure 2). We identified a total of 12,906 records. After removing duplicate references, we assessed 11,775 records for eligibility. We retrieved 222 full-text papers for detailed evaluation, from which 22 SRs published between 2008 and 2018 met the eligibility criteria. The list of included SRs is presented in Multimedia Appendix 2. In Multimedia Appendix 3, we provide the references of excluded papers as well as the reasons for exclusion.

Methodological Quality Assessment Results

We did not exclude papers based on methodological grounds, considering the scope of the SRSRs, which was not intended to inform action or decision making in terms of the most effective e-learning to impact nursing care. The assessment of methodological quality is presented individually for each SR (see Table 2) and globally (ie, all included SRs) using ROBIS (see Figure 3) and AMSTAR 2 (see Figure 4). Out of 22 SRs, 9 (41%) were at low risk of bias, 8 (36%) were at high risk of bias, and 5 (23%) had an unclear risk of bias. The assessment with AMSTAR 2 yielded the following results: out of 22 SRs, 6 (27%) had a high level of confidence, 4 (18%) had a moderate level of confidence, 10 (45%) had a low level of confidence, and 2 (9%) had a critically low level of confidence. The findings

regarding the risk of bias and the level of confidence for the same SR were consistent across the two tools. For example, an SR (Bloomfield et al., 2008) at high risk of bias according to the ROBIS tool was rated as having a low level of confidence using the AMSTAR 2.

Figure 2. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart. CE: continuing education.

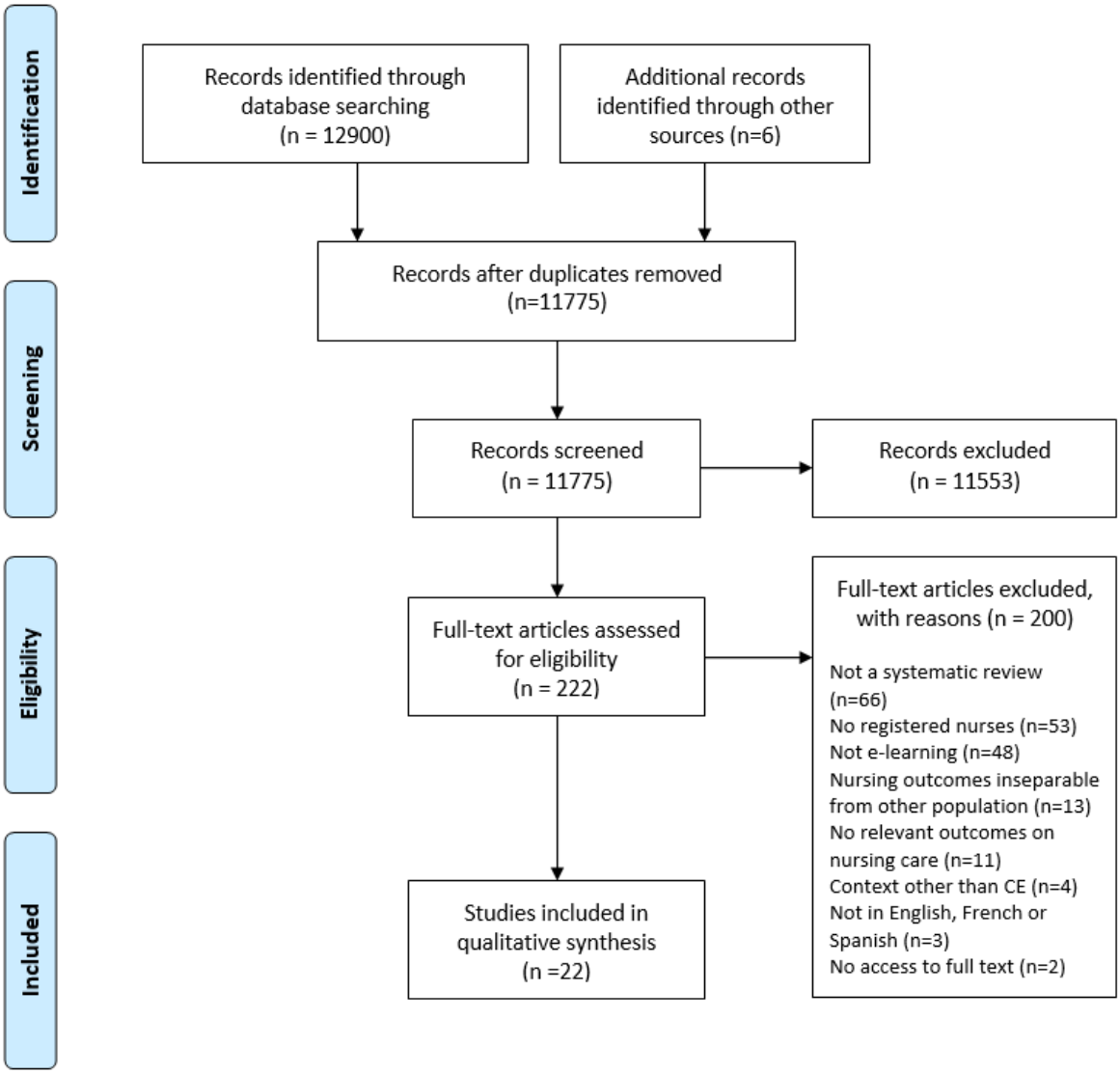


Table 2. Methodological quality assessment for each individual SR[a] included in this study using a combination of the ROBIS[b] tool and the AMSTAR[c] 2.

Author, year (type of SR)	Risk of bias using the ROBIS tool, Phase 2[d]: Identifying concerns with the review process—the four domains of bias				Risk of bias using the ROBIS tool, Phase 3: Judging overall risk of bias in the review	Level of confidence using the AMSTAR 2: final judgment
	Study eligibility criteria	Identification and selection of studies	Data collection and study appraisal	Synthesis and findings		
Bloomfield (2008) (QT[e])	Low	High	High	High	High	Low
Brunero (2012) (MSR[f])	Low	Unclear	Unclear	High	Unclear	Low
Byrne (2008) (QT)	High	Unclear	High	High	Unclear	Low
Carroll (2009) (MSR)	High	Unclear	High	High	High	Critically low
Chipps (2012) (QT)	Low	Low	Low	Unclear	Low	Moderate
Coyne (2018) (MSR)	Low	Low	Low	Unclear	Unclear	Moderate
Du (2013) (QT)	Low	Low	Low	Low	Low	High
Feng (2013) (QT)	Low	Unclear	Low	Low	Low	High
Freire (2015) (MSR)	Unclear	Low	High	High	High	Low
Härkänen (2016) (QT)	Low	Low	Low	Low	Low	High
Hegland (2017) (QT)	Low	Low	Low	Low	Low	High
Hines (2015) (QT)	Low	Low	Unclear	Low	Low	Moderate
Kakushi (2016) (MSR)	Unclear	Unclear	High	High	High	Low
Kang (2017) (QT)	Low	Unclear	Low	Low	Low	High
Knapp (2008) (MSR)	High	High	High	High	High	Critically low
Lahti (2014) (QT)	Low	Unclear	Low	Low	Low	Moderate
Lam-Antoniades (2009) (QT)	Low	Unclear	Unclear	High	High	Low
Lawn (2017) (MSR)	Unclear	High	Low	High	Unclear	Low
Nicoll (2018) (MSR)	Low	Unclear	Unclear	High	High	Low

Philips (2012) (MSR)	Unclear	Unclear	Unclear	Unclear	Unclear	Low
Sinclair (2016) (QT)	Low	Low	Low	Low	Low	High
Tomlinson (2013) (QT)	Low	Unclear	High	High	High	Low

[a]SR: systematic review.
[b]ROBIS: Risk Of Bias In Systematic Reviews.
[c]AMSTAR: Assessment of Multiple Systematic Reviews.
[d]Phase 1 is optional and consists of assessing the relevance of SRs. It was not performed nor described.
[e]QT: quantitative review.
[f]MSR: mixed-studies review.

Figure 3. Methodological quality using the Risk Of Bias In Systematic Reviews (ROBIS) tool.

The total risk of bias and the four domains of bias are shown. The numbers within the bars represent the number of systematic reviews.

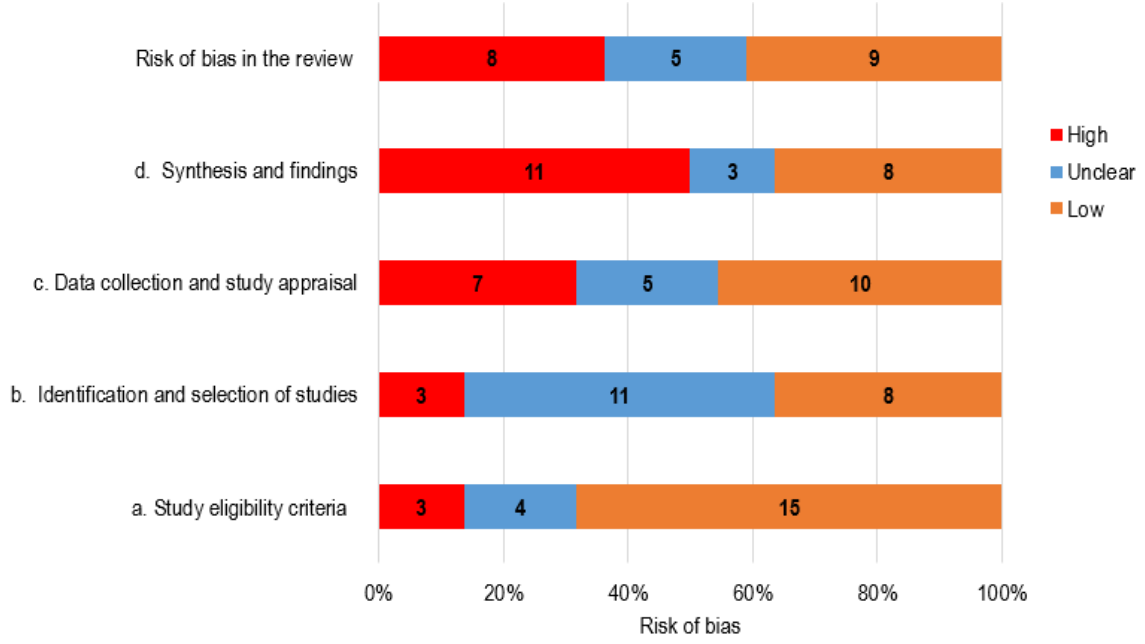
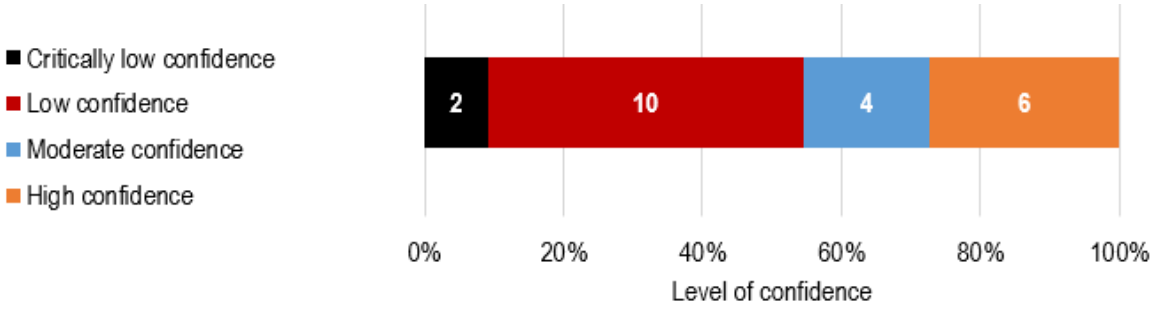


Figure 4. Methodological quality using the Assessment of Multiple Systematic Reviews (AMSTAR) 2.

The numbers within the bars represent the number of systematic reviews.



General Characteristics of Systematic Reviews and Participants

General characteristics of included SRs are shown in Multimedia Appendix 4. The first authors of the included SRs were from various countries: Australia (n=7), United Kingdom (n=4), Brazil (n=2), South Africa (n=1), China (n=1), Taiwan (n=1), Korea (n=1), Finland (n=2), Norway (n=1), United States (n=1), and Canada (n=1). In 8 SRs out of 22 (36%), there was an overlap regarding primary studies (see Multimedia Appendix 1).

We included any SRs that contained one or many primary studies focusing on RNs using e-learning interventions in a CE context, which means that SRs with populations other than RNs (eg, nursing students and other health care providers) were included as long as information about RNs was clearly retrievable. The ratio of primary studies targeting nurses in a CE context to the total number of primary studies pertaining to an SR was very low. For example, from Brunero et al (2012), we extracted only 2 out of the 25 (8%) primary studies that met all of the eligibility criteria. Only 1 SR (Knapp et Byers, 2008) included all primary studies (n=5) that concerned the population of interest (ie, RNs), the e-learning intervention, the outcomes of interest, and the CE context. When reported, the number of RNs across the SRs varied from 15 (Tomlinson et al., 2013) to 658 (Nicoll et al., 2018). RNs had different job titles (eg, nurse specialists, practice nurses, community nurses, and school nurses) and worked in different settings (eg, intensive care units, emergency departments, coronary critical care, medical-surgical, pediatrics, mental health, palliative care, geriatric hospitals, and primary care).

E-Learning Interventions and Comparison Groups

There were a variety of e-learning interventions targeting nurses in a CE context (see Multimedia Appendix 5). Some examples are an online learning module regarding the use of brief motivational

interviewing as a communication style to influence health behavior change (Lawn et al., 2017) and online and interactive CD-ROM programs on medication administration skills and safety (Härkänen et al., 2016). Other e-learning interventions were presented in terms of configuration, such as computer-assisted instructions (Bloomfield et al., 2008), computer-based simulation (Byrne et al., 2008), videoconferencing (Phillips et al., 2012; Tomlinson et al., 2013), and situated e-learning (Feng et al., 2013), while few had details on the instructional method, such as case-based learning (Brunero et al., 2012).

Examples of comparison interventions included the following: electronic intervention, face-to-face intervention, no intervention, and blended learning. In four SRs (Chipps et al., 2012; Hines et al., 2015; Lam-Antoniades et al., 2009; Nicoll et al., 2018), information about the theories or models used was reported regarding the engagement of stakeholders and the development or evaluation of e-learning interventions. These theories and models included engagement models (Seibert et al., 2004; Stain et al., 2005), adult learning theory (Conole et al., 2004), the Kirkpatrick model (2006), and the effects of information systems quality on nurses' acceptance of the e-learning system (Cheng, 2012).

Effects of E-Learning

Overview

The outcomes are presented under different formats. First, the findings are grouped per systematic review along with a description of the interventions and the comparisons (see Multimedia Appendix 5). Second, they are described under a frequency table (see Table 3). Overall, positive outcomes (ie, effects reported in favor of e-learning interventions) are overrepresented compared to negative outcomes and those with no effect. Finally, the outcomes are synthesized and presented narratively under four main themes, informed by the Kirkpatrick model (2006).

Table 3. Frequency and direction of outcomes.

Levels of evaluation from the Kirkpatrick model and subthemes	Number of documented outcomes from primary studies and direction of the effect			
	Negative	No effect	Positive	Total
1. Nurse reactions with e-learning (n=11 SRs[a])				
Total	7	0	27	34
General	0	0	9	9

	Anonymity	0	0	1	1
	Authentic scenario	0	0	1	1
	Computer and Internet experience	1	0	0	1
	Confidence in e-learning	0	0	1	1
	Content	0	0	1	1
	Discussion	0	0	1	1
	Information sharing	1	0	0	1
	Interactions	2	0	2	4
	Learners' experience	0	0	1	1
	Overall satisfaction	0	0	1	1
	Person-centered approach	0	0	1	1
	Satisfaction with interactive case studies	0	0	2	2
	Scope of reflection	0	0	1	1
	Sense of belonging	0	0	1	1
	Technical support	0	0	1	1
	Technology characteristics	3	0	3	6
2. Nurse learning (n=19 SRs)					
	Total	3	10	40	53
	Knowledge (n=13 SRs)				
	Total	1	5	18	24
	General	0	3	6	9
	Acute Physiology and Chronic Health Evaluation III scoring system	0	0	1	1
	Arterial blood gas interpretation	0	0	1	1
	Assessment (ability of neurological function)	0	0	1	1
	Assessment (general)	0	0	1	1
	Emergency preparedness	0	0	1	1
	Hospital quality	0	0	1	1
	Intravenous injections	0	0	2	2
	Medication administration	0	0	1	1
	Medication calculation	1	0	1	2
	Neonatal care	0	0	1	1
	Pain, physical and psychological symptoms, and loss	0	1	0	1
	Palliative care	0	1	1	2
	Attitude and self-efficacy (n=3 SRs)				
	Total	0	0	4	4
	Confidence postintervention	0	0	1	1
	Perceived effectiveness of e-learning	0	0	1	1
	Personal and professional development	0	0	1	1
	Stress in nurse-patient relationship	0	0	1	1
	Self-efficacy (general)	0	0	1	1
	Skills (n=10 SRs)				
	Total	2	5	18	25

		General	0	0	4	4
		Assessment (depression)	0	0	1	1
		Cannulation	1	0	0	1
		Cardiopulmonary resuscitation-defibrillation	1	0	0	1
		Care practice changes	0	0	1	1
		Child abuse detection	0	0	1	1
		Communication	0	0	1	1
		Critical appraisal of research literature	0	1	1	2
		Emergency preparedness skills performance	0	0	1	1
		Intravenous injections	0	1	0	1
		Medication preparation and administration	0	3	3	6
		Motivational interviewing	0	0	1	1
		Monitoring	0	0	1	1
		Neonatal care	0	0	1	1
		Universal precautions-related behaviors	0	0	1	1
		Scheduling activities	0	0	1	1
3. Behavior (change in practice) (n=0 SRs)			0	0	0	0
4. Results (n=2 SRs)						
	Total		0	0	1	1
	Patient outcomes (n=1 SR)					
		Nurses' perceptions of care for older adults	0	0	1	1
	Cost (n=2 SRs)		0	0	2	2
Total			10	10	70	90

[a]SR: systematic review.

Level 1: Nurse Reactions With E-Learning Interventions

Nurse reactions with e-learning interventions have been described in 11 of the 22 SRs (50%) (Bloomfield et al., 2008; Carroll et al., 2009; Chipps et al., 2012; Coyne et al., 2018; Du et al., 2013; Freire et al., 2015; Knapp et Byers, 2008; Lam-Antoniades et al., 2009; Lawn et al., 2017; Nicoll et al., 2018; Phillips et al., 2012).

Positive outcomes were described in 8 out of 22 SRs (36%) (Bloomfield et al., 2008; Carroll et al., 2009; Chipps et al., 2012; Du et al., 2013; Freire et al., 2015; Kakushi et Évora, 2016; Knapp et Byers, 2008; Lawn et al., 2017), mostly in terms of nurse satisfaction with using e-learning for the following reasons: quality of content (Freire et al., 2015), importance of social interactions (Chipps et al., 2012; Kakushi et Évora, 2016), active learning (Kakushi et Évora, 2016), flexibility (Knapp et Byers, 2008; Lawn et al., 2017), effectiveness and convenience of the technology, as well as quality of support received (Knapp et Byers, 2008). Other sources of nurse satisfaction were reported as follows: patient-centered approach, time-saving, and self-directed learning. Nurses stressed the importance of authentic

scenarios and of practicing skills in the work context (Lawn et al., 2017). Nurses found higher satisfaction with e-learning than from videotaped courses (Du et al., 2013), while in the SR by Lam-Antoniades et al (2009), nurses found that there were advantages of e-continuing education over lecture courses. Otherwise, nurses felt satisfied with both e-learning programs and traditional in-classroom programs (Nicoll et al., 2018).

In 3 out of 22 SRs (14%), nurse dissatisfaction with e-learning interventions was explained by the following reasons: technical difficulties (Chipps et al., 2012; Knapp et Byers, 2008), a lack of computer experience and Internet literacy, slower information exchange (Knapp et Byers, 2008), and a preference for face-to-face format (Phillips et al., 2012). In one SR (Lawn et al., 2017), nurses identified access, navigation, and time as challenges.

Level 2: Nurse Learning

Overview

Nurse learning outcomes were reported in 19 of 22 SRs (86%) (Bloomfield et al., 2008; Brunero et al., 2012; Byrne et al., 2008; Chipps et al., 2012; Coyne et al., 2018; Du et al., 2013; Feng et al., 2013; Freire et al., 2015; Härkänen et al., 2016; Hegland et al., 2017; Hines et al., 2015; Kang et Seomun, 2017; Knapp et Byers, 2008; Lahti et al., 2014; Lawn et al., 2017; Nicoll et al., 2018; Phillips et al., 2012; Sinclair et al., 2016; Tomlinson et al., 2013). We divided learning into three subthemes: knowledge, attitude and self-efficacy, and skills.

Knowledge

In 13 SRs out of 22 (59%) (Brunero et al., 2012; Chipps et al., 2012; Coyne et al., 2018; Du et al., 2013; Feng et al., 2013; Freire et al., 2015; Härkänen et al., 2016; Kang et Seomun, 2017; Knapp et Byers, 2008; Lahti et al., 2014; Nicoll et al., 2018; Phillips et al., 2012; Tomlinson et al., 2013), nurses improved their knowledge with the help of e-learning interventions on many topics, including assessment of ability of neurological function (Du et al., 2013), medication administration and calculation (Härkänen et al., 2016), physiology and chronic health evaluation (Knapp et Byers, 2008), arterial blood gas interpretation, intervention focusing on a rare disease (Nicoll et al., 2018), and palliative care (Phillips et al., 2012). With the help of e-learning, nurses improved their knowledge compared to no intervention (Feng et al., 2013). However, nurse acquisition of knowledge in a classroom was superior to e-learning for drug dose calculations (Härkänen et al., 2016).

In 7 SRs out of 22 (32%) (Bloomfield et al., 2008; Chipps et al., 2012; Hegland et al., 2017; Kang et Seomun, 2017; Knapp et Byers, 2008; Phillips et al., 2012; Tomlinson et al., 2013), no effects were reported on nurse knowledge. There were nonsignificant differences in knowledge scores on drug dose calculation between groups (Hegland et al., 2017) and in learning effectiveness outcomes between the face-to-face versus videoconference formats (Phillips et al., 2012; Tomlinson et al., 2013). The effect size difference reported was not significant in these 2 SRs (Kang et Seomun, 2017; Knapp et Byers, 2008). There were no significant outcomes related to learning on the topics of intravenous (IV) injections and medication administration and preparation (Bloomfield et al., 2008). No significant change was found in nurse knowledge related to pain, physical and psychological symptoms, and loss (Chipps et al., 2012).

Attitude and Self-Efficacy

Higher self-efficacy and performance scores were generally found among nurses using the e-learning intervention (Du et al., 2013). Nurses had positive attitudes toward effectiveness of online learning modules for motivational interviewing (Lawn et al., 2017). They perceived benefits of e-learning on their personal and professional development (Phillips et al., 2012). Other nurses improved their confidence in reducing stress in the nurse-patient relationship (Brunero et al., 2012).

Skills

In 9 SRs out of 22 (41%) (Bloomfield et al., 2008; Brunero et al., 2012; Du et al., 2013; Feng et al., 2013; Freire et al., 2015; Hegland et al., 2017; Hines et al., 2015; Nicoll et al., 2018; Sinclair et al., 2016), positives outcomes were documented related to the increase of skills following nurses' participation in e-learning.

Nurses had better performance outcomes with e-learning compared to no intervention (Du et al., 2013; Feng et al., 2013). Nurses improved their skills after attending a 1-hour, e-learning-based, mental health education program on self-harm, demanding behavior, manipulation, and splitting and attention-seeking behavior (Brunero et al., 2012). These nurses also had positive comments regarding assessment, monitoring, communication, and interventions such as scheduling pleasant activities (Brunero et al., 2012). Furthermore, they rated items highly that were related to the extent to which training changed their care practices (Brunero et al., 2012).

Nurses using e-learning interventions experienced positive outcomes related to universal precautions, IV injections, and medication administration (Bloomfield et al., 2008; Härkänen et al., 2016). The meta-analysis on computer-based simulation compared to other learning strategies showed significant effect in favor of e-learning for medication administration and preparation (Hegland et al., 2017). Nurses' perceived skills in performing, and clinical use of, brief motivational interviewing were more favorable postintervention (Nicoll et al., 2018). Nurses had better emergency preparedness as a result of e-learning than with no intervention and they improved child abuse detection with e-learning compared to no intervention (Sinclair et al., 2016). An increase in nurses' skills scores with e-learning related to neonatal care has been reported (Freire et al., 2015). In terms of cognitive skills, nurses self-assessed their critical appraisal competencies positively regarding research literacy (Hines et al., 2015).

Negative outcomes were reported in 2 out of 22 SRs (9%). Cardiopulmonary resuscitation-defibrillation and defibrillation performance was worse among nurses using long-distance learning than that of the control group (Du et al., 2013). Nurses using the computer-based simulation to cannulate a real patient with force feedback had lower success at the first attempt (Byrne et al., 2008).

Finally, 2 SRs out of 22 (9%) reported no effect by e-learning on skills. Nurses found no improvement in one critical appraisal competency related to research literacy: the identification of the sample (Hines et al., 2015). *Core 2* errors related to preparation and administration of medication increased but the rate was not significant, as underlined in Bloomfield et al's SR (2008).

Level 3: Behavior

No outcomes related to nurses' changes in practice were reported.

Level 4: Results

Patient Outcomes

In 1 of 22 SRs (5%), a positive outcome related to nurses' perceptions of care outcomes for older adults was reported (Brunero et al., 2012).

Cost

In 2 SRs out of 22 (9%) (Brunero et al., 2012; Knapp et Byers, 2008), positive outcomes were reported in terms of using intranet- and CD-ROM-based education as a low-cost method of providing education for nursing staff.

3.1.6 Discussion

Principal Findings

Our SRSRs aimed at synthesizing qualitative and quantitative evidence regarding the effects of e-learning interventions on nursing care in a CE context. To the best of our knowledge, this is the first broad synthesis on the impact of e-learning on nurses in a CE context. As we expected, heterogeneity was found between populations (ie, RNs and workplace settings), interventions, comparisons, outcomes, types of SRs, and corresponding evidence. Conducting a meta-analysis was not the purpose of this SRSRs.

Main Outcomes: Four Levels of Evaluation

The most reported outcomes were learning (19/22, 86%), corresponding to Kirkpatrick's evaluation level 2. Nurse skills were the most frequently reported, followed by knowledge. Outcomes related to evaluation level 1 (ie, nurses' reactions with e-learning) were found in 11 out of the 22 SRs (50%). Authors of SRs described these reactions mainly with respect to technology characteristics, including perceived advantages and disadvantages (eg, navigability, technical difficulties, access, and flexibility). We found no SRs that reported outcomes regarding the translation of the content of e-learning interventions into nurses' practice and behavior (ie, evaluation level 3). This finding does not mean that e-learning had no outcomes on practice; however, it reflects that behaviors are not usually reported in systematic reviews on e-learning.

During the data analysis and interpretation, we used a conservative approach to classify the outcomes. Limited granularity of reported details is a well-known issue for authors of SRSRs and was observed in the included SRs. Therefore, it was difficult to know if skills, for example, improved nurses' knowledge of medication administration and preparation or if it changed nurses' practice. Only 1 SR included nurses' perceptions of patients' outcomes (ie, evaluation level 4) regarding care of elders; it also included 2 outcomes about costs. Overall, most reported outcomes were positive (n=70) as compared to negative (n=10) and neutral ones (n=10). This could indicate the presence of a reporting bias at the level of primary studies and SRs because of the disproportionate number of positive results (Mlinarić et al., 2017).

Our findings related to the overrepresentation of the effects of e-learning interventions on reactions and learning, as well as the underrepresentation on practice and patient outcomes, are similar to those

found in the literature among health care students, including nursing students (Gentry et al., 2019; Voutilainen et al., 2017); physicians (Chen et al., 2017; Cho et al., 2017; Légaré et al., 2015); allied health practitioners (Berndt et al., 2017); and various health care providers (Vaona et al., 2018). However, Militello et al (2014) conducted an SRSRs on the efficacy of computer-mediated continuing education for health care providers, including nurses, and they performed a meta-analysis. They classified their outcomes according to the Kirkpatrick model (Kirkpatrick et Kirkpatrick, 2006). They found that 8 of the 11 SRs included measures of learner satisfaction (Level 1), 10 SRs included learning outcomes (Level 2), 9 included outcomes on provider behavior or performance (Level 3), and 5 included health and patient outcomes (Level 4). We can suppose that Militello et al (2014) were more inclusive in their way of classifying outcomes related to practice change than we were in our data analysis and synthesis. Furthermore, many authors (eg, Kitto et al., 2018; Légaré et al., 2014; Légaré et al., 2015) are interested by this transition from Level 2 to Level 3 that can occur as a result of changes promoted by the content and format of continuing professional development activities, as well as how competencies are acquired and assessed. This transition not only depends on the acquisition of knowledge and skills, but also on a myriad of other elements related, for instance, to the intervention (eg, relative advantage), the outer context (eg, resources), the inner context (eg, organizational culture), individual characteristics (eg, learning style), and process (eg, planning) (Damschroder et al., 2009).

Methodological Quality

The methodological quality of SRs varied greatly: 59% of SRs (13/22) had an overall high or unclear risk of bias, while 55% (12/22) had a low or critically low level of confidence. Only 41% (9/22) of SRs were assessed with low risk of bias while 45% (12/22) had a moderate or high level of confidence. Our results are different from those of Militello et al (2014), who synthesized the methodological quality of SRs (n=11) on computer-mediated CE for health care providers. They used 11 items from the AMSTAR (Shea et al., 2009). Out of 11 SRs, 5 were of moderate quality and 6 were of high quality. The authors only included quantitative SRs and meta-analyses.

These findings might be explained by several reasons. We used two tools that have been designed to assess systematic quantitative reviews. When we started this SRSRs in 2017 (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson, Bouix-Picasso, et al., 2017), no tool was available to appraise the quality of qualitative and mixed-studies reviews. Some criteria from the ROBIS tool and the AMSTAR 2, as well

as their corresponding vocabulary (eg, meta-analysis, heterogeneity, and risk of bias), were not adapted to fit with the specificities of qualitative and mixed-studies reviews. Furthermore, the systematic methodology of some included SRs was not obvious. Some authors (eg, Carroll et al., 2009; Knapp et Byers, 2008) mentioned the word *systematic* in their paper but they did not provide all the details to fully explain the systematic nature of their work. It is important to highlight that methodological quality is one of the three dimensions of *quality* (Hong et Pluye, 2018). However, methodological quality is only one dimension of critical appraisal that could be performed and it is centered on how the SR is conducted (Hong et Pluye, 2018). It does not capture other concepts, such as the social relevance of findings and the applicability and transferability of findings to other contexts. The dimension of conceptual clarity can also be appraised and it is related to insightfulness, including the clarity, richness, and depth of description of a phenomenon (Toye et al., 2013). Campbell et al (2011) observed that methodological and conceptual quality can be inversely correlated. It means that papers that are appraised with a low methodological quality score are usually those providing good conceptual insight. This can be partially explained by the inadequacy regarding the reporting of qualitative research methods. We recommend appreciating the richness of our findings as a means to get a broad picture of the effects of e-learning interventions on nursing care. However, our results must be interpreted with caution and are not meant to guide or inform practice, nor are they meant to determine which e-learning interventions are better in supporting CE for nurses.

Strengths and Potential Biases in the Systematic Review of Systematic Reviews Process

We used a comprehensive and systematic process throughout all stages of this SRSRs. In the search strategy, we used general keywords to explore the e-learning concept as an umbrella term, such as *virtual learning environment*, *distance learning*, *Web-based learning*, *e-learning*, and *m-learning*, among others. However, we did not use all specific key terms representing all forms of digital education, such as *serious games and gamification interventions*, *massive open online course*, *virtual reality*, and *virtual patient* (Car et al., 2019). Recent publications focused, for example, on serious games (Gentry et al., 2019; Ijaz et al., 2019) and virtual reality (Kyaw et al., 2019), either in a context of preregistration training in health students or postregistration training among health care professionals such as nurses. Nonetheless, the use of general key terms allowed for the coverage of a wide range of potentially relevant references, considering the initial 12,906 records screened.

During the screening of titles, abstracts, and full texts, we observed that information regarding the population was sometimes misleading or incomplete, such as a population of “health students” (eg, Coyne et al., 2018). In that case, instead of presuming that this abstract was not eligible based on the population, we decided to retrieve the full text. We discovered that nurses were targeted in some of these papers. Even if we were inclusive during the screening process, we may have excluded some references based on limited information provided in titles and/or abstracts. In order to limit the risk of excluding potentially relevant papers, we conducted the screening process as a team of three reviewers.

Future Research

Our SRSRs targeted specific questions about the effects of e-learning interventions on nursing care in a CE context. Few details were provided regarding RN characteristics (eg, age and educational background) and interventions, including the SRs’ instructional designs. The lack of information granularity provided by the authors of SRs (Campbell et al., 2011; Car et al., 2019) is a limitation of conducting SRSRs. Cook (2010) argued that these instructional designs can have an impact on the outcomes. Furthermore, few theoretical cues were given about active ingredients pertaining to the interventions that predict or explain professional or behavior change.

We would recommend using other types of knowledge synthesis to explore complementary and broader research questions. The following are some examples:

1. What are the contexts and mechanisms through which nurses and nursing students translate knowledge and skills from e-learning interventions to their practice and, consequently, how could they lead to specific outcomes among patients? How does it work? In that case, a realist review could be performed in a digital-based nursing education and CE context, with a lens similar to the work conducted by Wong et al (2010).

2. How do nurses experience e-learning interventions in their work setting? How do they describe their impact on their practice or in their environment? A meta-synthesis of qualitative studies could be done to answer these questions.

It would be useful if authors of primary studies provided enough information regarding the intervention, the context, and mechanisms, including theoretical underpinnings, which could allow researchers to understand the components that can affect outcomes.

We would also suggest exploring other types of outcomes that can be related to having e-learning interventions in workplace settings. We are in agreement with Bernt et al (2017), in that the relationship between access to continuing professional development and workforce retention is unknown. Other works could be done to investigate the influence of e-learning on nursing resources or structures (Dubois et al., 2013), for instance, on nurse retention and working conditions.

Furthermore, most outcomes found in the literature focus on reactions and nurses' satisfaction, learning, and change in practice. Change in knowledge and learning can be seen under a cognitivist learning approach. This approach targets the work of single individuals versus, for example, the social interactions that contribute to the learning experience of learners, seen under a social constructivist lens (Nicoll et al., 2018). We would benefit from using a diversity of theoretical underpinnings, educational learning theories (Lavoie et al., 2018), and critical (Josephsen, 2014; Mooney et Nolan, 2006) and complexity theories (Opfer et Pedder, 2011) that have the potential to shed light on many perspectives (eg, individual, interpersonal, organizational, and sociopolitical) of envisioning education, professional development, and learners' experience.

3.1.7 Conclusions

The findings of this SRSRs show that the effects of e-learning are mainly reported in terms of reactions, knowledge, attitude, self-efficacy, and skills (ie, the first two evaluation levels from the Kirkpatrick model). The effectiveness of e-learning interventions used by nurses in a CE context remain unknown regarding how the learning can be transferred to change practice and affect patient outcomes. Further scientific, methodological, theoretical, and practice-based breakthroughs must feed the fast-growing field of e-learning in nursing education, especially in a life-learning perspective.

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Support for People and Patient-Oriented Research and Trials (SPOR-SUPPORT) Unit, and the Quebec Network on Nursing Intervention Research.

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Authors' Contributions

GR conceived and designed the SRSRs with input from MPG and JC. GR informed the search strategy. GR, JPG, and EH were responsible for data extraction. GR and JBP assessed the methodological quality of the SRs. JPG and EH were involved in the interpretation of results. GR, MPG, JC, JPG, EH, CAD, and JBP were engaged in the drafting of this manuscript and they all read and approved the final version.

Conflicts of Interest

None declared.

Abbreviations

AMSTAR: Assessment of Multiple Systematic Reviews
CE: continuing education
CIHR: Canadian Institutes of Health Research
CINAHL: Cumulative Index of Nursing and Allied Health Literature
FRQS: Fonds de recherche du Québec Santé
IV: intravenous
JBI: Joanna Briggs Institute
MSR: mixed-studies review
MSSS: Ministère de la Santé et des Services sociaux
N/A: not applicable
NCPF: Nursing Care Performance Framework
PICOS: population, intervention, comparison, outcomes, and study design
PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PROSPERO: International Prospective Register of Systematic Reviews
QT: quantitative review
RN: registered nurse
ROBIS: Risk Of Bias In Systematic Reviews
SPOR-SUPPORT: Strategy for Patient-Oriented Research—Support for People and Patient-Oriented Research and Trials
SR: systematic review
SRSRs: systematic review(s) of systematic reviews

Multimedia Appendix 1. Overlap between primary studies overlap within included systematic reviews.

Systematic reviews/ Primary studies	**Bloomfield (2008)**	**Brunero (2012)**	**Byrne (2008)**	**Carroll (2009)**	**Coyne (2018)**	**Chipps (2012)**	**Du (2013)**	**Feng (2013)**	**Freire (2015)**	**Harkanen (2016)**	**Hegland (2017)**	**Hines (2015)**	**Kakushi (2016)**	**Kang (2017)**	**Knapp (2008)**	**Lawn (2017)**	**Lahti (2014)**	**Lam-Antoniades (2009)**	**Nicoll (2018)**	**Phillips (2012)**	**Sinclair (2016)**	**Tomlinson (2013)**	**Number of primary studies overlap within systematic reviews**
Abbaszadeh (2011)														x									**1**
Atack (2003)															x								**1**
Bahn (2001)				x																			**1**
Billingsley (2013)												x											**1**
Brunero (2010)		x																					**1**
Canning (2004)																				x			**1**
Chang (2002)			x																				**1**
Chang (2008)																			x				**1**
Choi (2012)														x									**1**
Chiu (2009)							x																**1**
Cortese-Peske (2013)																			x				**1**
Elgie (2010)								x													x		**2**
Fonseca (2008)									x														**1**
Fontaine (2016)																			x				**1**
Heartfield (2013)																x			x				**2**
Horiuchi (2009)							x							x									**2**
Ilot (2014)					x																		**1**
Innes (2006)				x																			**1**
Kinghorn (2005)				x																			**1**
Mak (2001)															x								**1**
Makinen (2006)							x																**1**
Matthew (2014)													x										**1**
Morris-Docker (2004)															x								**1**
Paladino (2007)														x			x						**2**
Schmitt (2004)															x								**1**
Schneider (2006)	x									x	x												**3**
Schneiderman (2009)																			x				**1**
Seibert (2004)						x																	**1**
Sery-Ble (2001)															x								**1**
Sherriff (2012)										x													**1**
Simonsen (2014)										x	x			x									**3**
Smeekens (2011)							x	x													x		**3**
Smith (2010)		x																					**1**
Sung (2008)										x													**1**
Thukral (2012)									x														**1**
Tsai (2004)	x																x	x					**3**
van Boxell (2003)						x														x		x	**3**
Welch (2014)																x							**1**
Wilkinson (2004)				x																			**1**
Wright (1997)	x																						**1**
																							48

Multimedia Appendix 2. List of included systematic reviews.

Anderson, J. A., & Willson, P. (2008). Clinical decision support systems in nursing: Synthesis of the science for evidence-based practice. *Computers, Informatics, Nursing: CIN, 26*(3), 151-158. https://doi.org/10.1097/01.NCN.0000304783.72811.8e

Bartoli, L., Zanaboni, P., Masella, C., & Ursini, N. (2009). Systematic review of telemedicine services for patients affected by chronic obstructive pulmonary disease (COPD). *Telemedicine Journal and e-Health, 15*(9), 877-883. https://doi.org/10.1089/tmj.2009.0044

Bowles, K. H., & Baugh, A. C. (2007). Applying research evidence to optimize telehomecare. *Journal of Cardiovascular Nursing, 22*(1), 5-15. https://doi.org/10.1097/00005082-200701000-00002

Carrington, J. M., & Tiase, V. L. (2013). Nursing informatics year in review. *Nursing Administration Quarterly, 37*(2), 136-143. https://doi.org/10.1097/NAQ.0b013e3182869deb

Dowding, D., Randell, R., Gardner, P., Fitzpatrick, G., Dykes, P., Favela, J., Hamer, S., Whitewood-Moores, Z., Hardiker, N., Borycki, E., & Currie, L. (2015). Dashboards for improving patient care: Review of the literature. *International Journal of Medical Informatics, 84*(2), 87-100. https://doi.org/10.1016/j.ijmedinf.2014.10.001

Finkelstein, J., Knight, A., Marinopoulos, S., Gibbons, M. C., Berger, Z., Aboumatar, H., Wilson, R. F., Lau, B. D., Sharma, R., & Bass, E. B. (June 2012). *Enabling patient-centered care through health information technology. Evidence report/technology assessment no. 206.* (AHRQ Publication No. 12-E005-EF). Prepared by Johns Hopkins University Evidence-based Practice Center under Contract No. 290-07-10061-I7.

Free, C., Phillips, G., Watson, L., Galli, L., Felix, L., Edwards, P., Patel, V., & Haines, A. (2013). The effectiveness of mobile-health technologies to improve health care service delivery processes: A systematic review and meta-analysis. *PLoS Medicine, 10*(1), e1001363. https://doi.org/10.1371/journal.pmed.1001363

Georgiou, A., Prgomet, M., Paoloni, R., Creswick, N., Hordern, A., Walter, S., & Westbrook, J. (2013). The effect of computerized provider order entry systems on clinical care and work processes in emergency departments: A systematic review of the quantitative literature. *Annals of emergency medicine, 61*(6), 644-653. https://doi.org/10.1016/j.annemergmed.2013.01.028

Husebo, A. M., & Storm, M. (2014). Virtual visits in home health care for older adults. *ScientificWorldJournal, 2014*, 689873. https://doi.org/10.1155/2014/689873

Jones, J. F., & Brennan, P. F. (2002). Telehealth interventions to improve clinical nursing of elders. *Annual Review of Nursing Research, 20*, 293-322. https://www.ncbi.nlm.nih.gov/pubmed/12092513

Kelley, T. F., Brandon, D. H., & Docherty, S. L. (2011). Electronic nursing documentation as a strategy to improve quality of patient care. *Journal of Nursing Scholarship, 43*(2), 154-162. https://doi.org/10.1111/j.1547-5069.2011.01397.x

Mador, R. L., & Shaw, N. T. (2009). The impact of a critical care information system (ccis) on time spent charting and in direct patient care by staff in the ICU: A review of the literature. *International Journal of Medical Informatics, 78*(7), 435-445. https://doi.org/10.1016/j.ijmedinf.2009.01.002

Maenpaa, T., Suominen, T., Asikainen, P., Maass, M., & Rostila, I. (2009). The outcomes of regional healthcare information systems in health care: A review of the research literature. *International Journal of Medical Informatics, 78*(11), 757-771. https://doi.org/10.1016/j.ijmedinf.2009.07.001

McKibbon, K. A., Lokker, C., Handler, S. M., Dolovich, L. R., Holbrook, A. M., O'Reilly, D., Tamblyn, R., B, J. H., Basu, R., Troyan, S., Roshanov, P. S., Archer, N. P., & Raina, P. (2011). *Enabling medication management through health information technology (health it). Evidence report/technology assessment no. 201.* (Prepared by the McMaster University Evidence-based Practice Center under Contract HHSA 290-2007-10060-I. AHRQ Publication No. 11-E008-EF).

Meissner, A., & Schnepp, W. (2014). Staff experiences within the implementation of computer-based nursing records in residential aged care facilities: A systematic review and synthesis of qualitative research. *BMC Medical Informatics and Decision Making, 14*, 54. https://doi.org/10.1186/1472-6947-14-54

Mickan, S., Atherton, H., Roberts, N. W., Heneghan, C., & Tilson, J. K. (2014). Use of handheld computers in clinical practice: A systematic review. *BMC Medical Informatics and Decision Making, 14*, 56. https://doi.org/10.1186/1472-6947-14-56

Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. *International Journal of Medical Informatics, 83*(11), 779-796. https://doi.org/10.1016/j.ijmedinf.2014.06.011

Nieuwlaat, R., Connolly, S. J., Mackay, J. A., Weise-Kelly, L., Navarro, T., Wilczynski, N. L., & Haynes, R. B. (2011). Computerized clinical decision support systems for therapeutic drug monitoring and dosing: A decision-maker-researcher partnership systematic review. *Implementation Science, 6*, 90. https://doi.org/10.1186/1748-5908-6-90

Poissant, L., Pereira, J., Tamblyn, R., & Kawasumi, Y. (2005). The impact of electronic health records on time efficiency of physicians and nurses: A systematic review. *Journal of the American Medical Informatics Association, 12*(5), 505-516. https://doi.org/10.1197/jamia.M1700

Randell, R., Mitchell, N., Dowding, D., Cullum, N., & Thompson, C. (2007). Effects of computerized decision support systems on nursing performance and patient outcomes: A systematic review. *Journal of Health Services Research & Policy, 12*(4), 242-249. https://doi.org/10.1258/135581907782101543

Stevenson, J. E., Nilsson, G. C., Petersson, G. I., & Johansson, P. E. (2010). Nurses'™ experience of using electronic patient records in everyday practice in acute/inpatient ward settings: A literature review. *Health informatics journal, 16*(1), 63-72. https://doi.org/10.1177/1460458209345901

Urquhart, C., Currell, R., Grant, M. J., & Hardiker, N. R. (2009). Nursing record systems: Effects on nursing practice and healthcare outcomes. *The Cochrane Database of Systematic Reviews Art. No.: CD002099*(Issue 1). https://doi.org/10.1002/14651858.CD002099.pub2.

Multimedia Appendix 3. List of excluded papers and reasons[9].

Not the right type of paper (n=66)

Aebersold, M., & Tschannen, D. (2013). Simulation in nursing practice: The impact on patient care. *Online Journal of Issues in Nursing, 18*(2), 6. https://www.ncbi.nlm.nih.gov/pubmed/23758424

Aggarwal, R., Darzi, A., & Grantcharov, T. P. (2008). Re: A systematic review of skills transfer after surgical simulation training. *Annals of Surgery, 248*(4), 690-691; author reply 691. https://doi.org/10.1097/SLA.0b013e3181884320

Anderson, C. (2009). How does social networking enhance the nursing narrative? *Nursing Management, 40*(9), 16-20. https://doi.org/10.1097/01.NUMA.0000360767.36858.0b

Anderson, C., Brock, T., Bates, I., Rouse, M., Marriott, J., Manasse, H., Futter, B., Bhojraj, S., Brown, A., & Gal, D. (2011). Transforming health professional education. *American Journal of Pharmaceutical Education, 75*(2), 22. https://doi.org/10.5688/ajpe75222

Bailey, J. (2012). The age of virtual learning. *Midwives, 15*(1), 34-35. https://www.ncbi.nlm.nih.gov/pubmed/24868670

Baker, J. D. (2009). Serious games and perioperative nursing. *AORN Journal, 90*(2), 173-175. https://doi.org/10.1016/j.aorn.2009.07.002

Beard, K., & Morote, E. S. (2010). Using podcasts with narrative pedagogy: Are learning objectives met? *Nursing Education Perspectives, 31*(3), 186-187.

Bera, K., Biswas, T., & Biswas, R. (2012). 'User driven health care': Understanding the complexity of clinical experience through online 'conversational learning' networks. *Australasian Medical Journal, 5*(1), 60-61.

Brown, J. F. (2008). Applications of simulation technology in psychiatric mental health nursing education. *Journal of Psychiatric and Mental Health Nursing, 15*(8), 638-644. https://doi.org/10.1111/j.1365-2850.2008.001281.x

Brunette, V., & Thibodeau-Jarry, N. (2017). Simulation as a tool to ensure competency and quality of care in the cardiac critical care unit. *Canadian Journal of Cardiology, 33*(1), 119-127. https://doi.org/10.1016/j.cjca.2016.10.015

Buckley, K. M., & Rietschel, M. (2012). Training and instructional strategies for the use of web conferencing in nursing education. *Computers, informatics, nursing: CIN, 30*(11), 569-576. https://doi.org/10.1097/NXN.0b013e31827740d6

Campbell, M., Themessl-Huber, M., Mole, L., & Scarlett, V. (2007). Using simulation to prepare students for interprofessional work in the community. *The Journal of nursing education, 46*(7), 340. https://doi.org/10.3928/01484834-20070701-10

[9] Dans la Figure 2, il est inscrit que 200 articles ont été exclus. Or, nous avons identifié (a posteriori) des doublons dans ces articles. Une fois les doublons retirés, nous comptons 197 articles exclus. Le nombre d'articles (n=22) inclus demeure inchangé.

Carlton, K. H., Dillard, N., Campbell, B. R., & Baker, N. A. (2007). Personal digital assistants for classroom and clinical use. *Computers Informatics Nursing: CIN 25*(5), 253-258. https://doi.org/10.1097/01.NCN.0000289187.32262.63

Cates, L. A., & Wilson, D. (2011). Acquisition and maintenance of competencies through simulation for neonatal nurse practitioners. *Advances in Neonatal Care, 11*(5), 321-327. https://doi.org/10.1097/ANC.0b013e31822a34a0

Considine, J., & Brennan, D. (2007). Effect of an evidence-based paediatric fever education program on emergency nurses' knowledge. *Accident and Emergency Nursing, 15*(1), 10-19. https://doi.org/10.1016/j.aaen.2006.11.005

Cooper, S. (2016). Simulation versus lecture? Measuring educational impact: Considerations for best practice. *Evidence-Based Nursing, 19*(2), 55. https://doi.org/10.1136/eb-2015-102221

Corbridge, S. J., McLaughlin, R., Tiffen, J., Wade, L., Templin, R., & Corbridge, T. C. (2008). Using simulation to enhance knowledge and confidence. *The Nurse practitioner, 33*(6), 12-13.

Culley, J. M., & Polyakova-Norwood, V. (2012). Synchronous online role play for enhancing community, collaboration, and oral presentation proficiency. *Nursing Education Perspectives, 33*(1), 51-54. https://doi.org/10.5480/1536-5026-33.1.51

Curran, C., Sheets, D., Kirkpatrick, B., & Bauldoff, G. S. (2007). Virtual patients support point-of-care nursing education. *Nursing Management, 38*(12), 27-33. https://doi.org/10.1097/01.NUMA.0000303868.95890.1e

Curran, V., Matthews, L., Fleet, L., Simmons, K., Gustafson, D. L., & Wetsch, L. (2017). A review of digital, social, and mobile technologies in health professional education. *Journal of Continuing Education in the Health Professions, 37*(3), 195-206. https://doi.org/10.1097/CEH.0000000000000168

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Not the right context (n=3)

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No access to full text (n=2)

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Multimedia Appendix 4. General characteristics of included systematic reviews.

First author, year, location of first author	Purpose of the SR[a]	Type of SRs as reported by the SR authors	Type of SRs as classified by Rouleau et al.	Numbers of primary studies about nurses using e-learning interventions in a CE[b] context / Total of primary studies in the SR	Search date	Number of nurses and their roles (when specified and reported) and their settings
Bloomfield (2008), United Kingdom	To review the research investigating computer-assisted learning for clinical skills education in nursing, the ways in which it has been studied and the general findings.	Integrative review	QT[c]	3/12	1997 to 2006	171 nurses Settings: General hospital and surgical units
Brunero (2012), Australia	To review and synthesize research evidence on Mental Health Education Programmes that have been designed to develop the knowledge, skills and attitudes of general healthcare professionals.	Integrative review	MSR[d]	2/25	1990-01 to 2010-12	273 nurses (including mental health liaison nurses) Setting: NR[e]

Byrne (2018), United Kingdom	To compare the methods used to train staff in clinical skills.	SR	QT	1/10	Initial search: 2006 Repeated checks up to June 2007	28 nurses Setting: NR
Carroll (2009) United Kingdom	To address the following question: Which e-learning techniques most enhance the learning experience of health professionals in the United Kingdom?	SR of qualitative data	Unclear but probably MSR considering data collection methods (e.g. surveys and interviews)	4/19	1992 to the end of 2007	93 nurses Settings: University, college
Chipps (2012), South Africa	1) To systematically review the literature and critique the research methods on videoconference-based education for the education of doctors and nurses 2) To summarize the existing evidence on the effectiveness of videoconference education for medical and nursing staff. 3) To apply the findings to South Africa.	SR	QT	2/5	1990 to 2011	20 palliative care nurses and 12 clinical nurse specialists Setting: NR

Coyne (2018), Australia	To inform future educational strategies by synthesising research related to blended learning resources using simulation videos to teach clinical skills for health students.	Integrative review	MSR	1/10	2006 to 2016	22 nurses Setting: Stroke rehabilitation
Du (2013), China	To examine the efficacy of web-based distance education for nursing students and employed nurses.	SR	QT	3/9	Up to 2012-07	193 nurses Settings: Neurological unit, geriatric hospital, ED[g]
Feng (2013), Taiwan	To determine the effectiveness of situated e-learning in prelicensure and postlicensure medical and nursing education.	SR	QT	2/14	2001-01 to 2012-05	80 school nurses and nurses Setting: ED
Freire (2015), Brazil	To identify resources that support education strategies mediated by technology in neonatal nursing.	SR	MSR	2/9	Up to 2014-01	104 nurses Setting: Neonatal units
Harkanen (2016), Finland	To evaluate the nature, quality and effectiveness of educational interventions designed to increase the	SR with meta-analysis	QT	4/14	2000-01 to 2015-04	Nurses: NR Settings: Medicine and surgical units, general hospital setting

	medication administration skills and safety of registered nurses working in hospitals.					
Hegland (2017), Norway	To evaluate effect of simulation-based training on nurses' skills and knowledge.	SR	QT	2/15	No restriction	171 nurses Settings: Medical and surgical units, primary care
Hines (2015), Australia	To identify the effectiveness of workplace, tertiary-level educational, or other interventions designed to improve or increase postregistration nurses' understanding of research literature and ability to critically interact with research literature with the aim of promoting the use of research evidence in practice in comparison to no intervention, other intervention, or usual practice.	SR	QT	1/10	No restriction	Nurses: NR Settings: Workplace environments in variety of clinical specialties

Kakushi (2016), Brazil	To identify the use of social networking in nursing education.	Integrative literature review	Unclear - MSR (Authors didn't precise the type of evidence)	1/14	Up to 2015-04	Setting: Neonatal unit
Kang (2017), Republic of Korea	To evaluate the effects of web-based nursing education programs by analyzing articles that report on how such programs affect learners' knowledge and clinical performance levels.	SR with meta-analyses	QT	5/11	2000-01 to 2016-07	454 nurses Setting: NR
Knapp (2008), USA	To review the literature systematically regarding the use of the Internet in nursing staff development and to focus specifically on the potential usefulness of this method in helping critical nurses understand how they can help patients' families during extremely stressful situations.	SR	MSR	5/5	Unspecified (articles range from 2001-2006)	310 nurses (when specified) Settings: Neurosurgical unit, surgical intensive care unit, general hospital settings

Lahti (2014), Finland	To investigate the impact of e-learning on knowledge, skills and satisfaction among nurses and nursing students compared to traditional education methods.	SR with meta-analysis	QT	2/11	1948 to 2010-12	130 nurses Settings: Nursing management rooms with computers hospital training room, hospital and nursing facilities
Lam-Antoniades (2009), Canada	To provide an update on evidence from RCTs[h] assessing the effectiveness of electronic continuing education in the health professions.	Literature search of RCTs	QT	1/15	2004-01 to 2007-12	81 nurses Setting: NR
Lawn (2017), Australia	To examine what is known about the evidence of e-learning instructional designs and formats that are best for teaching the depth of self-management skills needed by health professionals to work with patients with chronic and complex care need.	Integrative review	MSR	2/10	2006-2016	500 practice nurses serving veterans; nurses (NR) serving hospital inpatients Settings: Primary care, medical surgical units, telemetry unit
Nicoll (2018), United Kingdom	To identify the current literature relating to the evaluation of	Systematic integrative review	MSR	4/21	2006-01 to 2017-01	658 nurses, oncology nurses,

	technology-enhanced learning programs for health care professionals and to critically appraise the quality of the studies.					practice nurses
Phillips (2012), Australia	To review published studies evaluating the impact of continuing professional development programmes on rural nurses palliative care capabilities in order to inform the development of targeted learning activities for this population.	Integrative review	MSR	2/10	1993-01 to 2010-06	63 nurses Settings: Rural/remote settings, community
Sinclair (2016), Australia	To identify, appraise and synthesise the best available evidence for the effectiveness of e-learning programmes on health care professional behavior and patient outcomes.	SR	QT	2/7	2004-01 to 2015-07	90 nurses Settings: School, emergency department

Tomlinson (2013), Australia	To determine whether tele-learning delivery methods achieve equivalent learning outcomes when compared with traditional face-to-face education delivery methods.	SR	QT	1/13	2000-01 to 2012-12	15 community nurses Setting: Community

[a] SR: systematic reviews
[b] CE: continuing education
[c] QT: quantitative reviews
[d] MSR: mixed studies reviews
[e] NR: not reported
[f] QL: qualitative reviews
[g] ED: emergency departments
[h] RCTs: randomized controlled trials

Multimedia Appendix 5. Interventions, comparisons and level of evaluation/outcomes.

First author (year)	Examples of interventions		Examples of comparisons	Levels of evaluation according to Kirkpatrick model (2006) and description of outcomes
	Examples of nursing topics	Examples of medium used		
Bloomfield (2008)	Universal precautions and responded patient situations; IV[a] injections on basic oral medication administra-tion.	CAI[b], CD-ROM, CAL[c]	Face-to-face learning: Lecture on hospital orientation No intervention	I: 1/3 studies found high level of satisfaction with computer-assisted learning. II: 3/3 studies found positive outcomes related to skills (universal precautions, IV injections, medication administration). 2/3 studies found no significant outcomes related to learning on the topics of IV injections as well as medication administration and preparation.
Brunero (2012)	Demanding behavior, manipula-ting, splitting and attention seeking behavior; depression assessment, treatment, care planning, communication, and referral methods.	e-learning based education program, case-based learning	No comparison	II: 2/2 studies were positive. 1 study found that skills and knowledge were improved, 1 study pointed out improvements in nurses confidence and in reducing stress in nurse-patient relationship, 1 study showed improvements in non-technical skills such as communication, activity scheduling and assessment, and 1 study saw improvements in clinical skills (i.e. monitoring and care practice). IV: 1/2 studies had positive outcome related to care for older adults as perceived by nurses. Other: 1/2 studies found that CD-ROM-based education reduced costs.

Byrne (2018)	Venous cannulation	Computer-based simulation	Non-electronic intervention: plastic arm	II: 1/1 study found lower success with cannulation when using computer-based stimulation.
Carroll (2009)	NR	e-learning courses	N/A	I: 4/8 studies found satisfaction with e-learning. Nurses had a good learning experience, they found confidence in the medium, felt a sense of belonging and embraced anonymity as well as scope of reflection.
Chipps (2012)	Palliative care education and advanced health assessment	Videoconfe-rencing and workshops	Face-to-face learning	I: 1/2 study found dissatisfaction of using e-learning (preference for face-to-face, technical difficulties). 1/2 studies pointed out the importance of interactions during sessions. II: 1/2 study found improvement in knowledge regarding assessment with e-learning. 1/2 found no significant change in nurses' knowledge related to pain, physical and psychological symptoms as well as loss.
Coyne (2018)	Dysphagia training: modifying fluids, assisting with feeding and swallowing.	Blended learning using videos	No comparison	I & II: In 1/1 study, nurses found that the presentation of information in a blended learning format provided a platform for discussion and extended learning with peers and tutors. Nurses' learning effectiveness improved significantly: dysphagia knowledge and attitudes achieved significance.
Du (2013)	NR	Web-based distance learning	Face-to-face learning (e.g.	I: 1/3 study found higher satisfaction with e-learning

			Instructor-led videotaped learning program, CPR^{e}-defibrillation course)	than videotape courses. II: 1/3 study found improvement in knowledge regarding assessment of ability of neurological function with e-learning. 1/3 study had a higher self-efficacy and performance score in the e-learning intervention. 1/3 study found that CPR and defibrillation performance was worse with e-learning.
Feng (2013)	Emergency preparedness and child abuse detection	Situated e-learning	No intervention	II: 2/2 studies found positive effects: one study improved knowledge compared to no intervention, and the other found that nurses had better performance outcomes with e-learning compared to no intervention.
Freire (2015)	Semiotics and semiology of the preterm newborn; on-line neonatal training and orientation program	Distance education about virtual learning object	No comparison	I: In 2/2 studies, nurses evaluated positively e-learning, for example, regarding the quality of content. II: 1/2 study had positive outcomes with an increase in skills score with e-learning and in knowledge related to neonatal care.
Härkänen (2016)	Medication administration skills and safety	Online programs and interactive CD-ROM program on	Face-to-face learning No intervention No comparison	II: 1/4 study revealed less error rates for nurses who participated in CD-ROM program regarding medication administration and preparation. 3/4 studies had mixed outcomes regarding knowledge on medication administration and calculation: 2/4 found positive outcomes and 1/4 study found that classroom

				was superior to e-learning for drug dose calculations.
Hegland (2017)	Medication administration	Interactive CD-ROM e-Learning modules	No additional training Face-to-face learning and 1-day self-study	II: 2/2 studies had mixed outcomes on medication administration and preparation: one study was in favor of e-learning intervention and the other one had no effect. The meta-analysis on computer-based simulation compared to other learning strategies showed significant effect in favour of e-learning while non-significant difference in knowledge scores [drug dose calculation] has been found between groups.
Hines (2015)	Research literacy, critical appraisal competencies	Virtual journal club in "Second Life" virtual environment (Online program)	No comparison (pre/post)	II: 1/1 study revealed that a virtual learning environment, improved nurses' competencies in appraising many components of research literature (e.g. determining designs), but not in the one of identifying samples.
Kakushi (2016)	NR	Face-to-face and online learning with social networking (Ning), by means of audio, videos, quizzes, animations and forums.	No comparison: none specified	I: In 1/1 study, newly hired nurses from a neonatal hospital evaluated their experience with e-learning intervention positively through social interaction and active learning.
Kang (2017)	NR	Web-based learning	Traditional lecture	II: When the participants were nurses, 5/11 studies reported a positive effect on knowledge; however, the effect size difference was not significant.
Knapp (2008)	Stress management interventions	Intranet learning; online program;	Non-electronic intervention No comparison	I: In 2/5 studies, nurses were satisfied with e-learning interventions: they

	among families in critical care settings	computer with Internet access		appreciated the flexibility, effectiveness and convenience of the technology and they were pleased with the quality of support received. In 2/5 studies, nurses were dissatisfied with e-learning, explained by a lack of computer experience and Internet literacy, computer issues and by slower information exchange. II: In 2/5 studies, nurses improved knowledge of the Physiology and Chronic health evaluation and they broadened knowledge through Internet access. In 1/5 study, there was no significant change in improving knowledge. Other: In 1/5 study, Intranets were a low-cost method of providing education for their nursing staff.
Lahti (2014)	Hospital quality, IV injections	Computer programme, e-learning	Traditional learning	Note: Only "usable data" as reported by authors were extracted. II: In 2/2 studies, nurses gained knowledge regarding IV injections and hospital quality.
Lam-Antoniades (2009)	IV insertion	CD-ROM multicomponent (text, graph, picture, film, sound)	Face-to-face learning (lecture)	I: In 1/1 study, nurses found advantages of e-continuing education over lecture courses.
Lawn (2017)	Use of brief motivational interviewing as a communication style to influence	Online learning module regarding interactive modules offered online	(Qualitative evaluation and pre/post-test assessment)	I: In 2/2 studies, nurses were satisfied with e-learning interventions and valued it for the following reasons: patient-centred approach, flexibility, time

	health behavior change			saving, and self-directed learning. They stressed the importance of authentic scenarios and of practicing skills in the work context. In 1/2 study, nurses identified these challenges: access, navigation, and time. II: In 1/2 study, nurses had positive attitudes toward and statistically significant increase in mean score about effectiveness of online learning modules for motivational interviewing.
Nicoll (2018)	Arterial blood gas interpretation Motivational interviewing	Technology enhanced learning (e.g. Web-based e-learning, learning management systems).	No comparison No additional training	I: In 2/4 studies, nurses felt satisfied with ELP[f] and TICP[g]. They found the e-learning platform for brief motivational interviewing was feasible and acceptable in cardiovascular care. II: 4/4 studies had positive outcomes on knowledge and clinical skills. Staff nurses increased knowledge of arterial blood gas interpretation. They found e-learning intervention focusing on a rare disease in a culturally distinct population as an effective educating strategy. Nurses perceived skill and clinical use of brief motivational interviewing more favourable (post-training).
Phillips (2012)	Palliative care delivery	Videoconferencing Email	Face-to-face learning No comparison (pre/post)	I: In 1/2 study, nurses preferred face-to-face to videoconferencing format. II: In 2/2 studies, nurses perceived benefits on their

				knowledge in palliative care and on personal and professional development when using e-learning, while no significant change was reported in one study.
Sinclair (2016)	Emergency preparedness skills performance Child abuse detection	e-Learning modules	No intervention	II: In 2/2 studies, nurses improved clinical skills when they used e-learning. They had better emergency preparedness with e-learning than no intervention and they improved child abuse detection with e-learning compared to no intervention.
Tomlinson (2013)	NR	Videoconferencing	Face-to-face learning	II: In 1/1 study, there was no significant increase in learning effectiveness with videoconferencing compared to face-to-face.

[a] IV: intravenous

[b] NR: not reported

[c]: CAI: computer-assisted instruction

[d]: CAL: computer-assisted learning

[e] CPR: cardiopulmonary resuscitation-defibrillation

[f] ELP: e-learning programmes

[g] TICP: traditional in-classroom programme

3.1.8 References

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4 Chapitre 4. Fondements philosophiques, conceptuels et théoriques

Dans ce chapitre, nous traitons tout d'abord de l'approche du pragmatisme comme outil philosophique dont certaines caractéristiques s'harmonisent avec la manière dont le projet de thèse a été mené dans son ensemble, avec une perspective pluraliste et éclectique. Nous poursuivons avec les fondements conceptuels disciplinaires utilisés pour concevoir l'essence des soins infirmiers avec l'approche de soins fondés sur les forces (ASFF, Gottlieb et Gottlieb, 2014). Nous terminons avec l'approche théorique de l'EM de Miller et Rollnick (2013a, 2013b) pour soutenir l'esprit d'une conversation collaborative centrée sur le changement qui a servi à cocréer le scénario et le contenu clinique de la simulation numérique. Puisque l'intervention éducative développée et évaluée est une simulation numérique, nous nous sommes largement inspirées des principes visant à soutenir l'apprentissage actif des adultes (Clapper, 2010), lesquels sont décrits sommairement dans l'*article 4* portant sur le développement de la simulation.

4.1 Paradigme

Le concept de paradigme est défini de différentes manières (Morgan, 2007). Une définition couramment utilisée est celle de Kuhn (1972), dans lequel un paradigme est un cadre conceptuel général qui reflète des généralisations symboliques (ex. : formules logiques, lois universelles), des valeurs (impératifs qui assurent au travail scientifique la plus haute qualité possible) et des croyances qui représentent la manière dont le monde est perçu et vécu. Ces croyances sont communes et acceptées au sein d'une communauté scientifique. Un autre élément essentiel constituant un paradigme repose sur la résolution d'un problème. Ainsi, un groupe de chercheurs formule des questions qu'il croit légitimes et se dote d'instruments, de méthodes et de techniques fiables pour résoudre les problèmes identifiés (Gagnon et Hébert, 2000; Lévy, 1994). En conséquence, de nouvelles découvertes peuvent être réalisées sur le plan des connaissances, ou bien ces dernières peuvent être consolidées, précisées et raffinées (Gagnon et Hébert, 2000). Un paradigme est souvent associé à des croyances ou repères issus de la philosophie de la connaissance (Morgan, 2007), soit l'ontologie, l'épistémologie, la méthodologie et l'axiologie. Cette dernière est également nommée téléologie ou éthique (Fawcett et al., 2001; Lévy, 1994; McIntyre et McDonald, 2013). L'une des critiques adressées à Kuhn (1977) est le caractère incommensurable d'un paradigme. Cela signifie que, par exemple, le post-positivisme et le constructivisme, qui comprennent des repères ontologiques,

épistémologiques, méthodologiques et axiologiques distincts, sont incompatibles et irréconciliables (Morgan, 2007). Conséquemment, cette incommensurabilité crée inévitablement une forme de polarisation, de division, de séparation (Risjord, 2010). Le « piège » est en quelque sorte de « prêter allégeance » (Johnson et Onwuegbuzie, 2004; Morgan, 2007) et de se souscrire à un paradigme en particulier avant de commencer la recherche, en disant par exemple : « Je suis une chercheuse qualitative, je m'inscris dans le constructivisme (Biesta, 2010). » Or, nous souhaitons éviter une telle prise de position paradigmatique et avons plutôt privilégié le recours à l'approche du pragmatisme qui est cohérente et contributive à la manière dont le projet de thèse a été mené dans son ensemble. L'approche du pragmatisme, comme la surnomme Morgan (2007), est employée comme un outil philosophique pour réfléchir aux « problèmes » (ou objets de recherche), les résoudre ou leur apporter des éléments de solutions (Biesta, 2010). Le pragmatisme nous a permis d'adopter une posture éclectique, pluraliste, émergente et évolutive, autant dans le choix des questions de recherche et des concepts d'intérêt, que dans la sélection de théories et de méthodes de recherche variées qui ont pu être réconciliées et converger en un programme de recherche cohérent. Considérant que les auteurs du pragmatisme sont nombreux et qu'ils appartiennent à différentes époques et courants de pensée, nous nous sommes inspirées de l'angle du pragmatisme classique américain du 20e siècle (Biesta, 2010) en nous rapportant principalement aux travaux de William James, considéré comme le père de la psychologie. Les caractéristiques découlant de cette approche du pragmatisme sont décrites dans la prochaine section.

4.2 Approche du pragmatisme

Tout d'abord, l'approche du pragmatisme est une manière de dissoudre les disputes et les dualismes philosophiques entre, par exemple, la subjectivité et l'objectivité (Johnson et Onwuegbuzie, 2004; Kilpinen, 2008). James rejette ainsi la métaphysique ou l'ontologie (Kikuchi et Simmons, 1994) qui réfère à la nature de la réalité, à la nature immatérielle de l'origine et de la structure du monde vécu (Cronin et Rawlings-Anderson, 2004) pour s'intéresser à des questions plus larges que la réalité ou la vérité. Cette attitude philosophique du pragmatisme rejette ainsi le dogmatisme et les fausses dichotomies (Haack et Yong, 2010). Pour James, la théorie (aussi appelée idée, connaissance, ou croyance) n'est pas celle qui possède des propriétés ontologiques, mais celle qui nous permet de composer avec le futur à partir de notre expérience (Kikuchi et Simmons, 1994). Bordogna (2008) et Croce (2011) mettent en perspective que les travaux de James tendent à lier la psychologie et la

philosophie en une « science de l'homme », une entreprise visant à comprendre la nature humaine à travers les traits et les caractères humains, les pensées et les comportements. En ce sens, le pragmatisme renvoie à la nature de l'expérience plutôt qu'à la nature de la réalité ou à la recherche d'*une* vérité (Morgan, 2007). Si nous avions tout de même à articuler les fondements ontologiques du pragmatisme à partir d'une conception plus « traditionnelle », une piste serait de considérer l'existence d'une réalité unique et de multiples interprétations de cette réalité attribuées par les personnes (Mertens et Wilson, 2019).

Kaila et Kovalainen (2011) expliquent que la philosophie de James est basée sur la logique de l'action. Le critère de vérité est étroitement relié aux conséquences pratiques d'une connaissance (James et Madelrieux, 2007). L'une des caractéristiques du pragmatisme est son emphase sur « quelle différence cela fait » de croire une chose plutôt qu'une autre, ou d'agir d'une manière ou d'une autre (Morgan, 2007). Une idée vraie est celle qui fonctionne, c'est-à-dire celle qui nous conduit vers les résultats attendus, anticipés, celle qui résout des problèmes, celle qui a des conséquences pratiques (Kikuchi et Simmons, 1994). En ce sens, le pragmatisme est une philosophie centrée sur les valeurs puisqu'il y a un intérêt à savoir lesquelles de ces connaissances produiront les buts ou les résultats escomptés, ce qui est « bon » pour l'infirmière et pour le patient (Risjord, 2010). Pour le chercheur, faire des choix, privilégier une option plutôt qu'une autre, implique inévitablement une histoire personnelle, un bagage social, des fondements culturels qui viennent influencer la quête scientifique de savoirs (Morgan, 2007). Dans cette perspective, un chercheur ne peut être neutre et exempt de biais face aux phénomènes étudiés (Creswell et Creswell, 2018). Les valeurs ont un impact sur ce que nous, chercheurs, choisissons d'étudier et comment nous choisissons de le faire (Morgan, 2007). Ces valeurs viennent moduler les questions et les objets de recherche.

Le pragmatisme endosse l'éclectisme et le pluralisme. En effet, plusieurs manières sont utiles pour comprendre les personnes et le monde, par exemple : l'usage de différentes théories et perspectives qui peuvent sembler conflictuelles et divergentes, l'observation, l'expérience et l'expérimentation (Johnson et Onwuegbuzie, 2004). La contribution de l'approche du pragmatisme est notamment de mettre en relation et de connecter l'objectivité et la subjectivité, ces deux entités qui ont longtemps été considérées comme irréconciliables (Bordogna, 2008; Croce, 2011). Le pragmatisme est reconnu comme une approche philosophique qui permet l'harmonisation de méthodes mixtes, soit l'usage de techniques quantitatives et qualitatives, d'approches, de concepts et de langages combinés dans une

seule étude (Biesta, 2010; Creswell et Creswell, 2018; Johnson et Onwuegbuzie, 2004; Morgan, 2007). La visée que sous-tend le pragmatisme est d'offrir les meilleures opportunités de répondre aux questions de recherche (Johnson et Onwuegbuzie, 2004). Pour ce faire, la combinaison de différentes approches de recherche est un moyen d'y parvenir. En d'autres mots, le chercheur collecte des données avec ce qui fonctionne le mieux, dont le recours à diverses méthodes et techniques, pour répondre aux questions de recherche (Creswell et Creswell, 2018).

En somme, l'approche du pragmatisme a inspiré globalement notre démarche de recherche. Nous avons été guidées par des objets de recherche, des questions et des préoccupations qui ont été appréhendés avec des lentilles conceptuelles et théoriques complémentaires, tout en mobilisant les meilleures méthodes pour offrir des éléments de réponses.

4.3 Approche de soins infirmiers fondés sur les forces (ASFF)

L'ASFF est une philosophie animée par des valeurs et des croyances, centrée sur la personne, la famille et la communauté dans leur présent et dans leur contexte, pour les aider à composer avec les défis et à fonctionner de manière optimale (Gottlieb et Gottlieb, 2014, 2017). Nous utilisons dans cette section le terme « personne » de manière inclusive avec « famille », considérant la place centrale qu'occupe la famille dans l'ASFF. Il existe, selon Feeley et Gottlieb (2000), quatre types de forces qui permettent à la personne/famille de composer avec les défis, d'envisager le changement et de se développer pour faire face aux problèmes rencontrés : (1) les traits qui résident à l'intérieur de la personne ou de la famille (ex. : résilience) ; (2) les actifs, comme les finances ; (3) les capacités, habiletés et compétences ; (4) les qualités, comme la motivation. Les forces qui sont extérieures à la personne sont considérées plutôt comme des ressources, en référant par exemple au réseau social et aux services offerts dans la communauté (Feeley et Gottlieb, 2000).

L'ASFF influence et module la manière dont les infirmières créent des environnements de santé et de guérison pour les personnes et leurs familles, dont les enseignants (Gottlieb et Benner, 2013) créent des environnements d'apprentissage sains pour les apprenants et dont les *leaders* et gestionnaires créent des environnements de travail sains pour leurs employés (Gottlieb et al., 2012). L'ASFF a guidé l'étudiante-chercheuse dans sa manière d'appréhender globalement les soins infirmiers et s'est reflétée dans la façon de conceptualiser la nature de la relation infirmière-patient au cœur de la

simulation numérique, basée sur un partenariat de collaboration. Par ailleurs, en tant que « formateurs » et « inventeurs » de la simulation, nous avons mis en place des conditions pour créer une expérience d'apprentissage positive pour les infirmières. Pour y parvenir, les stratégies (ex. : *quiz*, rétroactions) étaient formulées de manière constructive, en transformant les erreurs en une occasion d'apprentissage, et non de manière à cibler les lacunes (*cf.* article 4).

Nous décrivons dans ce chapitre les caractéristiques de l'ASFF de même que ses valeurs, ce qui nous apparaît fondamental pour illustrer dans quelle mesure cette approche peut concourir à adopter une perspective singulière de la personne (patient), de son rôle dans les soins, de l'environnement et de la nature de la relation infirmière-patient. Ces valeurs issues de l'ASFF peuvent guider l'action. En cohérence avec l'ASFF, nous postulons que les soins infirmiers, incluant ceux visant l'accompagnement des PVVIH dans la prise du TAR, sont centrés sur ce qui fonctionne bien chez la personne, sur ses capacités à faire face aux difficultés rencontrées et à trouver ses propres solutions. L'infirmière valorise et reconnaît les expériences de la personne. Ainsi, le scénario de la simulation numérique a été créé avec la philosophie de l'ASFF comme toile de fond pour représenter la relation infirmière-patient qui convient à cette approche. Le tableau 1 contient des informations permettant de décrire l'ASFF.

Tableau 1. Description de l'approche de soins infirmiers fondés sur les forces (Gottlieb et Gottlieb, 2014)

Attribut	**Approche de soins infirmiers fondés sur les forces**
But premier	L'accent est mis sur ce qui fonctionne (bien), sur les capacités de la personne à faire face aux problèmes rencontrés. L'emphase repose sur les moyens qu'a trouvés la personne pour composer avec l'adversité et sa capacité à rebondir après un traumatisme. La personne et son intégralité sont prises en compte tout en évitant de lui attribuer une étiquette. Les forces sont mises à profit pour consolider la confiance en soi qui est essentielle pour alléger les préoccupations. Il est attendu que la personne soit responsable de trouver ses propres solutions. L'infirmière crée des conditions favorables et lui offre soutien, réconfort et encouragement.

	L'ASFF vise à soutenir et à renforcer les mécanismes innés de la personne en faveur de la santé, du rétablissement et de la guérison.
Contexte	Le contexte est un élément fondamental pour comprendre les buts de la personne et ce qui la préoccupe. La santé et la maladie sont prises en compte à travers la situation de la personne, ses expériences antérieures et actuelles, sa culture, ses relations et l'environnement socio-économique et politique.
Langage	Le langage est formulé positivement et évoque l'espoir : forces, énergie, défis, occasions, possibilités, capacités.
Relations	Les relations sont basées sur un partenariat de collaboration (voir description additionnelle dans le Tableau 2).
Principale source d'information	Les informations subjectives (ce que pense, vit et ressent la personne) et les données objectives sont valorisées. L'accent est sur la santé et sur la vie de la personne. Les sources premières d'information reposent sur la personne, la famille et la communauté. Durant les conversations cliniques, l'importance est accordée à l'histoire de la personne, à son récit, à ses réflexions et à ses expériences. Diverses sources d'information et de savoirs sont également valorisées pour avoir une compréhension globale de la personne : données empiriques, expériences personnelles, comportements éthiques et moraux, jugement esthétique.
Fondement de la prise de décisions : plan de soins	Le plan de soins infirmiers est formulé à partir des forces de la personne. Une approche non standardisée est préconisée, c'est-à-dire que la réponse et les décisions sont adaptées à la situation. La planification et la gestion des soins sont réalisées en partenariat avec la personne, sa famille et l'équipe de soins. Le plan de soins est personnalisé en fonction du caractère unique de la personne, de sa famille, et de leur situation.
Résultats	Les résultats sont déterminés par la personne et la famille, à partir de ce qui est important pour elles, comme le bien-être et la qualité de vie. L'accent est mis sur l'autonomisation, l'engagement, les forces, le dynamisme de la personne et les possibilités.

	Les effets peuvent avoir des retombées positives sur la motivation, la conscience de soi, la résilience, l'espoir, la responsabilité, etc.

L'ASFF est enracinée dans l'approche des soins infirmiers de Florence Nightingale (1860), une pionnière de la profession infirmière, dans le modèle McGill (Gottlieb et Rowat, 1987) en sciences infirmières, dans l'autonomisation et l'agentivité (Gibson, 1991; Regan et Rodriguez, 2011), dans les principes de soins centrés sur la personne/famille (Gooding et al., 2011), dans le soin relationnel (Koloroutis, 2004) de même que dans les capacités innées et acquises pour la santé et la guérison (Gottlieb et Ponzoni, 2016). Ces fondements se traduisent dans huit valeurs fondées sur les forces : 1) la santé et la guérison, 2) l'unicité de la personne, 3) l'holisme et l'indivisibilité, 4) la réalité objective et subjective et les significations créées, 5) l'intégralité de la personne et de son environnement; 6) l'autodétermination, 7) l'apprentissage, les dispositions pour apprendre et le moment opportun, 8) le partenariat de collaboration entre l'infirmière et la personne. Les valeurs ont pour fonction de déterminer ce qui est saillant et pertinent, en plus de servir de guide à la prise de décisions et subséquemment, à l'action (Gottlieb et Gottlieb, 2014). Chacune des valeurs sera décrite succinctement, en faisant ressortir le *partenariat de collaboration* qui a guidé la conceptualisation de la relation infirmière-patient au cœur de la simulation numérique.

La *santé et la guérison* ciblent la plénitude. La plénitude survient lorsque divers aspects de la personne sont intégrés et coordonnés sur les plans physique, mental, émotionnel et social et que ces aspects atteignent un état d'équilibre, d'harmonie, faisant ressentir à la personne un état de fonctionnement optimal. La *santé* sous-entend le développement des forces, c'est-à-dire : les aptitudes, capacités, talents, potentiels et compétences d'une personne/famille, en vue de survivre, de s'adapter et de relever des défis. La santé est plus que l'absence de la maladie : elle est présente en tout temps. La santé est dynamique, changeante et évolutive, tout en s'inscrivant dans un processus d'apprentissage. La *guérison* consiste à restaurer, réparer, renouveler, redéfinir, régénérer, rééduquer et redécouvrir une forme de plénitude au sein de la maladie, un accident ou autre traumatisme. La guérison n'a pas forcément une fonction curative : elle vise à rétablir une forme d'équilibre.

L'*unicité* reconnaît que deux êtres humains ne sont pas identiques, qu'ils sont génétiquement différents. L'unicité tient en compte les particularités d'une personne, ce qu'elle est à travers ses forces et ses faiblesses et sa manière singulière de vivre et de réagir à son environnement (Gottlieb, 2014; Gottlieb et Gottlieb, 2014, 2017). L'*holisme* considère la personne dans sa globalité et reconnaît ainsi

l'interconnexion des diverses parties avec le tout. La personne est *indivisible*, signifiant que son corps et son esprit sont intégrés. Dans l'ASFF, des sources de connaissances variées sont consultées par les infirmières, comme les données issues d'une *réalité objective, subjective et les significations créées*. Dans la *réalité objective*, les infirmières utilisent des sources d'information comme des analyses sanguines et des évaluations psychologiques pour soutenir, par exemple, leurs prises de décisions. À travers la *réalité subjective et les significations créées,* chaque personne vit des expériences et une réalité de manière unique. Pour comprendre et exprimer cette réalité, la personne *crée des significations* en développant un récit qui permet de relier ensemble ses expériences, perceptions, pensées et émotions. *L'intégralité de la personne et de son environnement* réfère au fait que la personne se situe dans plusieurs environnements : physique (temps, espace), relationnel (liens, réseaux), social (politique, économique). La personne est influencée par ses différents environnements et peut aussi les influencer. La famille peut être à la fois la personne aussi bien que l'environnement, dépendamment du contexte et des circonstances. L'*autodétermination* reconnaît à la personne ses droits de décider du cours de sa vie, son autonomie, son contrôle, et son pouvoir dans la prise de décisions éclairées en lien avec sa santé et le dénouement de sa vie. L'*apprentissage* est requis pour la survie de la personne, pour ses changements et pour son développement, et implique l'acquisition de connaissances et d'habiletés. La *disposition* est un prérequis pour l'apprentissage et le *moment opportun* implique de coordonner les actions pour atteindre les meilleurs résultats.

Le *partenariat de collaboration* entre l'infirmière et le patient est composé de ces ingrédients essentiels : un partage de pouvoir, l'ouverture et le respect, une attitude de non-jugement et d'acceptation, vivre avec l'ambiguïté, être conscient de soi-même et être réflexif. C'est dans cet esprit de partenariat collaboratif que prend appui la simulation numérique pour traduire les interactions préprogrammées entre l'infirmière et le patient virtuels tout en maximisant les conditions favorables pour un apprentissage actif et sans jugement à l'égard des infirmières. Les caractéristiques du partenariat de collaboration sont présentées dans le Tableau 2.

Tableau 2. Les caractéristiques du partenariat de collaboration qui qualifient la relation infirmière-patient

Critères à la base des caractéristiques	**Partenariat de collaboration**

Postulats	La personne est considérée comme un partenaire actif. La responsabilité des soins est partagée entre la personne et le professionnel. La personne possède des connaissances et des capacités qu'elle peut mettre à profit pour la compréhension et la prise en charge de sa maladie, ses problèmes ou pour tenter d'atteindre ses buts par des moyens qui sont porteurs de sens pour elle.
Point de mire	Centré sur la capacité de la personne de ressentir un bien-être, d'avoir une bonne qualité de vie, porteuse de sens.
Rôle de l'infirmière	L'infirmière joue le rôle de facilitatrice en encourageant la personne à lui faire part de ses perceptions et de son expertise, à se joindre à elle pour prendre des décisions et à développer son sens de l'autonomie et son auto-efficacité. L'infirmière accompagne la personne dans l'utilisation de ses forces et de ses ressources. L'infirmière possède des connaissances sur la maladie et sur la personne.
Rôle de la personne	La personne est un partenaire actif qui prend part de manière importante au choix des buts et de la recherche de solutions.
Nature de la relation	Le professionnel et la personne donnent et reçoivent. La relation est réciproque, mutuelle, symétrique et équilibrée. Les buts, rôles et responsabilités sont négociés constamment.
Établissements des buts	Les buts sont établis de manière conjointe entre le professionnel et la personne.
Évaluation	Le professionnel et la personne évaluent conjointement les progrès réalisés au niveau de l'atteinte des buts qu'ils ont fixés ensemble.
Résultats escomptés	Le problème peut ou non être résolu. Ce qui prime repose sur le rehaussement de la capacité de la personne à prendre en charge un problème actuel ou les problèmes futurs. Le professionnel et la personne acceptent la responsabilité partagée des résultats obtenus.

4.4 Entretien motivationnel pour guider le développement du contenu clinique de la simulation

À l'origine, l'EM a été développé à partir d'un contexte d'accompagnement des personnes souffrant d'une dépendance à l'alcool (Miller et Rollnick, 2013b), après quoi il a été employé pour divers comportements, incluant la prise des médicaments (Zomahoun et al., 2017), auprès d'une variété de clientèles (Frost et al., 2018). Miller et Rollnick (2013a) définissent l'EM comme « un style de conversation collaboratif pour renforcer la motivation propre d'une personne et son engagement vers le changement (p.12). » Ce style de conversation ne peut s'établir que dans une relation où les quatre aspects composant l'esprit de l'EM sont présents : 1) le partenariat ; 2) le non-jugement ; 3) l'évocation ; 4) l'altruisme. Ces quatre aspects représentent les composantes relationnelles de l'EM, soit ses fondements et ses valeurs (Miller et Rollnick, 2013b), lesquels peuvent se traduire notamment dans les habiletés thérapeutiques du professionnel et dans sa compréhension empathique (Rogers, 1959). L'EM inclut également des composantes techniques, lesquelles renvoient aux habiletés essentielles à la communication, soit : poser des questions ouvertes, valoriser, refléter, résumer, informer et conseiller. Ces habiletés techniques sont des prérequis pour favoriser une mise en action efficace de l'EM, mais ne constituent pas l'EM en soi. Ce qui constitue l'EM est l'utilisation stratégique de ces habiletés par le professionnel, fondée sur les valeurs énumérées ci-dessus (esprit de l'EM), pour ainsi guider la personne (ex. : le patient) vers la direction du changement.

4.4.1 L'esprit que sous-tend l'entretien motivationnel (composantes relationnelles)

Le *partenariat* se veut collaboratif, à travers lequel l'autonomie de la personne est honorée et respectée, dans une visée de comprendre son cadre de référence interne et de valoriser son expertise. « *L'EM n'est pas une façon de manipuler les gens pour leur faire faire ce que vous voulez qu'ils fassent »* (Miller et Rollnick, 2013a, p. 38). Les infirmières qui ont accès à la simulation numérique n'y trouvent pas de trucs sur « comment mieux motiver les patients à prendre leurs médicaments ». Elles y découvrent plutôt une autre méthode visant à collaborer et à communiquer avec les patients de manière à mobiliser leurs propres motivations et capacités à changer.

Le non-jugement se comprend à travers ces quatre aspects essentiels qui prennent racine dans les travaux de Carl Rogers (1959) tel qu'expliqué par Miller et Rollnick (2013a): *valeur inconditionnelle, empathie approfondie, soutien de l'autonomie et valorisation*. Le non-jugement se manifeste par la

reconnaissance du potentiel et de la valeur intrinsèque de chaque personne (*valeur inconditionnelle*). Il s'agit de l'acceptation et du respect de l'autre tel qu'il est, comme condition thérapeutique favorable permettant au changement de survenir. Ensuite, le non-jugement s'exprime à travers l'*empathie*, qui consiste à se mettre à la place de l'autre, pour comprendre son vécu à travers son cadre de référence. Dans le soutien de *l'autonomie* du patient, les infirmières reconnaissent explicitement qu'il est libre de faire ses choix, qu'elles le soutiennent inconditionnellement dans l'exercice de ses choix et qu'elles acceptent, qu'ultimement, il sera toujours libre de prendre ou non ses médicaments. Finalement, la *valorisation* consiste à reconnaître les capacités, les forces et les aspects positifs chez le patient.

L'évocation repose sur la croyance que le patient a déjà en lui tout ce qu'il faut pour adopter un comportement favorable à sa santé. Dans cette perspective, le rôle du professionnel est de guider la personne pour qu'elle puisse identifier et exprimer elle-même les éléments de son cadre interne ou de son monde intérieur sur lequel elle peut prendre appui pour adopter ou modifier un comportement (comme la prise du TAR). Pour ce faire, la notion d'ambivalence est importante à cerner : le fait de vouloir, en même temps, deux choses incompatibles. Nous pourrions illustrer l'ambivalence par deux voix qui discutent dans les pensées : l'une en faveur du changement, que l'on nomme le *discours-changement*, et l'autre en faveur du statu quo, appelée le *discours-maintien*. Un réflexe qu'ont beaucoup d'intervenants en santé est d'argumenter en faveur du changement auprès du patient : « vous devriez faire ceci », « il serait important de bien prendre votre traitement ». Même si cela est dit avec la plus grande gentillesse et délicatesse, implicitement, cela donne la parole au *discours-maintien* du patient. Pour répondre à ces interventions de nature directive, le patient est plus susceptible d'être sur la défensive et de se justifier. Ultimement, il risque de se désengager de la relation soignante (Miller et Rollnick, 2013b).

Si Miller et Rollnick (2013a) font de l'*évocation* une composante essentielle de l'EM, c'est que l'évocation implique que le professionnel change son style de communication de façon à aménager un espace pour favoriser le *discours-changement* chez le patient. L'esprit dans lequel a été développée la simulation numérique (*cf.* article 4) permet aux infirmières d'expérimenter comment certains de leurs styles de conversation ou de communication, comme le fait de guider la consultation avec le patient (cohérente avec l'EM) ou de la diriger (incohérente avec l'EM), peuvent induire soit un *discours-changement* ou bien un *discours-maintien* chez le patient.

Le non-jugement s'incarne à travers l'*altruisme*, dans la promotion active du bien-être du patient et dans la priorisation de ses besoins. L'altruisme complète les autres composantes essentielles de l'esprit de l'EM en gardant le point de mire sur le bien-être du patient tel qu'il le définit lui-même.

4.4.2 Les habiletés relationnelles cohérentes et incohérentes avec l'entretien motivationnel (composantes techniques)

Les habiletés techniques mentionnées précédemment - poser des questions ouvertes, valoriser, refléter, résumer, informer et conseiller - font référence aux savoir-faire essentiels de l'EM. Lorsqu'elles sont utilisées judicieusement, dans l'esprit de l'EM, ces habiletés sont favorables à la création d'un engagement relationnel, dans notre cas, entre l'infirmière et le patient. La pratique efficace de l'EM passe par l'adoption souple et stratégique d'habiletés relationnelles. Il existe également des pièges, qui sont des habiletés ou des savoir-faire incohérents avec l'EM, qui risquent de provoquer un désengagement dans la relation infirmière-patient. Ces pièges sont décrits plus loin (*cf.* article 4). Ils sont illustrés avec des définitions et des exemples concrets tirés de la simulation numérique. L'EM a guidé la manière dont les habiletés relationnelles ont été mobilisées pour créer le scénario. Le scénario simulé se compose de l'ensemble du contenu clinique et des dialogues entre l'infirmière et le patient virtuels intercalés de *quiz* et de rétroactions qui ont permis de favoriser l'apprentissage actif.

La simulation numérique que nous avons développée vise ainsi à améliorer les habiletés relationnelles des infirmières. Nous avons préféré l'usage du terme *habiletés relationnelles* plutôt que celui *d'habiletés de communication* pour refléter à la fois les composantes relationnelles de l'EM, soit l'esprit et les valeurs qui la sous-tendent, et les composantes techniques communicationnelles (Miller et Rose, 2009).

4.5 Complémentarité de l'approche de soins infirmiers fondés sur les forces et de l'entretien motivationnel

L'ASFF et l'EM partagent un éventail de caractéristiques, de principes et de valeurs qui sont convergents et complémentaires. Tout d'abord, les deux approches sont ancrées dans des principes centrés sur la personne/famille/organisation (Gottlieb et Gottlieb, 2014, 2017) et dans une relation d'aide centrée sur la personne (Miller et Rollnick, 2013b). Ainsi, l'ASFF cible plusieurs unités, dont le niveau individuel, familial et organisationnel, alors que dans l'EM, la relation thérapeutique se déploie

au sein d'une conversation thérapeutique entre le professionnel et la personne. En étant centrées sur la personne, cela signifie notamment que les deux approches sont orientées vers les buts de la personne telle qu'elle les définit elle-même. Les buts ne sont pas imposés ou déterminés par l'infirmière. Ceci peut rejoindre le principe d'autodétermination, qui est l'une des huit valeurs centrales de l'ASFF, alors que l'autonomie représente un aspect essentiel du non-jugement, composant en partie l'esprit de l'EM. Dans l'ASFF, le rôle de l'infirmière est de soutenir l'autodétermination de sorte à aider la personne à devenir plus autonome, par l'exercice d'un plus grand contrôle sur sa santé et les décisions sur le dénouement de sa vie. L'infirmière considère que les choix et décisions de la personne peuvent parfois être limités et que sa capacité à choisir peut être affectée par différentes circonstances (Gottlieb, 2014; Gottlieb et Gottlieb, 2014). Dans l'EM, l'autonomie personnelle est honorée : la personne fait ses propres choix comportementaux puisqu'elle détient l'expertise de sa propre situation. Ces choix ne devraient donc pas refléter ceux d'un intervenant ou d'un professionnel (Miller et Rollnick, 2009). Un professionnel qui utilise l'EM comme méthode d'intervention ou de communication a le rôle d'amener la personne à exprimer et à évoquer ses propres motivations vers le changement, à prioriser ses buts.

Les deux approches concourent sur l'importance de recourir aux forces de la personne, d'une part, pour guider le plan de soins (Gottlieb et Gottlieb, 2014) et d'autre part, pour orienter la direction vers le changement (Miller et Rollnick, 2013b). Le rôle des infirmières consiste à identifier les forces et les ressources de la personne/famille, à leur fournir une rétroaction authentique, à développer et à mobiliser leurs forces et leurs ressources (Feeley et Gottlieb, 2000). L'un des quatre aspects centraux du non-jugement au cœur de l'esprit de l'EM porte sur la valorisation. Des habiletés de valorisation sont utilisées par le professionnel pour identifier et miser sur les forces de la personne, pour encourager son autonomie, et pour lui offrir du soutien (Rollnick et al., 2008). Des techniques, comme l'échelle de confiance, permettent d'évaluer le niveau de confiance en ses capacités à effectuer le changement. Le professionnel peut recourir à différentes façons de faire pour rehausser la confiance, comme passer en revue les succès passés et évoquer un changement hypothétique, en se projetant dans un avenir où le changement aurait pris forme (Miller et Rollnick, 2013b). Finalement, les deux approches convergent vers une relation de partenariat. Dans l'ASFF, le partenariat collaboratif y est représenté comme l'une des huit valeurs alors que dans l'EM, il s'agit d'un aspect contributif à l'esprit de cette méthode. Le rôle du professionnel qui applique l'EM consiste à accompagner, à faciliter et à guider, en

reconnaissant et en valorisant l'expertise de la personne. Le partenariat se fait *pour* et *avec* la personne (Gottlieb et Gottlieb, 2014; Miller et Rollnick, 2013b).

En résumé, les deux approches (ASFF et EM) sont centrées sur la personne et sur ses buts. Elles misent sur ses forces, elles permettent de valoriser son autodétermination de même que son autonomie dans une prise de décisions significatives pour elle, tout cela au cœur d'un partenariat collaboratif.

La simulation numérique a été façonnée à partir d'une conception des soins infirmiers qu'est l'ASFF en recréant une relation infirmière-patient. L'EM se greffe à l'ASFF comme une méthode particulière de communication, avec ses assises théoriques qui offrent des repères pour concrétiser les interactions entre l'infirmière et le patient. En effet, les techniques de communication (comme les questions ouvertes, le reflet) proposées dans l'EM permettent d'opérationnaliser ces habiletés relationnelles au sein d'un partenariat collaboratif. L'arrimage de l'ASFF et de l'EM, ayant des valeurs complémentaires, ont permis d'établir des fondements solides au sein de la simulation numérique pour guider et pour orienter l'action, et donc, pour créer un contenu éducatif constructif.

5 Chapitre 5. Considérations méthodologiques

Nous résumons dans ce chapitre les considérations méthodologiques, organisées en fonction des buts et des objectifs du projet de thèse. Les informations contenues dans ce chapitre sont complémentaires à celles se trouvant dans les articles 3, 4 et 5.

Nous amorçons le chapitre en décrivant l'émergence de notre démarche de recherche. L'approche du pragmatisme sera, quant à elle, évoquée à nouveau au Chapitre 9 pour aborder les fondements épistémologiques et méthodologiques qui viennent éclairer les critères de qualité d'une étude mixte. Nous terminons ce chapitre en mentionnant les considérations éthiques du projet de thèse.

5.1 Une démarche de recherche émergente

Nous avons évoqué au commencement de la thèse que nous qualifions notre démarche de recherche comme étant émergente. En la caractérisant ainsi, nous attachons la notion d'émergence non seulement aux méthodes, mais aussi aux questions de recherche, aux décisions, aux valeurs, aux orientations et aux processus survenus parfois de manière non déterminée, impromptue. Notre conception de l'approche émergente est quelque peu différente de celle proposée par certains auteurs (Hesse-Biber et Leavy, 2006, 2008; Patton, 2015a) qui réfèrent principalement aux « méthodes ou devis émergents ». Pour Patton (2015a), la flexibilité du devis émergent représente l'une des stratégies de recherche qualitative qui prend racine à la fois dans la nature ouverte d'une recherche menée dans un milieu naturel (*naturalistic inquiry*) et dans des considérations pragmatiques. Être ouvert et pragmatique requiert une tolérance élevée à l'ambiguïté et à l'incertitude, en plus d'avoir confiance en la valeur ultime de ce qu'une analyse inductive va procurer (Patton, 2015a). Pour Hesse-Biber et Leavy (2006), les méthodes de recherche émergentes sont la réponse logique aux changements de paradigme, aux développements majeurs dans la théorie, aux nouvelles conceptions des connaissances et aux processus de création des connaissances. Elles permettent de répondre à des préoccupations et à des questionnements que les méthodes de recherche traditionnelles (comme celles ancrées dans le positivisme) ne peuvent pas résoudre adéquatement. Les méthodes émergentes peuvent être quantitatives, qualitatives et/ou mixtes (Hesse-Biber et Leavy, 2006; Morgan, 2006).

5.2 Développement de la simulation

5.2.1 Comprendre la pratique infirmière et ses défis

5.2.1.1 Devis qualitatif exploratoire

Tout d'abord, une étude qualitative exploratoire (Deslauriers et Kérisit, 1997) a été réalisée pour mieux comprendre la perspective des infirmières quant à leur pratique d'accompagnement des PVVIH qui prennent un traitement, aux défis rencontrés et aux ressources mobilisées. Le devis exploratoire est indiqué lorsque le phénomène d'intérêt est peu connu (Deslauriers et Kérisit, 1997). Les activités infirmières « attendues » relatives à la prestation des soins aux PVVIH sont bien décrites dans les lignes directrices internationales et nationales (CANAC, 2013a; Dumitru et al., 2017; Relf et al., 2011). Leur description porte davantage sur les exigences professionnelles attendues, sur ce que les infirmières *devraient faire* et non sur ce qu'elles *font* réellement. De plus, les barrières et les ressources mobilisées par les infirmières dans cette pratique demeuraient méconnues, d'où la pertinence du devis qualitatif exploratoire. L'usage de ce devis a été facilitant pour se familiariser avec le récit des infirmières sur leur pratique, leurs besoins et leurs préoccupations (Deslauriers et Kérisit, 1997). Cette recherche constituait une étape préalable au développement de la simulation à partir de laquelle certains besoins et préoccupations évoqués par les infirmières ont été transformés en une occasion d'apprentissage. Dans le quatrième article, nous spécifions le défi qui a retenu notre attention pour guider le développement de la simulation numérique.

5.2.1.2 Population, échantillon, processus de recrutement, méthodes de collecte de données

Pour réaliser cette étude qualitative, nous recherchions des infirmières réparties dans plusieurs régions du Québec qui avaient une expérience de travail auprès des PVVIH. Ces infirmières pouvaient exercer dans divers domaines, soit en gestion, en recherche, en clinique ou en enseignement. Nous avons utilisé une combinaison de stratégies d'échantillonnage pour recruter les infirmières : de convenance et à choix raisonné (Patton, 2015a). Nous résumons dans cette section le processus de recrutement et nous justifions le recours à deux méthodes de collecte de données (groupe de discussion et entrevues individuelles semi-structurées) pour répondre à l'objectif de la recherche.

Une première stratégie pour planifier le recrutement a été de communiquer avec la coordonnatrice du Programme national de mentorat sur le VIH et les hépatites (PNMVH). Le PNMVH (2020) est un

organisme qui offre des activités de formation continue destinées aux professionnels de la santé du Québec (médecins, infirmières et pharmaciens) travaillant dans le domaine du VIH et des hépatites virales. Il réunit les infirmières membres-expertes provenant de plusieurs régions du Québec à raison de quatre fois par année. Ces réunions sont des occasions de renforcer le réseautage, d'accéder à des conférences et de planifier le symposium annuel des infirmières en VIH. Ainsi, l'étudiante-chercheuse, étant impliquée comme membre experte au sein de cet organisme, et se trouvant régulièrement en contact avec plusieurs autres infirmières de ce groupe, a sollicité leur collaboration à ce projet de recherche. Dans un premier temps, une lettre d'invitation (annexe A) et un formulaire d'information et de consentement (annexe B) leur ont été envoyés par courriel (n=15) par la coordonnatrice du PNMVH. L'invitation visait à ce qu'elles se joignent à un groupe de discussion lors d'une réunion prévue au calendrier du PNMVH.

5.2.1.2.1 Groupes de discussion

Le groupe de discussion a été choisi pour son côté pragmatique en termes d'économie de temps (Scott Tilley, 2018) et de disponibilité des infirmières qui étaient rassemblées en un seul et même lieu. Le groupe de discussion permet de faciliter les échanges, les interactions et de mettre en lumière plusieurs perspectives (Patton, 2015a) autour de la thématique d'intérêt, soit la pratique infirmière d'accompagnement des PVVIH sous TAR. Par contre, cette méthode a l'inconvénient que certaines personnes se sentent moins confortables à partager leur expérience en groupe et donc, le temps de participation peut être inégal entre les participants (Patton, 2015a; Scott Tilley, 2018). Ainsi, tel que prévu avec la stratégie d'échantillonnage de convenance, les infirmières qui étaient facilement accessibles et intéressées par le sujet ont pris part au groupe de discussion. L'étudiante-chercheuse a mis en place des stratégies pour créer un climat de confiance afin que les infirmières se sentent à l'aise de partager leurs points de vue et pour favoriser une certaine équité au niveau des échanges. Elle a commencé en valorisant leur expertise : leurs connaissances expérientielles et cliniques serviraient de point de départ pour les informer de la conception et du développement d'une formation qui soit utile, pertinente, signifiante et applicable en pratique. Ensuite, elle a précisé certaines « règles » de bon fonctionnement de la réunion, comme le respect des perspectives et des opinions de chacune et l'importance de parler à tour de rôle. Dans la mesure du possible, l'étudiante-chercheuse a interpellé certaines infirmières pour susciter leur participation et pour refléter les particularités de leur pratique (ex. : accompagnement infirmier des mères et des enfants infectés par le VIH qui prennent un TAR).

5.2.1.2.2 Entrevues individuelles semi-structurées

Par ailleurs, pour approfondir et enrichir la compréhension de cette pratique infirmière et de ses défis, nous avons également opté pour des entrevues individuelles semi-structurées avec un autre groupe d'infirmières pour obtenir des données additionnelles et complémentaires à celles recueillies dans le groupe de discussion. Plus précisément, nous avons orienté les questions des entrevues afin d'obtenir des informations sur le contexte de travail respectif des participantes. Nous avons recueilli des exemples de situations cliniques d'accompagnement des PVVIH qui initiaient et/ou changeaient de traitement, de situations jugées difficiles comme soignants et de stratégies pour les surmonter. Nous avons demandé aux infirmières d'expliciter les actions réalisées dans l'ensemble des situations abordées encourant la prise du traitement de leur clientèle. Ces thématiques ont été effleurées dans le groupe de discussion alors qu'elles ont été approfondies dans chacune des entrevues, considérant le « temps de parole » prolongé et accordé de manière individuelle à chaque participante.

Le recours à l'entrevue qualitative est justifié par plusieurs arguments. Tout d'abord, cette méthode sert à explorer de manière approfondie la perspective des acteurs sociaux, ce qui permet d'appréhender et de comprendre des conduites sociales. L'entrevue crée une ouverture pour une compréhension et une connaissance des dilemmes et des enjeux auxquels sont confrontées les personnes, ce qui a permis de comprendre les défis rencontrés par les infirmières. De plus, l'entrevue est un bon outil d'information pour mettre en lumière les réalités sociales et accéder à l'expérience des personnes (Poupart, 1997). Une lettre d'information a été envoyée par voie électronique aux membres du PNMVH et aux infirmières du Centre hospitalier de l'Université de Montréal (CHUM) (annexe C) pour les inviter à prendre part aux entrevues individuelles. La stratégie d'échantillonnage par choix raisonné a été retenue avec l'objectif de sélectionner des cas différents parmi les infirmières intéressées, par exemple, en fonction de leur nombre d'années d'expérience auprès des PVVIH, de leurs contextes de pratique et de leurs milieux de travail. La diversification de l'échantillon était souhaitée pour obtenir une variabilité au niveau des caractéristiques des infirmières. Le même guide d'entrevue a facilité l'animation du groupe de discussion et la conduite des entretiens individuels. Des exemples de questions du guide d'entrevue sont présentés dans l'article 3.

Chaque infirmière participant au groupe de discussion et aux entrevues était invitée à remplir un questionnaire sociodémographique (annexe D) pour fournir une description de leur profil : groupe

d'âge, genre, niveau de formation complété, statut d'emploi, titre d'emploi, années d'expérience comme infirmière en VIH et auprès d'autres clientèles.

5.2.1.3 Analyse des données qualitatives

Nous avons procédé à l'analyse des données en suivant des procédures générales de recherche qualitative (Creswell et Creswell, 2018; Miles et al., 2003; Pope et Mays, 2006) et plus spécifiques à l'analyse thématique, inspirée des travaux de Paillé & Mucchielli (2016a) et de Braun & Clarke (2006). L'analyse thématique peut se définir comme suit : « elle consiste à procéder systématiquement au repérage, au regroupement, et subsidiairement, à l'examen discursif des thèmes abordés dans un corpus, qu'il s'agisse d'une transcription d'entretiens, d'un document organisationnel ou de notes d'observation (Paillé et Mucchielli, 2016b, p. 236) ». L'analyse thématique est une méthode qui permet de repérer, de relever et de synthétiser des thèmes présents dans un corpus (Paillé et Mucchielli, 2016b).

Nous avons procédé selon les étapes suivantes : 1) Préparer les données pour l'analyse tout en s'immergeant dans ces données ; 2) Générer un ensemble de codes initiaux ; 3) Condenser, classer et regrouper les codes dans des rubriques ; 4) Identifier et nommer les thèmes ; 5) Réviser, raffiner et renommer les thèmes ; 6) Présenter les thèmes sous forme d'une trame narrative. Nous nous sommes ancrées dans une posture inductive pour analyser les données qualitatives, c'est-à-dire que les codes et les thèmes ont été identifiés à partir des données du texte et non à partir d'un cadre préétabli ou de préconceptions analytiques du chercheur (Braun et Clarke, 2006; Hsieh et Shannon, 2005; Pope et Mays, 2006). Cette posture concorde avec le devis exploratoire (Hsieh et Shannon, 2005) privilégié dans le cadre de cette étude. Même si les étapes d'analyse sont présentées de manière linéaire et séquentielle, leurs frontières sont perméables. L'ensemble de la démarche a été entreprise de manière récursive, incluant des allers-retours constants aux données (Braun et Clarke, 2006).

La première étape de préparation des données commence par la transcription du corpus et l'organisation des documents nécessaires à l'analyse (Creswell et Creswell, 2018; Paillé et Mucchielli, 2016a; Pope et Mays, 2006). L'étudiante-chercheuse a débuté par retranscrire une portion du matériel qualitatif, disponible sur bandes audionumériques, comme approche initiale de familiarisation avec les données. Une personne extérieure au projet a complété la transcription intégrale du matériel qualitatif. L'organisation des documents a ensuite pris forme en remplaçant chaque information de nature

sensible (ex. : le nom d'une personne ou d'un milieu clinique) contenue dans l'ensemble du corpus par une information plus générale et anonyme. Par la suite, huit fichiers distincts (un pour le groupe de discussion et sept pour les entrevues) comprenant les transcriptions ont été intégrés dans la version 11 du logiciel NVivo (QSR International Pty Ltd, 2015) pour faciliter la gestion et l'organisation de l'ensemble du corpus. Cette étape préparatoire est essentielle pour s'immerger dans les données et pour se familiariser avec celles-ci (Braun et Clarke, 2006; Vaismoradi et al., 2013). L'étudiante-chercheuse a réécouté les entrevues et a validé la justesse des transcriptions. Les multiples lectures et relectures des transcriptions ont permis une pleine immersion dans les données (Braun et Clarke, 2006).

La deuxième étape consiste à générer un ensemble de codes initiaux à partir des données (Braun et Clarke, 2006). Il s'agit d'une étape de réduction des données (Johnson et Onwuegbuzie, 2004) qui consiste à coder et donc, à diviser les segments textuels qui se rapportent à une idée, à une signification. Le code permet ainsi de résumer le contenu de l'extrait auquel il est attribué. Nous avons entrepris un processus de codification très fin et détaillé, ligne par ligne, sur l'ensemble du matériel qualitatif issu du groupe de discussion et des entrevues. Ce processus a donné lieu à plus d'une centaine de codes. Dès cette étape, des mémos ont été conciliés dans NVivo, lesquels étaient de nature descriptive, en précisant le contenu d'un code par exemple, et de nature analytique et interprétative, traduisant notamment les réflexions de l'étudiante-chercheuse, les relations entre les codes et les pistes d'analyse à approfondir (Miles et al., 2003).

La troisième étape consiste à condenser, à classer et à regrouper les codes dans des rubriques. Les rubriques apportent une indication de ce qui est abordé dans un extrait du corpus, sans révéler précisément ce qu'il contient (Paillé et Mucchielli, 2016b). Les rubriques se distinguent ainsi des thèmes par leur degré de généralité et par leur niveau d'abstraction. Chaque code et rubrique ont été définis et ordonnancés dans NVivo, permettant ainsi un premier niveau d'analyse portant sur une classification préliminaire des données.

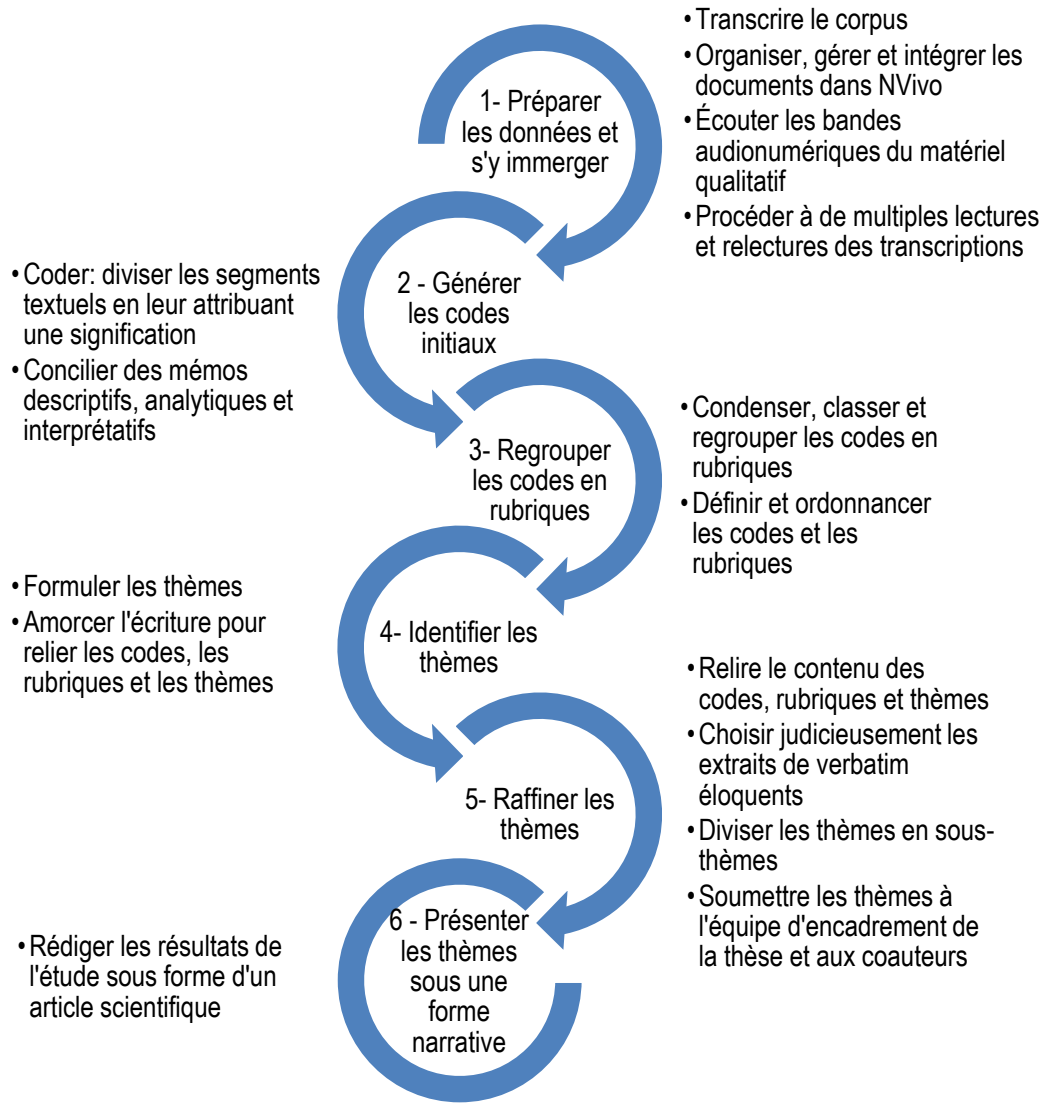
C'est à la quatrième étape qu'une première identification et formulation des thèmes a été possible. Les thèmes sont révélateurs de ce qui est abordé dans l'extrait d'un corpus puisqu'ils offrent des précisions sur la teneur des propos (Paillé et Mucchielli, 2016b). Nous avons entrepris l'activité d'écriture pour nommer les thèmes et leur contenu en lien avec les objectifs de la recherche (Paillé et Mucchielli,

2016b) et pour rendre explicite les relations qui existaient entre les codes, les rubriques et les thèmes en devenir (Braun et Clarke, 2006).

Dans la cinquième étape, nous avons révisé, raffiné et renommé les thèmes. Pour ce faire, nous avons relu le contenu des rubriques et des codes (Braun et Clarke, 2006) de même que l'ensemble du matériel pour s'assurer que les thèmes identifiés présentaient avec justesse la teneur des propos. La phase d'écriture s'est poursuivie. Chaque thème était appuyé par des extraits de *verbatim* éloquents. Nous avons aussi divisé certains thèmes en sous-thèmes. À cette étape, les membres du comité d'encadrement de la thèse ont joué un rôle clé en donnant leur avis sur la correspondance entre les thèmes, les sous-thèmes et les extraits *verbatim* choisis judicieusement. Ces phases itératives d'analyse, soutenues par des sessions de « débriefing », ont permis de bien définir les thèmes et les sous-thèmes, de les raffiner, c'est-à-dire de bien circonscrire leur signification et la teneur singulière des propos qui s'y rattachent, pour s'assurer que les données (issues des participantes) y étaient bien représentées (Braun et Clarke, 2006).

Finalement, comme sixième étape de l'analyse, nous avons rendu compte des thèmes et de l'ensemble des résultats sous forme narrative dans une publication scientifique. Les thèmes et les sous-thèmes y ont été explicités de manière cohérente, en harmonie avec les données telles que rapportées par les participantes à l'étude. La Figure 2 résume le processus d'analyse des données qualitatives.

Figure 2. Processus d'analyse des données qualitatives



5.2.2 Décrire le processus de codéveloppement de la simulation numérique, son contenu et ses défis : méthode collaborative

Nous avons entrepris le codéveloppement de la simulation numérique en se basant sur une approche collaborative et créative (*cf.* article 4), divisée en deux phases principales : 1) Planification du développement de la simulation numérique ; 2) Conception du contenu, de la séquence et du format de la simulation numérique. Dans la phase de planification, nous avons : 1a) Évalué les besoins de formation des infirmières en prenant soin de mieux comprendre leur pratique et les défis rencontrés ; 1b) Choisi des approches théoriques pour orienter le développement de la simulation ; 1c) Négocié un

contrat de partenariat entre l'institution de recherche, la chercheuse affiliée à cette institution et la compagnie de simulation numérique ; 1d) Formé une équipe interprofessionnelle. La réalisation de la deuxième phase de conception a été possible grâce aux activités suivantes : 2a) Établir les objectifs d'apprentissage et cocréer le contenu clinique (prébriefing, dossier de santé électronique du patient, scénario de la consultation infirmière-patient, glossaire) ; 2b) Enregistrer les narrations francophones et anglophones des acteurs qui incarnent l'infirmière et le patient virtuels ; 2c) Concevoir et valider les éléments graphiques de l'environnement numérique en deux dimensions ; 2d) Intégrer les modes de fidélité - physique, conceptuel, émotionnel/expérientiel - (Dieckmann et al., 2007; Rudolph et al., 2007) dans la simulation.

La deuxième phase de conception est celle qui a demandé davantage de créativité et d'itérativité, particulièrement pour la création du contenu, puisque les modèles existants (ex., Bartholomew Eldredge et al., 2016; Sidani et Braden, 2011) ne fournissaient pas les repères opérationnels nécessaires pour ce type d'intervention éducative spécifique. Nous avons eu recours à une approche de simulation narrative (Bearman, 2003; Bearman et al., 2001), basée sur des séquences conversationnelles automatisées et préprogrammées pour représenter le plus fidèlement possible la relation thérapeutique entre une infirmière et un patient. Ce type d'approche narrative implique des embranchements de cause à effet : un choix de l'apprenant à un *quiz* engendre une conséquence prédéterminée sur le déroulement du scénario et donc, sur la réactivité du patient. Il ne s'agit donc pas seulement d'une navigation linéaire. La transposition des habiletés relationnelles informées par les assises théoriques de l'EM dans une relation virtuelle infirmière-patient est un aspect fondamental qui illustre la spécificité de la simulation.

La réalisation de la phase de conception a été possible par la mise en commun d'expertises de divers acteurs impliqués. Un comité de travail a été formé dès le début du projet, composé d'une gestionnaire de projet habilitée dans la simulation numérique et de deux infirmiers ayant des expériences complémentaires dans la prestation des soins et des services offerts aux PVVIH, dans l'utilisation courante de l'EM et dans le développement d'interventions numériques. À ce comité de travail s'est ajoutée la contribution d'infirmières, de chercheurs, d'un médecin, d'un ingénieur pédagogique, d'une patiente-partenaire, d'un dirigeant d'un organisme communautaire et d'une équipe de concepteurs de la simulation numérique pour favoriser la création du « produit » qu'est devenue la simulation numérique.

Dans un premier temps, une version française de la simulation a été planifiée et développée. Lorsque cette version a été finalisée, l'adaptation anglaise a suivi.

5.3 L'évaluation de la simulation

5.3.1 Étude mixte à devis convergent pour évaluer l'acceptabilité de la simulation numérique

Une méthode mixte de recherche à devis convergent a permis d'évaluer quantitativement et qualitativement l'acceptabilité de cette simulation auprès des infirmières dans un contexte de formation continue (*cf.* article 5). La combinaison d'une composante quantitative et qualitative a été privilégiée pour offrir une perspective élargie et plus complète de la perception des infirmières de la simulation numérique (composante quantitative), de leur expérience d'apprentissage (composante qualitative), de la contribution de la simulation à renforcer les habiletés relationnelles et à transférer les apprentissages en pratique (composante mixte). Ainsi, chacune de ces questions amène des réponses complémentaires pour bien décrire et comprendre l'acceptation de cette formation numérique. Ces raisons d'entreprendre une étude mixte rejoignent les typologies de Bryman (2006) notamment en termes de complétude (l'état complet) et des différentes questions de recherche. Le devis convergent a permis d'intégrer, de comparer et d'interpréter les résultats quantitatifs et qualitatifs seulement une fois que les données quantitatives et qualitatives ont été collectées et analysées séparément (Creswell et Creswell, 2018). Dans les faits, la composante quantitative a été réalisée en premier lieu afin de pouvoir exposer les participantes à la simulation numérique, pour ensuite pouvoir mesurer leurs perceptions avec le questionnaire post-intervention. La composante qualitative a suivi, puisque l'objectif de recherche était celui d'explorer l'expérience d'apprentissage des infirmières suivant leur participation à la simulation numérique. La description de la composante quantitative et qualitative proposée dans la prochaine section reflète leur séquence dans le temps.

Nous avons choisi de cibler « l'exploration de l'acceptabilité » dans le cadre de notre étude mixte, considérant la nouveauté de l'intervention. L'étude d'acceptabilité représente une première phase dans l'évaluation des interventions (Sidani et Braden, 2011), laquelle pourrait nous donner des indications sur le processus de recherche et sur la nature de l'intervention en elle-même, pour y apporter des améliorations futures. L'acceptabilité a été évaluée de manière rétrospective (Sekhon et al., 2017) lorsque les infirmières ont complété la simulation numérique. Ultimement, la simulation numérique,

comme l'ensemble des activités de formation continue, vise à améliorer les habiletés relationnelles des infirmières et à changer des pratiques professionnelles, changements qui pourraient se répercuter sur les patients et sur la population (Moore et al., 2018). Si les infirmières perçoivent la simulation comme étant acceptable sur le plan de sa modalité et de son contenu, et qu'elles la considèrent comme étant pertinente et utile pour soutenir leur pratique, il est ainsi plus probable qu'elles utilisent les connaissances et habiletés s'y rapportant, et conséquemment, qu'elles puissent apprécier la contribution des apprentissages réalisés. À l'inverse, si la simulation elle-même, qui est le vecteur des connaissances et des habiletés, est perçue comme peu acceptable par les infirmières, il est peu probable qu'elles fassent bon usage de la formation et qu'elles utilisent les savoirs qu'elle renferme (Sidani et Braden, 2011). En somme, une étude d'acceptabilité nous apparaissait appropriée comme première phase de recherche pour recueillir des perceptions et l'expérience des utilisateurs, en vue d'optimiser l'intervention et d'orienter d'éventuelles questions évaluatives de recherche.

Le processus d'analyse et d'intégration des résultats quantitatifs et qualitatifs est présenté de manière détaillée dans l'article 5 et ne sera donc pas abordé dans ce chapitre.

5.3.1.1 Devis préexpérimental avec un groupe unique post-test

Plusieurs aspects relatifs à la simulation ont fait l'objet de l'évaluation quantitative pour recueillir les perceptions des infirmières sur : a) Les éléments de la simulation, incluant le contexte de la simulation (prébriefing), le glossaire, le dossier électronique du patient, les quiz, les rétroactions et les étiquettes, et la fidélité; b) La qualité globale du système et l'acceptation de la technologie; c) Le rôle de la simulation pour soutenir la pratique professionnelle; et d) L'atteinte des objectifs d'apprentissage. Cet objectif évaluatif a été répondu avec un devis préexpérimental (Campbell et Stanley, 1963) avec un groupe unique post-test. Ce devis permet de mesurer à un point dans le temps les perceptions des infirmières concernant la simulation numérique (Nieswiadomy, 2008).

Les participantes recherchées étaient des infirmières travaillant au Québec (hommes et femmes), ayant un permis valide de l'OIIQ et auto rapportant un niveau d'habiletés informatiques suffisant pour participer au projet. Diverses stratégies d'échantillonnage non probabilistes ont été adoptées pour les rejoindre : de convenance et par boule de neige (Nieswiadomy, 2008; Patton, 2015a). Des stratégies de recrutement hybrides ont été mises de l'avant : en ligne et en personne. Les stratégies « en ligne » sont les suivantes : envoi d'un courriel informatif (annexe E) aux membres du PNMVH et

publicisation de l'information dans leur infolettre à l'aide d'une bannière Web, envoi d'une infolettre par courriel aux infirmières membres de l'OIIQ[10] dans laquelle est diffusé le projet grâce à une bannière Web (annexe F). Un « clic » sur la bannière Web dirigeait les potentielles participantes vers le site Web de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers (2020) qui contenait une section « Projet simulateur numérique » avec les informations sur l'étude (annexe G). Les stratégies « en personne » consistaient à faire des présentations dans les milieux cliniques pour diffuser l'information sur le projet de recherche. Les infirmières étaient explicitement invitées à relayer l'information à leurs collègues. Des dépliants du projet (annexe H) ont été distribués dans les milieux cliniques et lors d'un symposium annuel des infirmières intéressées par les soins aux PVVIH.

Il importe de souligner que l'entièreté de l'étude mixte, incluant la collecte de données et la participation à la simulation numérique, a été réalisée en ligne. Les infirmières intéressées devaient d'abord répondre à la question suivante qui faisait office de critère d'éligibilité : Détenez-vous un permis valide de l'OIIQ ? (annexe I) En cliquant sur « OUI », les infirmières avaient accès au formulaire d'information et de consentement en ligne (annexe J). En cliquant sur « NON », elles étaient remerciées de leur intérêt au projet. Par la suite, elles complétaient un questionnaire sociodémographique en ligne (annexe K), consultaient la simulation numérique et répondaient au questionnaire post-intervention que nous avions développé, comprenant 80 énoncés (annexe L).

Considérant que plusieurs aspects relatifs à la simulation numérique étaient évalués et que les infirmières recherchées étaient dispersées à travers la province du Québec, l'usage d'un questionnaire en ligne représentait une méthode de collecte de données de choix. Le questionnaire en ligne permet de rejoindre un grand nombre de participants peu importe leur situation géographique et de documenter une grande quantité d'informations (Greenacre, 2016).

En cohérence avec le devis préexpérimental dont la portée des résultats est descriptive, nous avons analysé les données quantitatives du questionnaire en calculant des statistiques descriptives. Nous nous sommes intéressées à deux types de données pour chaque énoncé du questionnaire : continues et catégorielles. Nous avons utilisé deux mesures de tendance centrale pour situer le centre de la

[10] Nous avons priorisé l'envoi de l'infolettre aux infirmières membres de l'OIIQ de deux régions administratives du Québec de même qu'aux abonnés du *Bulletin emplois*. La région de la Mauricie et celle de la Capitale-Nationale (Québec) ont été préconisées en fonction du coût engendré pour la publicité (plus faible que la région de Montréal par exemple) et du nombre élevé de membres. Les détails suivront dans la section « Résultats additionnels » suivant l'article 5.

distribution des données, soit la moyenne et la médiane, de même que deux mesures de dispersion, l'écart-type et l'espace interquartile, pour nous renseigner sur la variabilité autour des valeurs de la tendance centrale. L'interprétation des données se faisait à partir d'une échelle de type Likert à quatre points (1= Fortement en désaccord, 2= En désaccord, 3= En accord, 4= Fortement en accord). La moyenne est largement utilisée puisqu'elle offre de manière générale une meilleure estimation de la tendance centrale de la population que la médiane. Cette dernière a l'avantage de ne pas être influencée par les scores extrêmes, alors que la moyenne l'est (Howell et al., 2008). Ces mesures de tendance centrale nous donnent des informations sur des scores moyens et des scores situés au milieu d'une distribution normale. Par contre, avec une moyenne ou une médiane, nous ne pouvions pas savoir combien de personnes avaient répondu, par exemple, « Fortement en désaccord » à un énoncé en particulier, ce qui est une donnée intéressante lorsque l'intérêt est d'évaluer l'acceptabilité d'une intervention en vue de la bonifier. C'est pourquoi nous avons également présenté les données catégorielles pour accroître la signification et l'interprétation des résultats en précisant la proportion des participantes qui ont répondu à chaque choix de réponses pour chacun des 80 énoncés.

5.3.1.2 Devis qualitatif exploratoire pour explorer l'expérience d'apprentissage basée sur la simulation

Les infirmières ayant complété la simulation et le questionnaire post-intervention, et qui ont accepté d'être recontactées, ont reçu un courriel d'invitation (annexe M) pour les encourager à participer à la composante qualitative. Dans ce courriel était jointe une copie électronique du formulaire d'information et de consentement (annexe N). Le consentement était obtenu « en ligne » via un hyperlien hébergé sur la plateforme LimeSurvey. Les infirmières étaient invitées à participer à un groupe de discussion en ligne pour explorer leur expérience d'apprentissage résultant de leur participation à la simulation numérique. Dans le même esprit qu'ont été dispensées la simulation numérique et l'évaluation quantitative, nous avons convoqué les participantes intéressées à échanger en ligne, via la plateforme de vidéoconférence Zoom (Zoom Video Communications Inc., 2016). Cette plateforme est avantageuse sur plusieurs points : elle est accessible de l'endroit souhaité par la personne et permet de rejoindre les infirmières géographiquement dispersées. Elle permet de rentabiliser le temps, notamment en réduisant le temps de déplacement. Elle est simple et conviviale à utiliser. Elle permet aussi l'enregistrement audiovisuel numérique, et ainsi, favorise la gestion et la sécurité des données (Archibald et al., 2019), en plus de faciliter l'immersion dans les données, avec la possibilité de revoir l'enregistrement vidéo. Le groupe de discussion a été privilégié comme méthode de collecte de

données pour les mêmes raisons évoquées plus tôt dans la section « Comprendre la pratique infirmière et ses défis. » Un guide d'entrevue a été développé de concert avec les membres de l'équipe d'encadrement de la thèse dans l'esprit d'une approche conversationnelle. Cette approche se voulait être un espace d'échange et de dialogue qui soit le plus naturel possible entre l'étudiante-chercheuse et les participantes, et entre les participantes elles-mêmes. L'étudiante-chercheuse a préalablement envoyé aux participantes les questions du guide d'entrevue pour qu'elles puissent se familiariser avec son contenu et se préparer à l'avance. Des exemples de ce guide sont précisés dans l'article 5.

L'analyse qualitative du groupe de discussion a suivi les mêmes procédures générales que celles énoncées précédemment (*cf*. Chapitre 5 « Analyse de données qualitatives ») et a aussi été inspirée de l'analyse thématique (Braun et Clarke, 2006; Paillé et Mucchielli, 2016b). Considérant que le corpus qualitatif était circonscrit à une seule transcription intégrale résultant du groupe de discussion, nous avons généré des codes et les avons regroupés en thèmes, et non en rubriques.

5.4 Considérations éthiques

L'ensemble du projet de thèse a été soumis et approuvé par un mécanisme d'évaluation multicentrique par le Comité d'éthique de la recherche (CÉR) du CHUM. Suite aux approbations émises par le CÉR du CHUM, le projet a été soumis et approuvé par le Comité d'éthique de la recherche de l'Université Laval (CÉRUL). L'étude qualitative se rapportant à la pratique des infirmières en VIH a reçu le premier certificat d'éthique en 2016 (CÉR du CHUM : MP-02-2017-6452/15.345 ; CÉRUL : 2016-198 phase I). L'étude mixte portant sur l'évaluation de la simulation a été approuvée en 2019 (CÉR du CHUM : MP-02-2019-8082/18.243 ; CÉRUL : 2016-198 phase II). Les renouvellements aux différents Comités d'éthique ont été faits et approuvés annuellement.

Nous avons conduit la recherche en respectant les normes éthiques telles que proposées par l'Énoncé de politique des trois conseils en matière d'éthique de la recherche avec des êtres humains (Conseil de recherches en sciences humaines et al., 2018). Tout d'abord, nous avons pris les mesures nécessaires pour obtenir le consentement libre et éclairé des infirmières participant à la recherche. Comme souligné précédemment, les participantes de l'étude qualitative et de l'étude mixte ont obtenu toutes les informations nécessaires aux projets avant de décider de prendre part à la recherche. L'étudiante-chercheuse était disponible pour répondre aux questions des infirmières avant qu'elles ne prennent une décision quant à leur participation. Le processus d'obtention de consentement « en

ligne » suivait les mêmes principes d'accès à l'information préalable à la prise d'une décision éclairée. Nous avons également pris les mesures qui s'imposaient pour assurer le respect de la vie privée et de la confidentialité. L'étudiante-chercheuse était la seule à avoir accès aux documents contenant l'identité des participantes. Un code a été attribué à chacune d'entre elles pour préserver l'anonymat. Des renseignements permettant d'identifier les participantes ont été modifiés, comme le lieu de travail. Considérant les particularités de la modalité « en ligne » de l'étude mixte, nous avons pris soin de relayer l'information aux participantes à propos de l'hébergement des données (*cf.* Annexe J. Formulaire d'information et de consentement) sur les serveurs de LimeSurvey (données du questionnaire sociodémographique et du questionnaire post-intervention) localisés au Canada et de *Google Compute Platform*, à Saint-Ghislain en Belgique (données pour la création du compte dans MedicActiv).

Durant les deux études réalisées, l'étudiante-chercheuse connaissait certaines des participantes qui étaient des collègues. Il y avait un risque potentiel de conflit d'intérêts au niveau des relations interpersonnelles entre l'étudiante-chercheuse et les participantes puisqu'une relation de collégialité s'était établie entre elles au fil des années. Pour minimiser ce risque potentiel, l'étudiante-chercheuse s'est assurée que les participantes ne ressentaient aucune pression pour participer au projet. Elle a bien expliqué son rôle d'étudiante-chercheuse dans la conduite du projet. Les participantes ont été informées de la possibilité de se retirer en tout temps de l'étude, sans préjudice ou inconvénient de quelque nature que ce soit. Les notions de réflexivité et de « biais » de l'étudiante-chercheuse seront abordées dans le Chapitre 9 dans lequel les critères de qualité sont évoqués.

6 Chapitre 6. Résultats – Volet 1

Les Chapitres 6, 7 et 8 comportent les résultats des trois articles qui répondent aux buts et aux objectifs du projet de thèse. Les résultats du premier but du projet de thèse, soit le développement de la simulation, sont présentés dans l'article 3 (objectif : comprendre la pratique infirmière et ses défis) et dans l'article 4 (objectif : décrire le processus de codéveloppement de la simulation). Dans l'article 3, la pratique infirmière déployée auprès des PVVIH sous TAR dans toute sa complexité est élaborée à partir d'une lentille qualitative. Par la suite, la méthode de développement de la simulation numérique, les éléments qui la composent de même que les leçons apprises font l'objet de l'article 4 (Chapitre 7). Une description détaillée rend compte des éléments clés de la simulation, laquelle est présentée dans une annexe de l'article. Finalement, l'étude mixte portant sur l'évaluation de l'acceptabilité de la simulation numérique (deuxième but du projet de thèse) est rapportée dans l'article 5 (Chapitre 8), après quoi succède la présentation de résultats additionnels liés à ce dernier article.

6.1 Article 3. Nursing practice to support people living with HIV with antiretroviral therapy adherence: A Qualitative study[11]

6.1.1 Résumé

La gestion du TAR est une compétence centrale de la pratique infirmière en VIH telle que documentée dans les lignes directrices. Les interventions menées par des infirmières sont efficaces pour améliorer l'adhésion au TAR. Cependant, ces interventions, basées sur les résultats probants, de même que sur les attentes professionnelles inscrites dans ces lignes directrices, ne reflètent pas ce que font couramment les infirmières et n'exposent pas les défis qu'elles rencontrent. Une étude qualitative a permis d'explorer la pratique des infirmières et les défis rencontrés lorsqu'elles accompagnent les PVVIH dans la prise de leur traitement. Nous avons conduit un groupe de discussion et des entrevues individuelles semi-structurées. A suivi la réalisation d'une analyse thématique. Les résultats illustrent les thématiques qui proviennent de l'expérience des infirmières en termes d'activités, de défis

[11] Rouleau, G., Richard, L., Côté, J., Gagnon, M.-P. & Pelletier, J. (2019). Nursing practice to support people living with HIV with antiretroviral therapy adherence: A qualitative study. *Journal of the Association of Nurses in AIDS Care*, 30(4), e20. https://doi.org/10.1097/JNC.0000000000000103

socioprofessionnels et sociopolitiques affectant l'accès aux services des PVVIH, et de ressources mobilisées en soutien à la pratique.

6.1.2 Abstract

Antiretroviral therapy (ART) management is a core competency for nursing practice in HIV as documented in best practice guidelines. Nurse-led interventions are an effective in fostering ART adherence in people living with HIV (PLWH). However, these evidence-based interventions and professional expectations pertaining to these guidelines do not reflect current practice, nor do they expose the challenges faced by nurses. We conducted a qualitative exploratory study with nurses to explore their professional practices in the context of ART adherence. Sixteen nurses participated in data collection: nine in a focus group and seven in individual interviews. We identified four themes: building a therapeutic relationship with PLWH as a foundation of HIV nursing care; nursing activities to support PLWH with ART adherence; challenges faced by nurses providing ART-related care; and resource mobilization supporting nursing practice development in ART management and HIV care. Aspects of HIV nursing practice need to be strengthened to enhance best practice care, such as managing powerlessness in a context of ART nonadherence.

Keywords: exploratory qualitative research, HIV, medication adherence, nurses, professional practice and role

6.1.3 Introduction

The world has committed to ending the HIV epidemic by 2030 (Joint United Nations Programme on HIV/AIDS, 2014, UNAIDS). To reach this objective, a target of 90-90-90 by 2020 is proposed: (a) 90% of all people living with HIV (PLWH) will know their HIV status; (b) 90% of all people with diagnosed HIV infection will receive sustained antiretroviral therapy (ART); and (c) 90% of all people receiving ART will attain viral suppression. ART adherence is essential to achieve viral suppression and for improving health outcomes for PLWH, including preventing and controlling HIV, avoiding resistance, and reducing HIV-related deaths (UNAIDS, 2016, 2017).

Despite medical advances in ART that have facilitated treatment management over the years (e.g., fewer pills to take, fewer side effects), ART adherence remains a complex health behavior. What matters is "not just the pills" (Barroso et al., 2017, p. 462). Pill taking has to be balanced with a broad

range of multi-level health and social needs that are critical to successful ART adherence, from basic biologic and physiologic needs, such as having shelter or access to food, through security, self-esteem, and cognitive needs, to self-actualization and interpersonal needs (Barroso et al., 2017).

Nurses play pivotal roles in HIV care (Dumitru et al., 2017; Tunnicliff et al., 2013). ART management (i.e., initiation, support, and follow-up) is one of the core competencies for nursing practice in HIV, as documented in international best practice guidelines (CANAC, 2013a; 2013b; Dumitru et al., 2017; Relf et al., 2011). Guidelines encompass recommendations that help to describe professional expectations, knowledge, and competencies that nurses should have in order to provide evidence-based care supporting both ART adherence and their own decision-making (see Table 1 for a Summary of Canadian Best Practice Guidelines). Moreover, there is increasing evidence of effective nursing interventions to enhance ART adherence in PLWH. For example, evidence from a systematic review (*n* = 10 primary studies) suggested that nurse-led interventions (such as tailored counseling, education, and reminders) could enhance medication adherence for people living with chronic conditions, including PLWH (Van Camp et al., 2013). However, the guidelines cited above do not necessarily reflect current practice; nor do they expose the challenges of translating the evidence-based care (e.g., Van Camp et al., 2013) into practice. Evidence is lacking on (a) current nursing practice (e.g., nursing roles and activities) to promote ART adherence for PLWH, (b) difficulties and challenges nurses encounter in a context of ART adherence, and (c) strategies nurses use to overcome the challenges they face in everyday practice.

We aimed to fill this gap and explore nursing practice to help PLWH adhere to ART, as well as the challenges faced by nurses. Our study represents an initial phase of a wider project to develop and evaluate an education intervention for nurses working with PLWH in Quebec, Canada. Findings from our study will inform development of an intervention to support nursing practice in HIV care.

Table 1. CANAC (2013a) Best Practice Guidelines - Summary of Recommendations

Practice Recommendations
1. Nurses incorporate specific skills and knowledge about HIV infection and AIDS into everyday practice.
1.a) Nurses incorporate knowledge of maternal and child health, elder care, addiction care, harm reduction, and the impact of stigma.
2. Nurses have knowledge of the impact of social determinants of health on PLWH.
2.a) Nurses consider the holistic needs of patients when delivering care.

3. Nurses practice reflectively to maintain continued awareness of current and evolving perceptions, attitudes and biases, values and beliefs when working with PLWH.
3.a) Nurses provide care in keeping with the principles of cultural safety.
4. Nurses inform patients of available treatment options for HIV infection on an ongoing basis.
4.a) Nurses provide education to patients on side effects, importance of adherence, and scheduling of medications.
4.b) Nurses ensure that patients are partnered with a primary care provider who can provide treatment.
5. Nurses have an understanding of the efficacy of ART in treating HIV infection.
5.a) Nurses have knowledge of side effects and drug-to-drug interactions associated with ART.
5.b) Nurses understand the importance of adherence in minimizing resistance and an awareness of strategies that can be used to support adherence.
6. Nurses have knowledge of the common opportunistic infections that are a result of a declining CD4+ T cell count.
6.a) Nurses are knowledgeable about treatment options for common opportunistic infections.
7. Nurses interpret the lab tests that are specific to an AIDS diagnosis, including CD4+ T cell count, CD4+ T cell fraction, and viral load.
8. Nurses interpret diagnostic tests for HIV antibody testing and provide informed care to persons who present for HIV testing.
9. Nurses are knowledgeable about the process of providing HIV testing.
9.a) Nurses understand factors that make persons vulnerable to HIV infection.
9.b) Nurses understand how to offer HIV testing to vulnerable clients.
9.c) Nurses understand the process of HIV testing either by point of care or ELISA.
10. Nurses understand the importance of pre- and post-test counseling for HIV testing.
10.a) Nurses can explain the difference between nominal, non-nominal, and anonymous testing.
10.b) Nurses support clients through the process of partner notification.
10.c) Nurses help clients get appropriate follow-up, including support groups and primary care.
11. Nurses identify clients who are at risk for HIV infection and provide prevention education.
11.a) Nurses incorporate the principles of harm reduction into care of vulnerable clients.
11.b) Nurses identify gender, ethnicity, lifestyle and socio-economic issues that put clients at risk for HIV infection.
12. Nurses have an understanding of how to prevent vertical transmission for pregnant women living with HIV.
12.a) Nurses have knowledge of the antiretroviral options used in pregnancy and during labor.
12.b) Nurses understand the issues that this often-marginalized population confront and how to support women living with HIV throughout pregnancy.
Education recommendations
13. Nurses understand that not all Aboriginal communities are ready to face issues related to HIV and build HIV awareness and readiness in Aboriginal communities.
13.a) Nurses provide quality end-of-life care to PLWH dealing with end-stage cancer or irreversible AIDS-defining illnesses.
14. Schools of nursing will integrate principles of HIV care into undergraduate curriculum.
14.a) Undergraduate curriculum will support evidence-based training and practice for HIV.
15. Nurses will incorporate knowledge of HIV into everyday practice and continuing education.

16. Nurses working in the field of HIV have access to formal training and education to achieve competencies in practice and standards of practice in HIV.
Organization and Policy Recommendations
17. Nurses advocate with policy makers for improved access to HIV care and treatment, including ART, as part of holistic, primary health care for all populations.
18. Health care organizations have policies that reflect uniform approaches to management of PLWH in all facilities, including seamless coordination of transfer and discharge between facilities for PLWH.
19. Health care organizations provide mechanisms of support for nurses through orientation programs and ongoing professional development opportunities regarding care and treatment options for HIV.
20. Nursing best practice guidelines can only be successfully implemented with adequate planning, resources, organization and administrative support, as well as appropriate facilitation. Organizations may wish to develop a plan for implementation that includes: • Assessment of organizational readiness and barriers to implementation. • Involvement of all members (whether in direct or indirect support functions) who will contribute to the implementation process. • Dedication of a qualified individual to support needed education and implementation processes. • Opportunities for reflection on personal and organizational experiences in implementing guidelines.
Note. ART = Antiretroviral Therapy; CANAC = Canadian Association of Nurses in AIDS Care; ELISA = Enzyme Linked ImmunoSorbent Assay; PLWH = Person(s) Living with HIV

6.1.4 Methods

The report of our qualitative study was informed by the Consolidated Criteria for Reporting Qualitative Studies (Tong et al., 2007), as shown in Table 2.

Table 2. Consolidated Criteria for Reporting Qualitative Studies (COREQ): 32-Item Checklist

No.	Item	Description
Domain 1: Research team and reflexivity		
Personal characteristics		
1.	Interviewer/ facilitator	The Student-Research, G.R.
2.	Credentials	G.R. – Student-Researcher – MSc, PhD Candidate (Nursing)
		L.R. – BSc (Hons), PhD (Nursing)
		J.C. – PhD (Nursing)
		M.-P.G – PhD (Community Health)
		J.P.- MSc (Nursing), PhD Student (Nursing)
3.	Occupation	G.R.–PhD candidate (Université Laval); Research coordinator (Research Centre in Montreal, Canada).
		L.R.– Research Fellow (University of Otago); Associate Professor (Université de Montréal in Canada); Hon. Research Fellow (University of Melbourne)
		J.C. – Full Professor (Université de Montréal in Canada); Researcher and Chair's Holder (Research Centre in Montreal, Canada)

		M.-P.G – Full Professor (Université Laval), Researcher and Chair Holder (Research Centre in Quebec City, Canada)
		J.P. – Professor (Université du Québec à Rimouski in Canada), PhD student (Université Laval)
4.	Gender	Four female-identifying and one male-identifying (interviewer, female-identifying).
5.	Experience and training	G.R. – has experience in qualitative research (animating a focus group with PLWH; conducting semistructured interviews with WLWH; and analyzing qualitative data in different projects).
		L.R. – is an early career researcher with expertise in qualitative research, including refugee health services research and access to primary health care for vulnerable populations
		J.C. – has specific expertise in developing and evaluating web-based interventions for PLWH in the context of ART adherence and nursing interventions.
		M.-P.G – has specific expertise in implementation science, mixed methods, knowledge-transfer, evidence-based decision-making, and evaluation of ICTs
		J.P. – has clinical experience with PLWH and experience in behavioral change interventions.
Relationship with participants		
6.	Relationship established	G.R. conducted focus group and interviews and had relationships with a majority of participants prior to this study; she was directly involved in participant recruitment and data collection. J.C. and J.P. had various relationships with participants.
7.	Participant knowledge of interviewer	G.R. introduced herself to participants as a PhD nursing student at Université Laval and as a research coordinator, with many years of experience in developing and evaluating interventions to support ART adherence.
8.	Interviewer characteristics	Member of HIV mentoring program interested in interventions targeting ART adherence among PLWH and nursing practice in that context.
Domain 2: Study design		
Theoretical framework		
9.	Methodological orientation and theory	Qualitative exploratory design; taking into account nurses' descriptions of current practices to support PLWH in ART adherence, as well as challenges encountered; inductive thematic analysis.
Participant selection		
10.	Sampling	Focus group: Nurses enrolled as part of participation in a meeting held by HIV mentoring program. Nurses approached based on convenience sampling strategy (i.e., focus group was planned in advance as an "activity" that was part of 1-day meeting).
		For interviews: A combined maximum variation strategy and purposive sampling approach used to select nurses for interviews. A heterogeneous sample was assembled with variation in terms of nursing practice settings (e.g., clinic, academic/research, management); work locations (e.g., various levels of deprivation of HIV clientele); and nurse profiles (e.g., gender, professional

		qualifications, current or past experience in HIV). Purposive criteria included nurses who were French-speaking and interested in reflecting on their practice with PLWH.
11.	Method of approach	Potential participants were contacted by email and telephone.
12.	Sample size	16 participants
13.	Non-participation	A number of nurses did not respond to invitation to participate in the research, and some declined invitation given the nature of their practice (e.g., not working with PLWH) or on the basis of availability (lack of time, retired). No participants withdrew from the study.
Setting		
14.	Setting of data collection	Conference room (10 participants); G.R.'s office (1 participant); telephone (2 participants); and workplace (3 participants). Participants indicated preferred location for an interview, according to their convenience.
15.	Presence of non-participants	No.
16.	Description of sample	16 nurses participated in the study; most worked in specialized outpatient HIV care clinics located in university-affiliated hospitals and private medical centers. Two worked in a university setting and one worked in a public health organization. Most were female (13). Participants were experienced with PLWH care, with the majority having more than 12 years clinical practice experience. Different nurses' roles were represented: clinician (*n* = 6), research assistant (*n* = 2), professor and researcher (*n* = 2), public health intervener (*n* = 1), and manager (*n* = 1).
Data collection		
17.	Interview guide	Focus group and interview topic guide covered the same questions/topics. We particularly invited nurses to reflect on concrete examples from their practices so as to provide rich illustrations of the scope of practice and different ways in which they fostered ART adherence for HIV patients.
18.	Repeat interviews	No repeat interviews undertaken.
19.	Audio/visual recording	Audio recording.
20.	Field notes	No field notes taken during or after interviews or the focus group. A reflexive diary of the analysis was maintained by G.R., providing an audit trail of the analysis process and its emerging categories, and also promoting reflexive research practice.
21.	Duration	Focus group lasted 1 hour and interviews were an average duration of 45 minutes (range: 37 - 53 min).
22.	Data saturation	Data saturation obtained at two different points: during data collection and during data analysis. At the moment of data collection, G.R. ended interviews because no new data were emerging. G.R. and L.R. worked together throughout the data analysis process to identify any new emerging themes related to our scope of enquiry, which was discussed with the wider team at regular intervals.

23.	Transcripts returned	No participant received focus group or interview transcripts. The only opportunity to provide feedback was at a regional conference bringing together nurses interested in HIV nursing care.
Domain 3: Analysis and findings		
Data analysis		
24.	Number of data coders	Coding was led by G.R. and involved comparison across transcripts. Descriptive codes were organized into higher order thematic categories.
25.	Description of the coding tree	A list of codes was developed iteratively, and each code was defined.
26.	Derivation of themes	G.R. and L.R. independently assessed the descriptive value of the categories against the transcripts. Other team members (J.C., M.-P.G, J.P.) were involved in discussions of preliminary thematic findings and throughout the data interpretation process.
27.	Software	NVivo Pro version 11
28.	Participant checking	Not done
Reporting		
29.	Quotations presented	Illustrative quotes support presentation of findings while participant anonymity is respected. A clear demarcation established between exemplars belonging to participants from the focus group and those from interviews.
30.	Data and findings consistent	The findings were strongly supported by the data.
31.	Clarity of major themes	Major themes were clearly identified.
32.	Clarity of minor themes	Minor themes clearly identified and related to major themes.
Note: ART = Antiretroviral Therapy; ICTs = Information and Communication Technologies; PLWH = Person(s) Living with HIV; WLWH = Women Living with HIV.		

Design

We used a qualitative exploratory design (Deslauriers et Kérisit, 1997) to investigate aspects of nursing practice related to ART adherence, including experiences of providing care to PLWH and supporting them with ART adherence, as well as barriers and facilitators to practice development in the field.

Sample

We used a combination of sampling approaches to select nurses to take part in a focus group and semi-structured individual interviews. For the focus group, we used a convenience sampling strategy to recruit nurses at one of the quarterly meetings of the HIV mentoring program, which brings together expert nurses from health care organizations across Canada. These day-long meetings provide HIV

specialist nurses with education and mentoring and allows them to critically reflect on the challenges and opportunities of practice with PLWH. For the semi-structured individual interviews, we used a combined maximum variation strategy and purposive sampling approach to select participants (Patton, 2015a). A maximum variation strategy ensured breadth (heterogeneous sample) in terms of nursing practice settings (e.g., clinic, academic/research, management), work locations (e.g., variable level of deprivation of PLWH clientele), and nurse profiles (e.g., gender, professional qualifications, current or past experience in HIV). All nurses (target for the focus group and the interviews) were French-speaking. We invited nurses to participate in interviews via e-mail. We sent the invitation letter through the HIV mentoring program contact list. We systematically excluded nurses who had participated in the focus group for the semi-structured individual interviews.

Data Collection

The first author conducted a 1-hour focus group (in a meeting room) with nine nurses involved in the HIV mentoring program. The development of the interview topic guide was inspired by a research project on the experiences of PLWH who participated in a self-management web-based intervention to support ART adherence (Côté, Rouleau, et al., 2015). Topics for discussion were formulated to answer the research objectives, including challenges faced by nurses in practice with PLWH related to ART adherence, as well as strategies to overcome challenges, promote ART adherence, and empower patients to self-manage their treatment. The focus group allowed interactions between participants and fostered sharing ideas and perspectives on the topic of ART adherence (Patton, 2015a).

The semi-structured interviews lasted 45 minutes on average (range: 37-53 minutes). For practical reasons, we conducted interviews in different settings: three in the first author's office (two by telephone and one face-to-face), one in a meeting room, and three in nurses' workplaces. The focus group and interviews covered the same topics (see Topic Guide, Table 3). During the focus group and the interviews, we particularly invited nurses to reflect on concrete examples from their practices so as to provide rich illustrations of the scope of practice and the different ways in which they fostered ART adherence for PLWH. We digitally audio recorded the focus group and all interviews with participant consent and fully transcribed the recordings.

Table 3. Examples of Questions Included in the Focus Group and Interview Topic Guide

How would you describe your approach to a patient who is starting ART? Who is involved in planning and managing treatment? What are common difficulties faced by PLWH regarding ART and adherence?
How is your nursing follow-up carried out in terms of providing support for PLWH in taking ART?
If we had to develop training on nursing assistance for PLWH in terms of providing support in their ongoing treatment, what would be some essential elements to include?
What has proven helpful in your practice for encouraging your patients to take their medication?
Are there any situations in which you have had difficulty supporting your patients in taking their medication? If so, could you please tell us more about these situations?
At the very beginning of your practice with HIV clients, what helped you or could have helped you feel confident in your ability to support clients in taking their medication?
Note. ART = Antiretroviral therapy; PLWH = Person(s) Living with HIV.

Each participant completed a short sociodemographic questionnaire about the following information: age group, gender, work settings, city, highest education level completed, work status (full time, part time), and years of experience.

Ethics Approval

The project received ethics approval from the institutional review board of the University of Montreal Hospital Center [#CE 15.345]. Participation in the study was voluntary and written consent was obtained prior to conducting the focus group and interviews.

Data Analysis

Qualitative data analysis followed an inductive, iterative process informed by Tesch (1990) and Paillé & Mucchielli (2016a). We thematically analyzed narratives from the focus group and semi-structured interviews (Paillé et Mucchielli, 2016a). Coding was led by the first author and involved comparison across transcripts. Descriptive codes were organized into higher order thematic categories. Two authors (G.R. and L.R.) independently assessed the descriptive value of the categories against the transcripts. The other team members (J.C., M.-P.G., J.P.) were involved in discussions of preliminary thematic findings and throughout the process of interpreting the data. A reflexive diary of the analysis was maintained by the first author, providing an audit trail of the analysis process and its emerging categories, and also promoting reflexive research practice. NVivo Software Pro 11 was used to facilitate data management and organization. Quality criteria (i.e., credibility, dependability, transferability, confirmability) for qualitative research were used to ensure rigor across all stages of the research

(Lincoln et Guba, 1985; Sandelowski, 1986). Debriefing sessions were held with the research team to discuss emerging trends from data analysis and support interpretation of the findings. Preliminary results were also disseminated and discussed with a sample of HIV nurse specialists for validation through a regional conference.

6.1.5 Results

Participant Characteristics

Sixteen nurses participated in the study. Most participants worked in specialized outpatient HIV care clinics located in university-affiliated hospitals and private medical centers. Two participants worked in a university setting and one worked in a public health organization. Participant sociodemographic characteristics are presented in Table 4.

Table 4. Participant Sociodemographic Characteristics

Characteristics		**Nurses (*n* = 16)**
Gender, *n* (%)		
	Female	13 (81)
	Male	3 (19)
Age Group, *n* (%)		
	55 to 65	2 (12)
	45 to 54	6 (38)
	35 to 44	5 (31)
	25 to 34	3 (19)
Education levels, *n* (%)		
	Community college	2 (12.5)
	Bachelor's	9 (56)
	Master's	3 (19)
	Ph.D	2 (12.5)
Nursing practice domain, *n*		
	Clinical practice	11
	Clinical research	2[a]
	Research-teaching (Academic/University)	2
	Public health	1
	Management	1
Nurses' role, *n*		
	Clinician	11
	Research assistant	2[a]
	Professor and researcher	2

	Public health intervener	1 (6)
	Manager	1 (6)
Years of experience as HIV nurse (*mean*)		0.7 to 25 (12)
Years of experiences as practicing nurse *(mean)*		4 to 35 (21)
Note: [a] One participant worked as a clinician and research assistant and therefore appears in both domains (i.e., clinical practice and clinical research).		

Participants referred to their practices holistically in terms of HIV nursing care, with adherence being one of many facets of their roles with PLWH. Results from qualitative data analysis led to the identification of four core themes: (a) building a therapeutic relationship with PLWH in a context of vulnerability as a foundation of HIV nursing care, (b) nursing activities to support PLWH with ART adherence, (c) challenges faced by nurses providing ART-related care to PLWH, and (d) mobilization of resources to support nursing practice development in ART management and HIV care.

Building a Therapeutic Relationship with PLWH in a Context of Vulnerability as a Foundation of HIV Nursing Care

The creation of a therapeutic relationship with PLWH represented a foundation for nursing interventions, as illustrated in this exemplar: "*Of course, something happens in terms of the [therapeutic] relationship with patients. It's the foundation of everything else*" (Interview, Female Nurse # 4). Participants emphasized relational components essential for building trust with patients. These included, in particular, the establishment of a solid foundation for open and honest communication that encompassed active, respectful, and non-judgmental listening; being open to patient experiences; and the importance of being centered on PLWH needs. The importance of promoting acceptance, as well as a helpful and non-punitive approach toward PLWH, were reflected in these two exemplars: "I think that it's important for patients not to feel rejected, but accepted, illness and all" (Interview, Female Nurse #2).

> You're allowed to say it [if the patient forgets the medication] … "I'm not here to punish you, I'm here to help. If something doesn't work, you don't take the meds, tell me; we'll look at it together. I'm here [as a nurse] to help you." I think this is really important because, if not, people feel a bit stuck. (Focus Group, Female Nurse #3)

As described by this participant, a lack of listening to and/or involvement with patients can weaken the therapeutic relationship and may even exacerbate feelings of exclusion, which can ultimately threaten

a clientele whose trajectories are already often marked by experiences of social isolation and stigmatization.

> But [this] is more often where it plays out, it's in the relationship, the support … listening … [patients] deal more with the frustration of not being heard than with their own side effects. All of this is interconnected, but when they come to talk about how they feel and what you tell them makes them feel worse [due to a lack of listening]. (Interview, Female Nurse #3)

The creation of a therapeutic relationship relied on the nurse's ability to focus on the patient and take into account his/her unique trajectory to avoid the reproduction of relational processes that may further vulnerability and exclusion. The exemplar below illustrates a personal approach that takes into account this singularity in establishing interpersonal relations with reference to patient cultural specificities.

> It's different from one patient to the next. A positive narrative with one patient will not necessarily have a positive effect with another patient … You can't talk to a patient from Africa in the same way that you would talk to a drug addict to get him or her to take the required medication. It's completely different. You really need to have that capacity for clinical judgment, to adapt what you say to the person in front of you. (Interview, Male Nurse #2)

As mentioned by participants, PLWH were often exposed to experiences of social exclusion and stigma related to HIV that could impact the way that nurses provided care and built relationships with this clientele. A context of vulnerability reinforces the need to adopt a humanistic nursing practice in which relationships are based on acceptance of PLWH so as to foster trust, which is fundamental to the process of supporting PLWH in their entire care journey, including ART adherence.

Nursing Activities to Support PLWH with ART Adherence

This theme encompassed nursing activities to support PLWH with respect to ART adherence: (a) assessing an array of dimensions related to PLWH health; (b) teaching and sharing knowledge about HIV, ART, and skills to promote treatment adherence; and (c) coordinating care and connecting PLWH with social and health-related resources. Nurses evaluated an array of dimensions of PLWH health, which allowed nurses to identify needs that could be addressed in collaboration with health and social resources. Education interventions were led by nurses: they provided information, suggested practical tips, and offered advice to manage ART and side effects.

Assessing an array of dimensions related to PLWH health.

Throughout their experiences, nurses reported assessing an array of dimensions related to PLWH health: biomedical (e.g., ART intake and adherence, side effects, symptoms); psychosocial (e.g., social support, socioeconomic status); and PLWH symbolic representations of HIV and ART.

Assessment of ART-related side effects in PLWHs was frequently mentioned by nurses. "*Every time we meet with patients, we evaluate the side effects*" (Interview, Female Nurse # 1). Nurses also evaluated ART intake (e.g., taking with or without food, posology, missed doses, schedule) and the impact of medication on patient daily routines. When nurses faced PLWH who did not adhere to their ART, they evaluated the reasons that might explain non-adherence, such as mental health (e.g., depressive symptoms, psychological distress), substance use, level of motivation, side effects, living conditions, and so on.

Participants explored symbolic representations relating to HIV and ART (e.g., beliefs, norms, attitudes, knowledge) with patients. Sometimes, PLWH had misconceptions and negative thoughts about HIV and ART based on the epidemic portrait of the early 1980s. Exploring these representations allowed nurses to "*deconstruct the negative image that people have of treatments*" (Focus Group, Female Nurse #6), and provide the most up-to-date information.

> For 50-year-old men, their perception of HIV is stuck in the 1980s, it's the same story. When we talk to them about medication, they think of lipodystrophy, diarrhea. So: "What do you know about living with HIV? Do you know people who have HIV? What are their lives like?" And from there, they can be brought up to date. (Focus Group, Male Nurse #1)

Nurses also assessed available resources in terms of social support: "*We need to be able to properly establish the psychosocial network so as to firmly anchor our approach*" (Interview, Male Nurse #2). Finally, another major focus of nursing activity was on assessing social determinants of health that had an impact on the patient's ability to self-manage treatment and cope with the range of challenges related to living with HIV. These determinants included, among others, patient socioeconomic status, availability of insurance coverage, housing conditions, and access to food. Addressing the range of social needs of PLWH was a fundamental aspect of HIV nursing care.

> If you don't take care of the social aspect, you can't deal with your HIV-positive person because you're out of luck if you haven't figured out what the problem is … The whole

> range of social problems: financial problems, family problems, finances; you're faced with housing, nutrition, lifestyle, minimal stability issues, and more. (Interview, Female Nurse #5)

From nurses' experiences, supporting PLWH in ART adherence went beyond an assessment of medication intake; it also encompassed the psychosocial dimensions of PLWH health. The assessment was an entry point from which it was possible for nurses to identify PLWH's biopsychosocial needs in order to subsequently address them. Assessment appears to be transversal with respect to the other nursing activities that follow.

Teaching and sharing knowledge about HIV, ART, and skills to promote treatment adherence.

One of the essential roles reported by nurses working with PLWH involved knowledge sharing and teaching to keep PLWH informed about HIV and ART, to support the development of skills and agency, and to encourage them to pursue treatment. Nurses educated patients on these basic notions of HIV, including topics such as: pathophysiology, prevention of transmission, ART action mechanisms, drug resistance, interactions with other medications and illicit substances, and possible side effects. Such information was imparted especially when providing a new diagnosis and during treatment initiation. Pharmacologic and non-pharmacologic advice (e.g., sleep, food) were offered to help with the management of side effects.

Teaching was also about building patient skills and capacities to foster treatment management and adherence. Participants described providing technical advice to facilitate ART integration into the daily routines of adult patients.

> Find a single daily action on the part of the patient where time is not of the essence. And now we're going to incorporate pill taking. For example, put the tablet next to the coffee machine, so that every morning, while sipping coffee, the person can take their pill. (Focus Group, Female Nurse #6)

When taking care of young children living with HIV, nurses had to find creative ways and tricks to help promote ART adherence:

> What will have a big impact on adherence is to make sure that they can swallow the tablets, depending on the size of the pills. We test with other drugs, such as vitamin C, that are close in size to their pill. They'll try to take them for 2-4 weeks. So, if they're able to swallow their vitamin C, it gives them an idea of what's in store for other drugs

> (antiretrovirals). The test "pills" can also be mini M&Ms, which are smaller still. (Focus Group, Female Nurse #4)

Nurses relied on general principles to guide their teaching: assessing a patient's prior level of knowledge, making knowledge accessible, and validating understanding. While taking these steps, they also assessed literacy levels and patient interest in education material such as visual support display.

> Pamphlets… mmm… our patients are often, though not always, barely literate. Documents and pamphlets end up in the garbage. For some patients, yes, I'll leave them documentation. I'll tell them to read all this. But it's more in the form of one-on-one teaching. This is what I did with patients who were beginning medication, I made a chart for them, drawing the pill, to explain to them that such a pill in their Dispill is that one. That one must be taken with food. (Interview, Female Nurse #1; *Note:* Dispill™ is a patented, cold-sealed, multi-dose medication packaging system; CareRx Integrated Pharmacy, 2015).

Teaching and sharing knowledge represented a major nursing activity in which the prior knowledge and literacy of PLWH were taken into consideration. Nurses mentioned offering their expertise by providing information and practical advice, with the intention of supporting and facilitating ART adherence among patients.

Coordinating care and connecting PLWH with social and health-related resources.

Considering the array of dimensions related to the health of PLWH, nurses needed to work in collaboration with providers from the health, social, and community sectors. In this exemplar, the nurse asked a community intervener with expertise in caring for PLWH from the Caribbean to help him learn how to adopt a culturally sensitive approach: "I brought in a community intervener who works with that clientele. It helped me a lot" (Interview, Male Nurse #2). Nurses described playing pivotal roles in coordinating care and services for PLWH through networking activities with social and health-related resources and enabling access to a range of services (e.g., community organizations, pharmacies, Quebec public health insurance) to meet the needs of patients and facilitate ART management.

> Regarding access to medicine, access to care. Well, everything pertaining to coordinating all the things they need…. A patient who's broke can't afford drugs. He's homeless. [We do] everything we [can] to try to help facilitate the care processes and their journey. (Interview, Female Nurse #5)

Connecting PLWH with resources also meant, for this nurse, to support patients by going with them to resources to help establish first contact and promote access to services.

> She came in the winter, wearing summer shoes; she was pitiful. I told her, “Get in the car.” At least the doctor saw her. “I'm going to take you home. We'll go via the pharmacy.” You know, I went with her. (Interview, Female Nurse #5)

These coordination and networking activities were essential to help PLWH connect with services that met their needs.

Challenges Faced by Nurses Providing ART-Related Care to PLWH

In the domain of ART adherence for PLWH, challenges experienced by nurses have to be understood in a broader context, as illustrated by these sub-themes: (a) perceived nursing roles at the interface of social and biomedical boundaries; (b) misalignment between nurses’ expectations and roles in promoting ART adherence with PLWH’s medication intake; and (c) sociopolitical determinants affecting access to health care resources and services. These themes highlight the fact that nurses experienced complex and multidimensional challenges affecting their practices and PLWH themselves.

Perceived nursing roles at the interface of social and biomedical boundaries.

This sub-theme covered the scope and nature of nurses’ perceived roles in providing care to PLWH and promoting ART adherence. Nurses (mainly those with postgraduate studies, i.e., interviews of females # 3 and #4) adopted critical stances with respect to roles that fell within their scope of practice and that they could perform, deepen, and actively pursue, such as patient advocacy and more in-depth assessments.

> The fact of empowering the person so that he or she will hammer home to the physician, “No, it’s an undesirable effect, it's intolerable for me, and I want to change medications.” It should be the nurse who further encourages clients to adopt such a position. (Interview, Female Nurse #4)

> You won’t make the diagnosis, but you’ll do a more in-depth assessment … When someone tells us about a difficulty related to side effects or treatment, well, to be able to offer solutions is key. (Interview, Female Nurse #3)

The nature of nursing activities carried out in the HIV care context, including ART adherence, was seen in terms of its biomedical character. This participant said that defining the nursing role in regard to

medical practice overshadowed professional autonomy and thus impacted the deployment of a full scope of nursing practices.

> When working in HIV clinics, it's very biomedical…. And often the nurse will fulfill functions such as … a little bit of education … testing…. administering medication, following-up on lab results, but it's still very defined with respect to the medical practice. You always have a supporting role with respect to the medical practice versus the nurse being trained to be fully autonomous. (Interview, Female Nurse #3)

For this same nurse, autonomy was perceived as the nurse's capacity to carry out activities conferred to her/him and to take charge of caring for a patient, such as undertaking complex health assessments, without referring to other professionals. "*Ok, I evaluated you [the patient], but I think that there's around a 50% chance that I, as a nurse, in my scope of practice, I'm able to take charge. And no, I don't have to refer the patient"* (Interview, Female Nurse #3).

For many participants (e.g., Interviews with Male nurse #1, Female Nurses # 2, # 3, and #5), it was also a question of a nurse's capacity to act outside of the biomedical boundaries to engage in the social nature of nursing practice. For this participant, the social dimension of nursing care was fundamental. "*It's all these resources [intended to foster ART financial access], finally by default, with time, you get to know more…. Social knowledge, the social aspect, is our premise in absolutely everything*" (Interview, Female Nurse #5).

This social role was also apparent in the second theme, with the assessment of social determinants of health and conditions of access to ART, and with nurses' roles related to connecting PLWH to social resources.

Misalignment between nurses' expectations and roles in promoting ART adherence with PLWH medication intake.

A number of nurses perceived patient motivation as one of the key elements of ART adherence. As such, some nurses would attempt to identify, at times with difficulty, the patient's sources of motivation, in order to guide teaching and encourage adherence behaviors.

> I find that it goes with the motivation of [the] patient. I think that the most difficult part is to know what will motivate the patient to take his or her medication. It's all very well to [tell] them, "You've got to take your meds!" The challenge is how to pass on this knowledge while making them more aware of what's at stake. (Focus Group, Female Nurse #7)

Others believed, instead, that the disproportionately positive and optimistic perspective of professionals regarding medication could be harmful to relationships with patients, even if the primary intention was to help them pursue treatment. The risk of putting the emphasis on medication is to lose sight of a holistic, person-centered approach. It is as if adherence became an ideal normative goal and something that the nurse projected on the patient. *"We often tend to make that projection, assuming that the person is observant and that things will go the way we would like them to*" (Focus Group, Male Nurse #1).

Challenges arose when there was a misalignment between nurses' expectations regarding adherence, their roles in supporting it, and patient behaviors. Situations in which PLWH were not taking ART as prescribed or were even missing medical follow-up visits proved difficult for nurses with higher expectations. Consequently, nurses expressed incomprehension, discomfort, disappointment, powerlessness, and a sense of failure.

> I've worked with young people and I find the same type of block that I can't explain. Resistance to taking medication. And they don't come to the appointments. I really don't get it. We try to get them to talk it out. We would like to get them to see a psychologist, but they don't come to their appointments.… We're very, very powerless … It's my conundrum as a nurse because I want to help but it's as if I just can't. (Interview, Female Nurse #1)

Some nurses took on part of the blame for non-optimal adherence to ART and experienced self-doubt, which sometimes gave rise to feelings of guilt. "*I ask myself what messages I've failed to get across to the patient. What could I have told you more to motivate you*?" (Focus Group, Female Nurse, #2)

Motivational interviewing was an approach used and perceived as being beneficial when confronting situations in which the nurse and patient were not on the same page regarding adherence. Adopting this approach was, among other things, a way to respect the patient's rhythm, without imposing a direction that was not his or her own.

> Motivational interviewing is … so easy to understand, so fruitful for clinicians to use, because you no longer fight with the patient … You no longer need to force the issue. It's the patient who does the heavy lifting, and if he or she doesn't do it, well, that means the person just isn't ready yet. There's no point in fighting. (Focus Group, Male Nurse #1)

Sociopolitical determinants affecting access to health care resources and services.

In the practice of providing HIV care, nurses said they were confronted with complex policies and regulations as well as challenging conditions that could hinder or facilitate PLWH access to health care resources and services. Nurses must know these conditions and be aware of their impact on PLWH. Nurses had to find solutions to help PLWH access the resources that they needed to foster ART adherence and to promote health and well-being more broadly. In addition, nurses took into account the social conditions that could influence a patient's ART adherence pathway. For example, nurses organized health care delivery within a geographic area accessible to patients, while considering, in this case, the precarious social trajectories of homelessness.

> Often homeless people have their own habits. They'll make use of a certain resource, sleep in a particular shelter. They'll have a circuit. So, finding a pharmacy that's strategically located based on their circuit will encourage adherence because it's on their beaten path! (Interview, Female Nurse #1)

Participants provided some examples of policies and regulations that impacted access to and affordability of treatment for PLWH: provincial (Quebec) and national (Canada) immigration and refugee protection acts, public health insurance (RAMQ), private health insurance, and social assistance and solidarity programs. Nurses were confronted with the particularities and complexities of the regulatory processes that affected their practices with PLWH, especially because the applicability of the processes varied according to different patient profiles. Nurses reported not feeling sufficiently trained or prepared to deal with the questions of financial access to ART across different groups of PLWH having various precarious circumstances, as well as with complex regulations surrounding ART.

> I wonder, I'm not sure. Those who are on welfare, if they are reimbursed. I don't know the answer to that question ... because I have a lot of immigrants and they're all medicated but they don't have the money. Surely there is help. They have social workers with them; surely, they have government help ... This is my big question mark, and I don't know where to go for the information. (Interview, Female Nurse #2)

> Where I've always wanted to go for more information is a tough nut to crack since it's really among people who aren't covered by RAMQ. On this side, it's so complicated, so difficult to be able to refocus then to know, ok, towards where … you know, what are the organizations that I can refer them to? What's the difference between the different immigration statuses, who is entitled to what kind of treatment, and in what types of institutions? (Interview, Male Nurse #1)

Nurses who cared for people living in precarious situations (e.g., refugees, immigrants, homeless, on welfare or social security) would benefit from having more support and resources, both for themselves and for their patients.

Nurses reported having to anticipate challenges lying ahead and use creative strategies to circumvent policies, laws, and programs, in order to foster access to treatment in this sometimes-restrictive sociopolitical context. “You get to a point where you’re able to get a bit of a handle on the obstacles that patients are going to encounter” (Interview, Female Nurse #5).

> So, I’m with an immigrant patient who is not yet covered by RAMQ, and the person has to pay for all these laboratory costs in addition to medication. Well, I’m inclined to redirect them to research in this case to give them an opportunity that might be better for them. (Interview, Male Nurse #1)

Mobilization of Resources to Support Nursing Practice Development in ART Management and HIV Care

Nurses mobilized resources - knowledge, networks, and strategies - to enhance the development of their practices with PLWH, as illustrated in these sub-themes: (a) relying on different sources of knowledge, (b) networking with people and resources, and (c) reflexive nursing practice. All of these resources provided opportunities to support professional development. In addition, nurses drew on these resources to strengthen alliances with and between patients and other service providers, and to further build capacity to overcome challenges of managing complex health and social situations pertaining to HIV nursing care.

Relying on different sources of knowledge.

Nurses reported relying on different sources of knowledge to support their practices with PLWH, including biomedical/pharmacological, experiential, social, empirical, and theoretical knowledge. They also provided examples of different ways of learning.

Being knowledgeable about the biomedical and pharmacological aspects of HIV and ART allowed nurses to teach PLWH. Attending conferences in the field and consulting colleagues were means of developing and deepening biomedical and pharmacologic knowledge (Interviews with Female Nurses #1 and #5, Male Nurse #1). Nurses also drew on knowledge derived from PLWH experiences of ART:

"*People who take medication are often best positioned to identify the things that really work*" (Interview, Female Nurse #3).

Furthermore, considering the social dimension of nursing practice with PLWH, social knowledge was key for most nurses, including knowledge of the sociopolitical determinants of health, community resources, and conditions of access to treatment. A few nurses considered using or used empirical knowledge derived from scientific papers as a source of knowledge on which to base nursing practice (Interviews with Female Nurses #3, #4, and #5). Nurses also mentioned theoretical knowledge as a means of linking theory and clinical practice (Interview, Male Nurse #2); of understanding ART adherence behavior (Interview, Female Nurse #4); of developing cultural competencies (Interview, Male Nurse #2); and of considering a wide perspective of the person (i.e., PLWH and their families), when providing care (Focus Group, Female Nurse #8).

All of these sources of knowledge were essential supports for nursing practice in the context of HIV care. Many nurses also consulted colleagues (e.g., nurses, physicians, pharmacists, social workers) as a means of learning and to build working relationships that could facilitate continuity of care for PLWH.

Networking with people and resources.

As mentioned, connecting patients with social and health-related resources was an important part of nursing practice with PLWH. Participants underlined the importance of seeking help and engaging with a range of resources to address the complex situations of care with which they were involved.

> But the whole medico-legal and criminological aspects are a little neglected. What are the human rights of people with HIV? What about their rights with regards to work? What rights do citizens have that people with immigration status don't? … You really have to seek out community stakeholders and… community groups to find answers to those questions. (Interview, Male Nurse #1)

One particular aspect that the nurses found important was establishing high-value alliances with resources and, above all, selecting and targeting those that were welcoming and accommodating to PLWH.

> Some pharmacies are more accommodating than others. You end up knowing the network. You know which pharmacies are more "injecting-drug-user-friendly," and "homeless-friendly" because not all of them are. Some of them are extremely

> accommodating with our clientele … It's easy to build this alliance with pharmacies. You can establish a really good relationship. (Interview, Female Nurse #1)

Being part of an HIV nursing network allowed nurses to engage with colleagues and share experiences, as well as to break down feelings of loneliness and exclusion.

> I find it wonderful to be with the committee of experts [nurses] because, wow, you get to swap tips, you share. This is the key to success. You feel less alone, especially nurses outside of metropolitan areas. Because you do feel alone sometimes. (Interview, Female Nurse #5)

Reflective nursing practice.

Nurses used reflective practice to help create therapeutic relationships with PLWH. Introspective processes, such as self-consciousness and self-reflection, help nurses identify potential gaps and strengths in their activities and roles in order to reinforce professional development and, ultimately, interventions for PLWH. Reflective practice enabled nurses to acknowledge and examine their own discomforts and gauge the impact of those discomforts on relationships with patients.

> Your whole value structure is often challenged when it comes to HIV. Essentially, you have to be able to recognize what you're comfortable with and what you aren't, to then be able to focus [on how to intervene] … It's okay to be uncomfortable with stuff. You have to be able to recognize what makes you ill at ease, you must also be able to name it. To say so. It means saying this makes me uneasy, so as to then intervene the way you should. (Interview, Male Nurse #2)

Difficult situations experienced by nurses in clinical practice, concerning ART adherence for example, served as a springboard for putting reflective practice exercises to use.

> You want to make sure to incorporate these abilities into your practice. To really reflect based on these situations, it's basically a reflective practice exercise. It's truly in drawing on clinical cases … that nurses have found difficult … supporting patients in taking medication. (Interview, Female Nurse #4)

6.1.6 Discussion

Main results

We explored HIV nursing practice, particularly the challenges that nurses face in promoting ART adherence and opportunities for practice development in the field. The nurse-patient relationship was at the forefront of nursing practice to support PLWH. This practice translated into a range of nursing

activities to foster ART adherence by supporting PLWH in their whole situation, including the assessment of an array of dimensions related to PLWH health, teaching and sharing knowledge, coordinating care, and connecting PLWH with resources. Providing HIV nursing care, especially ART-related care, to PLWH was challenging in three areas: (a) performing nursing roles at the interface of social and biomedical boundaries, (b) misalignment between nurse and patient expectations regarding ART (non) adherence, making nurses feel powerless when faced with situations of non-adherence, and (c) dealing with sociopolitical determinants affecting access to health care resources and services. Nurses mobilized a range of resources - knowledge, networks, and strategies - to build capacity and overcome challenges relating to their practices with PLWH.

Relational Care: A Primacy for HIV Nursing Care While Exposing Nurses to Their own Vulnerability

The creation of a therapeutic relationship as the foundation of HIV nursing care corroborated the results of a qualitative study in which health care providers (including nurses) and PLWH felt that a "long-term relationship was an essential part of HIV treatment over the entire course of having HIV infection, starting with initial diagnosis, to entering treatment for HIV, adhering to medication regimens, and staying connected to care" (Dawson-Rose et al., 2016, p. 5). Similar to our results, the findings of Dawson-Rose et al. (2016) emphasized relational components essential for building a trusting and respectful relationship with marginalized patients. Otherwise, the therapeutic nurse-patient relationship has often been labelled as a determinant positively or negatively affecting patient health outcomes such as ART adherence, stigma, and quality of life (Heestermans et al., 2016; Langebeek et al., 2014). However, in nurse-led interventions to support ART adherence (de Bruin et al., 2017; Van Camp et al., 2013) and in some best practice guidelines for people at risk for or living with HIV (e.g., CANAC, 2013a), the relational components of interventions is sometimes highlighted or perhaps taken for granted, but without being explicitly described as a core component of interventions or of practice guidelines.

Our findings shed light on the diversity of nurses' roles in motivating and supporting PLWH to maintain ART, as underlined in other studies targeting nurse-led interventions specific to HIV (Côté, Godin, et al., 2015; Wood et al., 2018) and in best practice guidelines (CANAC, 2013a). However, our study specifically served to highlight misalignment between nurses' and PLWH's objectives regarding ART adherence, as well as the emotional burden expressed by nurses having to cope with situations of non-

optimal ART adherence, translated by feelings of powerlessness, helplessness, sense of failure, disappointment, and self-doubt.

The misalignment described by our participants may be compared to the righting reflex described by Miller and Rollnick (2013b), founders of motivational interviewing. They described the righting reflex as, "the belief that you must convince or persuade the person to do the right thing" (p.10). The righting reflex is a manifestation of a directive conversation dynamic, which can compromise the therapeutic relationship. According to Miller and Rollnick (2013b), the righting reflex often stems from a sincere, selfless intention to help. Despite these good intentions, caregivers feel that they ought to confront patients. For example, optimal ART adherence might be the main objective of nurses for the patients they care for. To this end, they try different strategies to help patients adhere to treatment (e.g., provide information about consequences, suggest the use of different strategies to remember to take pills). However, these interventions are not always compatible with many other issues related to HIV and ART that PLWH have to handle. In a therapeutic relationship where nurse goals predominate, patients can feel that nurses don't listen to them. And, in return, nurses can experience feelings of powerlessness, self-doubt, and disappointment when their interventions do not produce expected outcomes. These feelings might also be the signs or triggers of compassion fatigue (Nolte et al., 2017) and of psychological effects of nurses' vulnerability (Rogers, 1997). Compassion fatigue is defined as a state of exhaustion limiting the ability to engage in caring relationships that can impact professional nursing performance commitment (Nolte et al., 2017). Participants in our study were emotionally committed to PLWH, which can, according to Heaslip and Board (2012), increase nurses' vulnerability. Compassion fatigue and carer vulnerability still represent under-investigated areas in nursing that would be worth further study as they can impact the ability to establish a therapeutic relationship and the deployment of nursing activities, while potentially altering professional development.

Nursing Activities

Nursing activities required to foster ART adherence for PLWH (i.e., assessment of many dimensions of PLWH's health, teaching and knowledge sharing, care coordination, and connection to resources) discussed by our participants aligned with nurse-led interventions to support ART (de Bruin et al., 2017; Van Camp et al., 2013), as well as with Canadian (CANAC, 2013a; 2013b) and international (Dumitru et al., 2017; Relf et al., 2011) best practice guidelines. Providing education and counseling to promote ART adherence (e.g., coping with side effects, providing practical strategies to remember to take pills,

sharing self-management skills) have been identified as usual care/practice (de Bruin et al., 2017). Nurses' activities of facilitating linkages to and retention in HIV care have been documented elsewhere, including the care coordination function (Dumitru et al., 2017; Tunnicliff et al., 2013). Supporting PLWH in ART adherence has to do with interprofessional collaborative practice (Ngunyulu et al., 2017). In that sense, our findings portraying nursing activities for HIV care were not surprising and also broadly aligned to the general scope of nursing practice, including assessment and care planning, communication, and care coordination, as well as teaching patients and their families (D'Amour et al., 2012).

Challenges

There is overwhelming evidence regarding PLWH's perspectives on the challenges, determinants, and complex needs related to ART adherence (Barroso et al., 2017; Heestermans et al., 2016). However, there is still little research on how nurses have faced the challenges of supporting PLWH in ART adherence. Our findings represent a unique contribution to the field and shed light on complex and multidimensional (i.e., professional, relational, and sociopolitical) challenges that nurses face in everyday practice.

Some participants provided a critical perspective on their roles in supporting ART adherence, and more broadly, in caring for PLWH. A potential gap has been noted between current nursing activities and the roles that nurses would hope to be strengthened and further engaged in (e.g., complex assessment skills, advocacy). This resonated with concepts of enacted and ideal roles (D'Amour et al., 2012; Déry et al., 2015). On one hand, the enacted role refers to professional activities actually carried out by nurses. On the other hand, the ideal role refers to "the range of activities for which nurses are educated and licensed, as distinct from the job responsibilities that might be expected on the basis of nurses' qualifications and licensed training" (Déry et al., 2015, p. 136). Professional autonomy was highlighted by some of our participants, who maintained that nursing care involved more than simply supporting medical practice and the biomedical aspects of HIV care regarding ART adherence.

Perceived nursing roles at the interface of social and biomedical boundaries were in line with the results of a review of 14 papers (Tunnicliff et al., 2013), which showed that HIV nurse specialists have a "wide-ranging and diverse role that fulfils a wider social care function as well as a clinical function" (p. 3351). Participants seemed to be comfortable with the biomedical aspect of their practices (e.g., teaching and

sharing knowledge). However, the social aspect of nursing care appeared more challenging for some nurses. Indeed, as stated in one Canadian best practice guidelines for HIV nursing care, nurses "must understand how the social determinants impact on the health and well-being of individuals and possess the skills that allow them to advocate for practices and approaches that support equity" (CANAC, 2013a, p. 18). Participants raised the importance of these determinants in their patients' trajectories of care and acknowledged the impact of living in complex and sometimes impoverished social conditions on the abilities of patients to access ART and other resources critical to self-management. Some participants appeared to struggle with this social facet of practice, possibly provided with much less guidance compared to that received concerning the biomedical dimension of HIV care.

Mobilization of Resources

A comparison of the mobilization of resources – knowledge, networks, and reflective practice – with practice recommendations revealed that they broadly corresponded to professional expectations required in providing HIV nursing care (CANAC, 2013b). Participants relied on various sources of knowledge (experiential, biomedical/pharmacological, social, empirical, theoretical) to inform their practices. This was also in line with the work of nurse theorists (e.g., Carper, 1978; Chinn et Kramer, 2011; Leininger, 2006) who have discussed various ways of knowing (i.e., empirical, ethical, aesthetic, personal, political, sociocultural, and emancipatory) that shape nursing practice and the discipline of nursing more broadly (Richard, 2014). Our participants found it important to mobilize informative resources and networks to address complex questions and thus be better equipped to support PLWH, using reflective practice, an approach extensively discussed in the nursing literature as a means of developing knowledge and improving professional practice (Dubé et Ducharme, 2015).

Strengths and Limitations

A strength of our study stemmed from the wealth of experiences of nurses working with PLWH on an ART regimen. The heterogeneous sample of nurses made it possible to portray nuances in their roles and identify a range of challenges and opportunities to further develop practice. The findings could be transferable to other nurses working with people living with complex health and social conditions in urban settings where the health system model is comparable (e.g., the public system). We also believe that our results could be transferable to other medication-use contexts for clients in vulnerable situations (e.g., mental health) and/or those with other chronic diseases. In light of our findings, some recommendations would be worth considering in future work (see Table 5).

There were several limitations to the study. The interview/focus group topic guide was not validated, but it was inspired by research in the field (Côté, Rouleau, et al., 2015). Participants did not validate the interview data or data analysis, but preliminary findings were discussed at an HIV nursing conference. Despite time-limited discussions in the focus group, participants who took part were experienced and shared rich knowledge about their practices. During the focus group, the first author took the role of facilitating exchanges and discussions. Even if interpersonal dynamics were documented as part of the focus group (with observation and field notes), the first author was there as a group facilitator, emphasizing the nature and content of the discussion, while putting less stress on interpersonal dynamics.

Table 5. Recommendations for Future Work

Implications for research
• Conduct a mixed-method study to (a) measure enacted (actual) scope of nursing practice in a context of nurses supporting PLWH in ART adherence; and (b) explore (qualitatively) reasons for potential gaps between the enacted and full scope of nursing practice.
• Compare current nursing practice with the Canadian Association of Nurses in AIDS Care Best Practice Guideline.
• Map and compare the needs of nurses working across different settings (e.g., rural and remote areas); those with various roles and levels of clinical experience; and those who care for PLWH with a range of profiles (e.g., drug users, homeless people, women).
Implications for education and practice
• Further emphasize the importance of the relational dimensions of the role of nurses in HIV care to promote ART adherence (e.g., in international best practice guidelines).
• Provide opportunities for ongoing professional development to build confidence and skills in relational and cultural competencies; acquire and deepen many sources of knowledge needed by nurses to strengthen professional development; and help nurses translate this knowledge to nursing activities with PLWH.
• Provide accessible information about education resources (e.g., local, regional, and international conferences on HIV) and psychosocial resources (e.g., resource directory).
• Offer greater opportunities for nurses to critically reflect on their practices with PLWH and to maintain relationships with other care providers and networks.
• Support nurses' abilities and competencies to cope with uncertainty and challenging situations, such as facing sociopolitical determinants that impact PLWH access to ART and managing non-adherence.
Note. ART = Antiretroviral Therapy; PLWH = Person(s) Living with HIV.

6.1.7 Conclusion

Our study provided a greater understanding of nurses' current practice in the context of HIV care, and sheds light on particular challenges pertaining to ART adherence and areas for practice improvement. Our findings provide a solid basis upon which to design an education intervention for HIV nurses in a context of continuous professional development, and this will be undertaken as the next step of our wider research program. In light of our results, this type of intervention could be multi-level, taking into account the systemic components of the nursing practices in question, including a strong relational dimension; nursing activities in support of ART adherence; relational, professional, and sociopolitical challenges; and the mobilization of resources. Supporting best nursing practice in the context of HIV care will require professional development opportunities specifically targeted to nurses that reflect the complex challenges they face to enhance quality of care and improve health outcomes for PLWH.

Key Considerations

- We suggest that evidence-based practice and other sources of evidence in HIV care should include explicit recommendations about the relational dimensions of nursing practice. If the quality of the nurse-patient relationship is improved, it may have a significant impact on patient care and on ART adherence.

- It is important to reinforce nurses' capacity-building in order to ensure that they are prepared and confident about providing HIV and ART-related care.

- Specific areas of improvement (e.g. dealing with situations of non-adherence, questioning socioprofessional roles) are needed to strengthen nursing practice in HIV care and optimize the quality of professional practice and patient care.

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7 Chapitre 7. Résultats – Volet 2

7.1 Article 4. Codeveloping a virtual patient simulation to foster nurses' relational skills consistent with motivational interviewing: A situation of antiretroviral therapy nonadherence[12]

7.1.1 Résumé

Nous élaborons dans ce quatrième article la méthode de développement de la simulation numérique, en fournissant également une description détaillée de son contenu, de deux grands défis rencontrés et de solutions mobilisées pour leur faire face. Nous décrivons notre méthode comme étant collaborative et itérative. Au cœur de la simulation se dessine une consultation simulée entre une infirmière et un patient virtuels. Or, notre conception des soins infirmiers alimentée par l'ASFF s'est transposée dans la manière d'avoir modelé et représenté cette relation thérapeutique virtuelle entre l'infirmière et le patient. Les assises théoriques de l'EM ont quant à elles permises d'opérationnaliser finement le scénario basé sur des échanges de communication. Transposer une dimension relationnelle des soins infirmiers dans un dialogue préprogrammé comporte son lot de défis, considérant que nous étions également préoccupées d'offrir une formation qui suscite l'intérêt, l'engagement et l'immersion dans cette expérience d'apprentissage.

7.1.2 Abstract

Background: Although helping people living with HIV manage their antiretroviral therapy is a core competency of HIV nursing care, no educational intervention has sought to strengthen this competency. Thus, we codeveloped a simulation of a virtual patient (VP) having difficulty adhering to treatment to foster the relational skills that nurses require in such situations.

Objective: This viewpoint paper aims to describe the codevelopment process and the content of VP simulation, as well as the challenges encountered and the strategies used to overcome them.

[12] Rouleau, G., Pelletier, J., Côté, J., Gagnon, M.-P., Martel-Laferrière, V., Lévesque, R., … Fontaine, G. (2020). Codeveloping a virtual patient simulation to foster nurses' relational skills consistent with motivational interviewing: A situation of antiretroviral therapy nonadherence. *Journal of Medical Internet Research*. 22(7): e18225

Methods: We used a collaborative and iterative approach to develop the simulation based on qualitative evidence, theoretical approaches (strengths-based nursing, motivational interviewing [MI], and adult learning theories) and expert recommendations. We carried out 2 main phases: (1) planning the simulation development and (2) designing the simulation content, sequence, and format. We created the script as if we were writing a choose-your-own-adventure book. All relational skills (behavior change counseling techniques deriving from MI) were integrated into a nurse-patient dialogue. The logic of the simulation is as follows: if the nurse uses techniques consistent with MI (eg, open-ended questions, summarizing), dialogue is opened up with the VP. If the nurse uses relational skills inconsistent with MI (eg, providing advice without asking for permission), the VP will react accordingly (eg, defensively). Learners have opportunities to assess and reflect on their interventions with the help of quizzes and feedback loops.

Results: Two main challenges are discussed. The most salient challenge was related to the second phase of the VP simulation development. The first was to start the project with divergent conceptions of how to approach the VP simulation - the simulation company's perspective of a procedural-type approach vs the clinical team's vision of a narrative approach. As a broad strategy, we came to a mutual understanding to develop a narrative-type VP simulation. It meshed with our conception of a nurse-patient relationship, the values of strengths-based nursing (a collaborative nurse-patient relationship), and the MI's counseling style. The second challenge was the complexity in designing realistic relational skills in preprogrammed and simulated nurse-patient dialogue while preserving an immersive learning experience. As a broad strategy, we created a collaborative and work-in-progress writing template as a shared working tool.

Conclusions: Our experience may be helpful to anyone looking for practical cues and guidance in developing narrative VP simulations. As relational skills are used by all nurses—from novices to experts—and other healthcare practitioners, focusing on this clinical behaviour is a good way to ensure the simulation's adaptability, sustainability, and efficiency.

Keywords: motivational interviewing; HIV; nurses; education, continuing; virtual patient; simulation; nurse-patient relations; communication

7.1.3 Introduction

The role of simulation in continuing professional development

Professional expectations and social accountability require that nurses pursue continuing professional development (CPD) to reinforce and maintain their competencies, so they can provide evidence-based care and ensure patient safety (American Nurses Credentialing Center's Commission on Accreditation, 2014; Fleet et al., 2008). CPD is typically offered through interactive and/or didactic educational meetings such as conferences, workshops, seminars, lectures and courses (Forsetlund et al., 2009). However, many of these approaches require time, money and human resources, which are often limited in healthcare environments (Berndt et al., 2017; Nickerson et al., 2011). There is a need to develop accessible and innovative ways to strengthen nurses' learning and expertise while considering resource availability as well as workplace realities. The use of virtual patient (VP) simulation, a digital learning modality, is one way to address these challenges and is increasingly used in contemporary nursing education (Cant et Cooper, 2014).

Virtual patient simulation and education for health professionals

VP simulation is an interactive computer simulation that depicts real-world scenarios with the goals of training, education and assessment (Ellaway et al., 2006) for healthcare professionals. A VP enables learning in a nonjudgmental, ethical and safe environment (Cant et Cooper, 2010, 2015; Cheng et al., 2016; Nickerson et al., 2011) as learners acquire knowledge and develop skills by learning from their mistakes, without harming patients (Kaplonyi et al., 2017). The use of VP simulation in health professional education is growing exponentially, considering the number of reviews published in the field (Bracq et al., 2019; Cant et Cooper, 2014; Cook, Erwin, et al., 2010; Kononowicz et al., 2019; Peddle et al., 2016). Although the populations included in these reviews are mainly undergraduate and postgraduate students as well as healthcare providers in medicine, nursing and other disciplines, we found only 1 integrative review focusing exclusively on web-based simulation in nursing programs (Cant et Cooper, 2014). Thus, it is relevant to explore the use of VP simulation as a means of supporting CPD for nurses.

On the basis of the needs identified by nurses providing HIV care in a qualitative study (Rouleau, Richard, et al., 2019), we developed a VP simulation aimed at improving the nurses' relational skills consistent with motivational interviewing (MI) (Miller et Rollnick, 2013b) in situations of antiretroviral

therapy nonadherence. MI is a person-centered, collaborative communication style that seeks to elicit people's motivation and commitment to change. A systematic review conducted by Shingleton and Pafai (2016), which included 41 studies, aimed to characterize the use of technology-delivered MI interventions and their efficacy at changing various health-related behaviors among several populations. One of the authors' recommendations was to provide details, for instance, in methodological papers, on how the relational (eg, empathy) and technical (eg, confidence rulers) components of MI are translated into a technology-delivered intervention.

Insufficient guidance for developing a specific type of educational intervention

Several approaches exist to develop interventions aimed at improving health (O'Cathain et al., 2019) and supporting behavioural change by healthcare professionals (Colquhoun et al., 2017). Relative to a taxonomy of eight approaches to intervention development (O'Cathain et al., 2019), we locate ours as a specific type of intervention and behavior (Francis et Presseau, 2019) because of the following elements: its modality (VP simulation), the action to be performed (adoption of relational skills consistent with MI), the actors performing the action (nurses and, more broadly, all healthcare professionals), the target behavior (medication adherence) and the recipients of this action (patients who are living with HIV or not). Developing such a specific intervention was challenging, given that we faced a scarcity of operational and practical guidelines for doing so, particularly with regard to creating and translating the relational skills into preprogrammed schemes of communication between the virtual nurse and VP. Although we strongly believe in the value of development frameworks (Colquhoun et al., 2017; O'Cathain et al., 2019) to broadly inform intervention development, these frameworks are not intended to offer the extensive and practical description needed to guide the creative process of translating relational skills into an intervention-specific VP simulation. Furthermore, while the evaluation of interventions is well known to be a core research activity, the interventions themselves and their methods remain poorly described in the literature. Cheng et al (2014; 2016) support the importance of providing a detailed description of the development process of simulation.

Relevance of this viewpoint paper

This viewpoint paper attempts to fill the gaps cited earlier. In addition, this study may be helpful to VP simulation developers, educators responsible for CPD, and healthcare professionals wanting to undertake such an endeavor. At the same time, as our paper ensures transparency in reporting the

development methods, the components of the VP simulation (including its content), and the lessons learned, it provides insights into an approach to codeveloping a theory-informed VP simulation aimed at improving nurses' relational skills with patients. The viewpoint paper provides practical cues on how to deliver and translate MI through technology into preprogrammed nurse-patient dialogues.

Scope, aim and objectives

This viewpoint paper is an opportunity to make explicit the tacit knowledge that comes from our personal experience in codeveloping a VP simulation, supported by theoretical approaches and the literature. The specific objectives are to describe (1) the entire codevelopment process of a VP simulation, including its guiding principles, its content and features and (2) the challenges encountered, and the strategies used to overcome them.

7.1.4 Methods

Codeveloping a virtual patient simulation and its content

In this section, we describe the methods and processes involved in 2 main phases: (1) planning the VP simulation development and (2) designing the content, sequence and format of the VP simulation. We also identify the deliverables (or outputs) of each phase and subphase, such as the qualitative evidence of the needs assessment, the composition of an interprofessional team, the clinical content and the graphical presentation of the VP simulation. We used a collaborative and creative approach to codeveloping the VP simulation. The term *codevelop* is preferred because 2 nurses worked together to produce the clinical content from scratch, along with the project manager of the VP simulation team, and with the support of a larger interprofessional team. Some models (Bartholomew Eldredge et al., 2016; Olszewski et Wolbrink, 2017) and standards of best practice in simulation (International Nursing Association for Clinical Simulation and Learning Standards Committee, 2016, INACSL) inspired and broadly informed the general codevelopment processes. Although being very useful, especially in the planning phase, these models did not provide operational guidance for the design phase, particularly with regard to creating the full conversational script of the nurse-patient consultation rooted in relational skills. Therefore, describing this process of codevelopment was a retrospective exercise: it was not preplanned but was rather emergent.

The processes are presented in a linear manner to facilitate understanding. However, in reality, they were conducted concurrently, and some, in a pre-ordered sequence (the planning phase was done

before the design phase). We used field notes, meeting summaries, and debriefing sessions with team members to keep track of important decisions throughout the project. In this paper, sentences or groups of words in *italics* are used to emphasize important guiding principles or key elements surrounding the codevelopment of the VP simulation.

Phase 1: Planning the virtual patient simulation development

There are four subphases related to the planning phase: (1.1) assessing training needs; (1.2) selecting theoretical approaches to inform the VP simulation development; (1.3) negotiating a detailed partnership contract between the research institution, the researcher and the VP simulation company; and (1.4) assembling an interprofessional team.

1.1. Assessing training needs by understanding HIV nursing practice and its challenges

To gain insight into HIV nursing practice and the challenges nurses face when providing antiretroviral therapy-related care, a qualitative study (Rouleau, Richard, et al., 2019) was conducted, identifying 3 challenges. The first was performing nursing roles at the interface of social and biomedical boundaries: nurses sometimes felt unequipped to perform their social role. The second challenge was the lack of alignment in the expectations of nurses and patients regarding antiretroviral therapy adherence. The third focused on dealing with the sociopolitical determinants affecting access to healthcare resources and services.

From these results, *one challenge was chosen and prioritized because it targeted a clinical behavior amenable to change within the nurse-patient relationship and offered room for practice improvement and change:* the misalignment between the expectations of nurses and patients regarding medication adherence. Some nurses had an optimistic attitude toward antiretroviral therapy; they encouraged patients to take their medication while expecting an outcome of adherence that was not achieved. Nurses felt powerless in such situations of nonadherence, as though they had failed in their role. One of the strategies used by nurses to overcome this challenge was to use the MI (Miller et Rollnick, 2013b) approach. This challenge was then transformed into a learning opportunity and thus appeared feasible for translation into a simulated clinical situation.

1.2. Selecting theoretical approaches to inform virtual patient simulation development

We selected 3 theoretical approaches to lay the groundwork for the VP simulation, each serving a different purpose. Firstly, a strengths-based nursing (SBN) was chosen as a philosophy and value-driven approach (Gottlieb et Gottlieb, 2017) to clarify the goals and mission of nursing overall. *It offers a lens through which to view the roles of nurses and patients, the focus of nursing care and the nature of the nurse-patient relationship. The assumptions and values underlying SBN guided the conceptualization of the core of the simulation to be a collaborative partnership within the nurse-patient relationship. Second,* while SBN allows for a broad conception of the role of nurses, *MI is the approach used to design the virtual nurse's key actions in the simulation. MI was used to inform the creation of the VP simulation content (ie, the nurse-patient dialogue, quizzes, and feedback)*. The use of MI aimed to operationalize the content creation. Third, *considering the learner-centered vision of the VP simulation, the principles of adult learning theories were identified to support the learning processes and activities*. SBN and adult learning theories were used for the basic structure of the VP simulation.

Strengths-based nursing approach

SBN is grounded in principles of person and family-centered care, empowerment, relational care, and innate health and healing. *Collaborative partnership,* one value underlying SBN, meshes with our conception of the nurse-patient relationship. The term *collaborative partnership* refers to power, to the way it is distributed, and how it is shared with the person/family to give them a voice in achieving their goals (Gottlieb et Gottlieb, 2017). In this approach, goals are set by the nurse and patient together, each bringing their own experience, knowledge and competencies to the relationship (Gottlieb, 2014). Under a facilitator role, the nurse provides guidance to help patients find their own solutions. The recognition of the patient's strength is a key element in this collaborative relationship.

In Textbox 1, we present the criteria underlying the collaborative partnership adapted from SBN (Gottlieb, 2013), showing how this form of the nurse-patient relationship can guide nursing practice based on different assumptions, principles and values. The purpose here is to raise awareness and reflect on how nursing activities and actions can potentially be influenced or shaped by broad conceptions of the nurse-patient relationship, whether these conceptions are known or unknown, conscious or unconscious, implicit or explicit.

Textbox 1. Collaborative partnership within the nurse-patient relationship; strengths-based care.

Focus The person's capacity to be well, have a high quality of life and experience it in a meaningful manner. **Role of the nurse** The nurse is a facilitator. Encourages people to share their perspectives and expertise, participate in shared decision-making processes, develop their autonomy, and use their strengths and resources. Role of the person (includes patient/client and the family) Acts as an active partner who plays an important role in setting goals and in looking for solutions that best match the person. **Nature of the relationship** It is reciprocal and mutual, more symmetrical, with continuous negotiation of goals, roles and responsibilities. Both partners give and receive and gain and grow. **Goal setting** Goals are jointly set. **Evaluation** Nurse and person share in joint assessment of progress in reaching mutually determined goals. **Expected outcome** The problem may or may not be solved, but the person's skills for managing current or future problems are reinforced. Joint responsibility is accepted for the outcomes.

Motivational interviewing

The SBN approach and MI share common roots and a core value: collaborative partnership. In fact, the person-centered communication style characterizing MI (Miller et Rollnick, 2013b) can be established only in a relationship where these 4 values are present: partnership, acceptance, evocation, and compassion. In MI, collaborative partnership is about honoring and respecting the person's autonomy and seeking to understand the person's internal frame of reference.

In addition to these values, the VP simulation is based on a number of elements related to MI. First, the VP simulation is divided into 4 processes: (1) engaging, (2) focusing, (3) evoking, and 4) planning (see definitions in Textbox 2).

Textbox 2. Definitions of the 4 motivational interviewing processes that are the building blocks of the virtual patient simulation.

1. *Engaging*: "Engaging is the process of establishing a mutually trusting and respectful helping relationship" (Miller et Rollnick, 2013b, p. 47). Engaging in the relationship can be very brief at times, as is the case in the consultation between Mr Wilson and the nurse who have known each other for a long time. At other times, engaging can be very long. However, in all cases, it goes beyond stock greetings or courtesy. Engaging must

be manifest throughout the therapeutic relationship. It is about the development of a working alliance (Miller et Rollnick, 2013b, p. 27).
2. *Focusing:* Focusing serves to pinpoint the goal to be achieved to set and maintain a direction. To this end, nurses clarify the following with patients: • Their values and goals • The nature of the desired change • The importance patients attribute to the change
3. *Evoking*: "Evoking involves eliciting the client's own motivation for change." (Miller et Rollnick, 2013b, p. 28). At this stage, nurses guide patients in exploring their motivation, while simultaneously evoking hope and confidence. To this end, nurses: • Explore with patients their perceptions (*ambivalence*) about change • Mobilize relational skills to elicit *change talk* (a discourse in favor of changing the patient's health-related behavior such as medication adherence) • Mobilize relational skills to respond to *sustain talk* (a patient's discourse in favor of the statu quo)
4. *Planning.* A clear plan drawn up by the patient and guided by the nurse is conducive to engagement toward change and success in effecting change. To this end, nurses: • Recognize signs or cues indicating that patients are ready to take action (ie, increased *change talk* or decreased *sustain talk*) • Avoid slipping (back) into a *directing counseling style* by drawing up the plan for the patients • Make a transition from *evoking* to *planning* (eg, "Where does this get you?" "What do you intend to do about it?" and "Let's imagine for a moment that you decide to change: How might you go about it?") • Mobilize their relational skills and their practical knowledge to clarify the plan • Guide patients in anticipating obstacles and solutions to these

Second, VP simulation is based on relational skills that are essential to the proficient practice of MI (Multimedia Appendix 1) by creating optimal conditions for relational engagement with patients: asking open-ended questions, using reflective listening, summarizing, affirming the patients' strengths, providing information and advice, evoking a hypothetical change, eliciting and scaling change talk, setting patient-determined goals, and arriving at a plan. These relational skills are called *behavior change counseling techniques* because they are active ingredients that allow providers to initiate or maintain health behavior changes (Dragomir et al., 2019; Fontaine et al., 2019; Michie et al., 2017). Third, traps or roadblocks (eg, expert and blame traps, a directing counseling style) are also part of the VP simulation (Multimedia Appendix 2). These are interventions, advice or relational skills inconsistent with MI that are delivered by the nurses with the best of intentions to help their patients but that are likely to cause relational disengagement and to shut down dialogue with them.

Several reasons justified the use of MI to inform the VP simulation. First, some nurses from the previous work used it in their current practice and found it effective, whereas others clearly expressed the need

for training in it (Rouleau, Richard, et al., 2019). Second, MI training is promising for improving the relational skills of healthcare professionals working in HIV care (Beach et al., 2018) and has proven effective in enhancing medication adherence (Hill et Kavookjian, 2012; Palacio et al., 2016; Zomahoun et al., 2017). Third, MI is commonly used as a behavioral change counseling approach in nursing, as highlighted in a systematic review conducted by Fontaine et al (2019). This means that some nurses may be familiar with it and associate this approach with prior knowledge and experience.

Adult learning theories

Simulation is rooted in certain principles of adult learning theories (Clapper, 2010) that describe how adults learn and gain an understanding of clinical expertise. In our case, (Kolb, 1984, 2014) is created by the interaction of nurses with the VP simulation environment. The learners, or nurses (these terms will be used interchangeably), will be actively involved in the simulated experience by practicing and testing relational skills with the VP. They will have opportunities to assess their interventions and reflect on them with the help of quizzes and feedback loops (these will be explained later on). We sought to create a *transformative learning experience* (Merriam, 2001). *Transformative learning* capitalizes on the learners' prior experiences and their interpretation of a situation in order to build a new way of thinking and then act differently by using critical reflection (Clapper, 2010; Mezirow, 2000). Feedback is one powerful and effective mechanism to support adult learning and was integrated throughout the VP simulation (Issenberg et al., 2005).

> *In sum, SBN and adult learning theories contributed structuring elements with regard to the goal of the nurse-patient relationship and learning processes. MI informed the integration of concrete communication techniques in the fine content of the VP simulation.*

1.3. Negotiating a detailed partnership contract between the research institution, the researcher and the virtual patient simulation company

The coming together of the research team and a representative of the VP simulation company (SimforHealth) was an important aspect of this project. The research team was composed of experts in clinical content, and the company had expertise in digital training for healthcare providers (SimforHealth, 2020a). A person with extensive experience at the research institution was in charge of negotiating the terms of the contract between the researcher (JC) and the company. These terms were financial considerations, accountability and commitments, mandate duration and timeline, confidentiality duties, intellectual property and platform use licenses.

1.4. Assembling an interprofessional team

An interprofessional team was formed, comprising experts from a VP simulation team and clinical, research, and community-based settings. The VP simulation team was composed of a project manager, a pedagogical engineer, a two-dimensional (2D) design professional, 3D graphic designers and a software engineer. The clinical, research and community team members included nurses (clinical nurse specialists, a head nurse, researchers, and student-researchers, including one with experience using MI with people living with HIV), an infectious disease specialist, the director of an HIV community-based organization, a woman living with HIV, and researchers with experience in developing and evaluating web-based interventions to improve antiretroviral therapy adherence and in health technology assessment.

Furthermore, 2 members of the team (GR and JP) cocreated the clinical content of the VP simulation and worked in close collaboration with the project manager of the VP simulation team. These 3 people made up the working committee. The other team members played a consultative role, providing input on the clinical content and graphical components (eg, the VP, the nurse's office).

Phase 2: Designing the content, sequence, and format of the virtual patient simulation

This second phase includes the following subphases: (2.1) setting the learning objectives and cocreating the clinical content; (2.2) recording the nurse and patient voice-overs; (2.3) designing and validating the 2D learning environment; and (2.4) integrating 3 modes of fidelity to ensure learner engagement and immersion in the VP simulation.

In order to provide an exhaustive description of the content, sequence, and format of the VP simulation and of how we can translate MI through technology, we have provided detailed information on the following in Multimedia Appendices 1 to 5: the relational skills that are or are not consistent with MI, the key elements of the VP simulation, an excerpt of the writing template, and the table of contents of the glossary. In Multimedia Appendix 3, we offer a comprehensive description of all the key elements (eg, simulation designs such as quizzes and feedback points, learner orientation, exposure, participant groups) constituting the VP simulation, which was adapted from Cheng et al (2014; 2016) and Peddle et al (2019).

2.1. Setting the learning objectives and cocreating the clinical content

The learning objectives evolved throughout the clinical codevelopment of the VP simulation and are listed in Multimedia Appendix 3. Cocreating the clinical content involved more than just the wording of the script for the nurse-patient dialogue. It was a creative process that took into account the assumptions, nursing philosophy, and values embedded in the simulated situation (ie, SBN) - the active ingredients of MI and the learners' roles (adult learning theories).

The clinical content as a whole is made up of the following: a prebriefing video featuring the nursing student-researcher and its corresponding text; the simulated clinical situation, also referred to as the "virtual nurse-patient consultation," which includes the patient's electronic record (also named patient's file); a glossary; quizzes and feedback loops; and labels (green and red visual cues).

> *Key simulation design elements and features, including prebriefing, repetitive practice, MI techniques, quizzes, feedback, labels and fidelity, were included to optimize interactivity, foster nurses' engagement with and immersion in the training, and to promote their active and transformative learning.*

Prebriefing

The simulation-based experience with a prebriefing is considered the best practice in simulation (INACSL, 2016). In our case, the goal of the prebriefing, provided via video and text, was to offer basic information about MI so all learners could begin the simulated nurse-patient consultation with the same standardized information. It also aimed to set boundaries about the scope of the simulation to help nurses manage their expectations. For instance, some nurses might otherwise have thought that the simulation's goals were to acquire or deepen knowledge of antiretroviral therapy, or that prior experience with people living with HIV was needed (neither of which were the case). The prebriefing was also an opportunity to establish a fiction contract, which refers to a kind of commitment in which nurses are invited to act as though the simulation is real, although acknowledging its limitations (Dieckmann et al., 2007; Rudolph et al., 2014). Multimedia Appendices 6 and 7 show excerpts of the prebriefing video and a demonstration of the VP simulation.

Patient electronic record

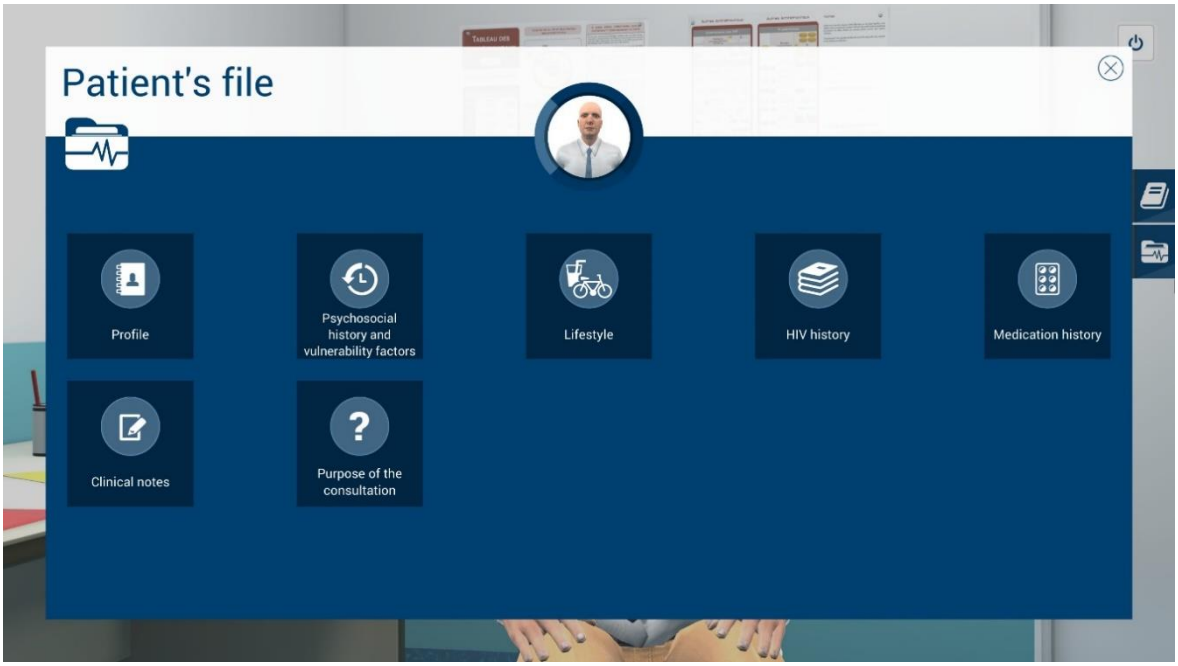
The content of the patient's electronic record was cocreated with the interprofessional team members for 2 reasons: (1) to ensure the credibility and validity of the patient's medical history and (2) to ensure the fidelity with real patient record rubrics in HIV outpatient clinics. The purpose of the patient's

consultation is presented in the patient's record and is summarized in Textbox 3. The different rubrics of the patient's electronic record (eg, clinical notes, HIV, and medication history) are illustrated in Figure 1.

Textbox 3. Purpose of the consultation.

The story is about Mr Wilson, a 50-year-old man living with HIV since 2011. He generally takes his medication regularly. His viral load was undetectable for 6 years (which is a sign of antiretroviral therapy adherence). Mr Wilson changed his treatment 1 year ago. He was very busy at work, and his routine changed, so it was difficult to take the medication as prescribed. Now, his viral load is over 1000 copies/ml, indicating that the antiretroviral therapy is not as effective (the target is to achieve an undetectable viral load, that is, below 40 copies/ml). What is going on?

Figure 1. Patient's electronic file rubrics.



Full script of the nurse-patient consultation

We created the script as if we were writing *a choose-your-own-adventure* book. We started by writing the *green pathway*, that is, the whole storyline in which the script is based on relational skills that are consistent with MI. Afterwards, we identified strategic places in the script to incorporate traps or roadblocks - the *red pathways*. These crossroads between the green and red pathways are introduced by quizzes in which learners must select an intervention. When a red pathway is chosen, a short

interaction inconsistent with MI shows learners how some types of communicational traps used by nurses generate negative reactions in the patient's speech. At the end of the interaction, the red pathway stops, written feedback is given to the learners, and they can go back to the crossroads to make a different choice. When the green pathway is chosen, the script (ie, nurse-patient dialogue) becomes automated until the next crossroads. We had to carefully select strategic places within the script to insert the crossroads. Thus, the arborescence that supports the whole script is made up of the green and red pathways, including quizzes and feedback loops.

> *All these relational skills, whether they are consistent with MI (eg, open-ended questions) or not (eg, providing advice without asking for permission), were integrated into a nurse-patient dialogue in which learners had to choose between the interventions that generate openness in the patient's speech and those that can shut down communication. This scenario provides learners with safe, constructive, positive, and nonjudgmental spaces that allow for transformative learning and self-reflective practice (Clapper, 2010).*

The main stages in writing, validating, and producing (ie, filming, voice-over recording) the overall content and testing it in the platform are summarized in Textbox 4. Steps 1 to 4 are more general and account for how we created the script for nurse-patient consultation.

Textbox 4. Main stages in writing, producing, and validating the overall content and making it accessible as a virtual patient simulation platform.

1. Writing the green pathways, meaning the overall storyline between the nurse and patient that is consistent with motivational interviewing, by using behavior change counseling techniques (Multimedia Appendix 1), and structured according its 4 processes: (1) engaging, (2) focusing, (3) evoking, and (4) planning (Textbox 2). *Note:* The script of the nurse-patient dialogue was first written in a linear way to open up onto the patient's experience. At this stage, no crossroads (red pathways) were part of the script
2. Validating the green pathway with the interprofessional team
3. Identifying strategic places along the green pathway where traps or roadblocks could be integrated and then writing the *red pathways* (see Multimedia Appendix 2). This step included the creation of quizzes and feedback
4. Creating visual cues that we called *green* and *red labels* to engage the learner observing the preprogrammed dialogue. These labels were integrated into strategic places in the script (eg, when the nurse uses a directing counseling style)
5. Producing the content of the patient's electronic record, the glossary and the prebriefing (video and text)
6. Validating the whole clinical content with members of the interprofessional team
7. Culturally adapting the script (nurse-patient dialogue). Originally, it was written in French from Quebec (Canada). The text was adapted to an *international* French
8. Recording of the nurse's and the patient's speech by professional actors and filming the prebriefing video

9. Integrating all the content in the MedicActiv platform (SimforHealth, 2020b)
10. Performing functionality tests and validating the content within the platform
11. Validating the virtual patient simulation with a small group of nurses
12. Launching the French version
13. Translating the virtual patient simulation to English and revising the content in close collaboration with an Anglophone nurse who was an expert in motivational interviewing and a member of the Motivational Interviewing Network of Trainers (MINT).
Note: Steps 9 to 13 were repeated for the English version.

In our various attempts to write the script, we developed multiple versions of a writing template. This was a work in progress throughout. The final template (see Multimedia Appendix 4) includes the nurse-patient dialogue (script), quizzes, feedback, labels, guidelines for the VP simulation team regarding the branching, and notes for the actors who would record the voice-overs. This template was a tool that allowed us to write the script in the manner of a *choose-your-own-adventure* book.

A total of 14 *quizzes*, including multiple-choice and open-ended questions, are part of the VP simulation. Most were formulated to allow learners to select the most appropriate intervention, depending on the script's progress and the patient's speech. Each quiz is supported by synchronous written *feedback* focusing on the rationale for the good or bad answer selected based on their consistency with or without MI (Multimedia Appendices 1 and 2).

Visual cues, called *green and red labels*, were introduced during the nurse-patient consultation to qualify their speech (eg, open-ended question, defensive attitude) and in the written feedback. These labels correspond to theoretical MI techniques and provide feedback. The introduction of visual cues into the automated dialogue allows learners to grasp the rationale for the virtual nurse's communication skills and to observe the patient's reaction while limiting the number of pathways (green and red) to be scripted.

Glossary

An online glossary is available within the VP simulation as a supplementary educational material to complement the content of the nurse-patient consultation. It covers theoretical concepts, definitions, and applications. The main topics covered in the glossary are presented in Multimedia Appendix 5.

2.2. Recording the nurse and patient voice-overs with French- and English-speaking actors

The project manager of the VP simulation team was responsible for preselecting French- and English-speaking actors and assisting them during the recording of the nurse and patient voice-overs.

> *It is important to add stage directions in the writing template, alongside the speech of the nurse and patient, so that the actors can respect the tone of voice and the ambience/vibe in the virtual nurse-patient relationship, consistent with MI.*

The nurse's mode of communication had to be respectful, calm, warm, and welcoming, without becoming caricatured, especially in the red pathways. That way, the learners could not guess or deduce the right answer merely from the character's tone of voice or an intervention that is obviously inadequate. As for the patient, if he was feeling worried, the actor had to convey this in his performance.

2.3. Designing and validating the 2D learning environment

At the same time, as the clinical content was being written, the VP simulation team was working to design the graphical elements of the 2D learning environment. Figure 2 shows a mock-up of the virtual office, including both nurse and patient, and Figure 3 shows the patient only.

These mock-ups allowed us to get the team members' opinions of the graphical designs before selecting the final 2D learning environment. It was important to display a chart of antiretroviral therapy on the wall, to represent a real-life artifact. Decisions about the virtual nurse and patient had to then be made. For example, would we see the nurse on-screen (third-person view) or not (first-person)? What would the HIV-positive man look like? How would the desk be positioned in the virtual office (ie, between the nurse and patient or on the side)? Ultimately, the first-person view was preferred, where the nurse is not visible on-screen, but we hear her voice and see her speech. This way, only the VP is visible. The desk was placed on the side to avoid creating distance between the nurse and patient. Figure 4 shows the final design for the virtual nurse's office and the patient (Mr Wilson).

Figure 2. Mock-up of the virtual office including nurse and patient.

Figure 3. Mock-up of the virtual patient.

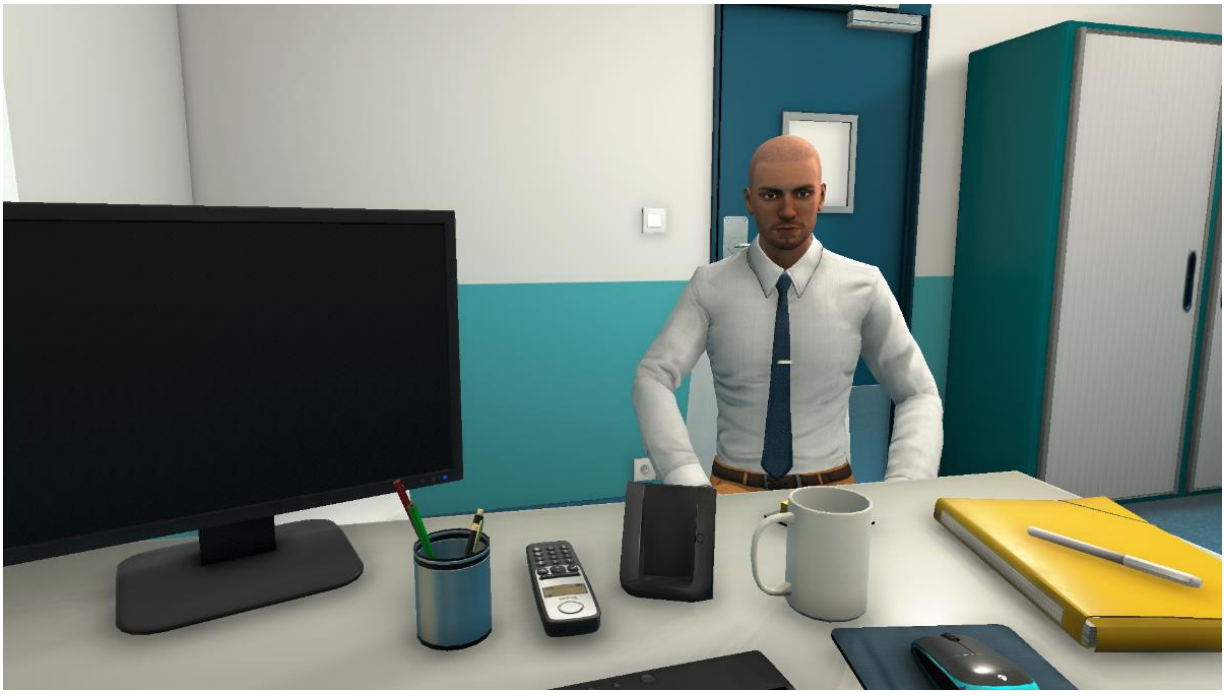


Figure 4. Final design of the virtual patient simulation.

Some features were created to fit with this project, such as the green and red labels, and the interfaces to support synchronous feedback. Furthermore, SimforHealth developed a specific content/dialogue management module (questions/answers) to meet the clinical team's needs. This module made it possible to speed up the content creation (full script of the nurse-patient consultation) and facilitated content integration into the VP simulation.

All the regular 3D content was created using 3D Studio Max (Autodesk), the leading 3D digital content creation solution (Figure 5). Figure 6 shows examples of wireframes used in the creation of the 3D content. Wireframes are illustrations of proposed VP simulation components and "assist in visual communication and design of the structure, functionality, learner interface, and positioning of an application." (Olszewski et Wolbrink, 2017)

Figure 5. 3D digital content creation solution.

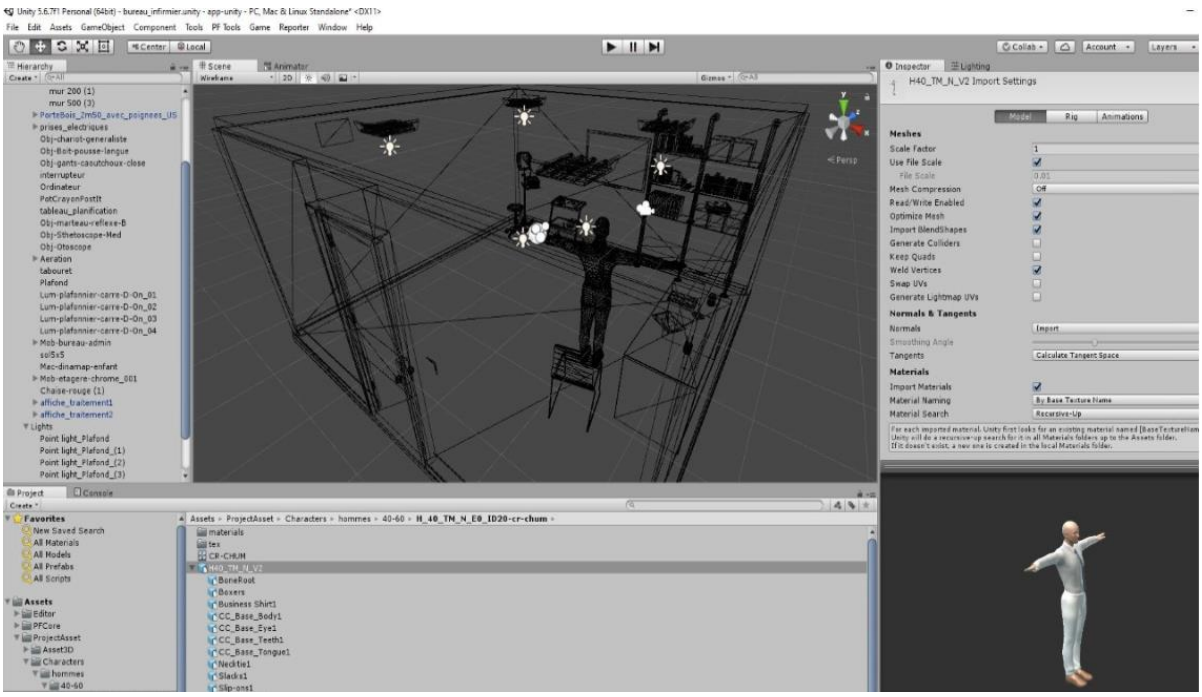


Figure 6. 3D Virtual patient.

MedicActiv platform

The MedicActiv platform (SimforHealth, 2020b) was designed to support digital training for healthcare providers and was used to host the simulated nursing scenario. The simulated scenario is a self-directed learning approach that is accessible via a computer or tablet. It is a 2D visual interface (Figure 4) with 3D content and is considered nonimmersive virtual reality (Slater et Sanchez-Vives, 2016). The 2D elements include the graphical user interface, such as colours, icons and text-based interface. The 3D elements are the dynamic *objects* created to have volume, such as the VP and the nurse's office (Figure 6). MedicActiv is a software as a service solution providing a library of virtual clinical cases. Thanks to the Authoring Tool it includes, developers (eg, researchers, educators, healthcare providers) can easily create their own clinical case in order to share it with other users on the platform. The trainer can set up the training sessions' parameters (eg, date, time, duration) and, immediately after any session, is able to retrieve several key performance indicators (eg, time, errors). Most of the clinical cases are available on multiple devices and operating systems (Windows, MacOSX, iOS, Android). However, our clinical case with the HIV-positive VP was not available to everyone because it was embedded in a research process, and thus, was available only to a small sample of research participants, namely, the nurses.

2.4. Ensuring fidelity to ensure learner engagement and immersion throughout the virtual patient simulation

One important feature to include in any simulation, be it virtual or not, is the concept of fidelity, also known as realism or authenticity (Bearman, 2003). Fidelity is about the learner's perceptions of how well a simulation represents or reproduces reality (Dieckmann et al., 2007) and offers them a realistic learning opportunity (Peddle et al., 2016). In this context, 3 modes of fidelity represent the ways humans think about reality: (1) physical; (2) conceptual (or semantic); and (3) emotional and experiential (or phenomenal) (Dieckmann et al., 2007; Rudolph et al., 2014; Rudolph et al., 2007). These modes can influence the learner's engagement with and immersion into the simulation as well as their learning process (Dieckmann et al., 2007; Peddle et al., 2016; Rudolph et al., 2007).

The *physical mode* can be described by the physical properties of the virtual patient (eg, movements, appearance) and of the nurse's office, including objects and artifacts in that environment. The voice-over acting for the nurse and patient (eg, voice tone, vocabulary) are other elements of fidelity that were taken into account. The *conceptual or semantic mode* relates to concepts and their relationships,

for example, theories, meaning or information that are presented via various means (eg, text, voice-overs). It also involves the if/then relationship. In our simulated situation, it is globally represented by this logic: if the nurse uses behavior change counseling techniques (communication skills) consistent with MI, this will open up dialogue with the VP. If the nurse uses relational skills inconsistent with MI, then the VP will react accordingly (eg, defensively). Finally, the *emotional and experiential mode* refers to the learner's emotions, feelings, and beliefs relating to their holistic experience of participating in the simulation. In Table 1, we present strategies used to ensure that the VP simulation had the characteristic of fidelity.

Table 1. Strategies used to ensure 3 modes of fidelity throughout the virtual patient simulation.

Modes of fidelity	Strategies used
Physical fidelity	Giving cues to VP[a] simulation team for their design of the VP: • Taking a picture of a real nurse' office for representation of the virtual nurse' office • Adding objects that represent reality (eg, chart of antiretroviral therapy on the wall) Getting charts from real patient records to use the same vocabulary in the VP's electronic record. Designing the VP with human features (eg, facial expression, body movements) based on past experiences of the VP simulation team Using real voice-overs for both patient and nurse: • Preselecting some French- and English-speaking actors, listening to their audio tracks and choosing the ones that best fit the spirit of the simulation • Providing descriptive cues in the script besides the nurse's and patient's speech, so that the actors can respect the tone of voice and ambience and vibe in the nurse-patient virtual relationship, consistent with SBN[b] and MI[c]. Getting written approval for each step of the graphical design before undertaking the subsequent one.
Conceptual fidelity	Co-designing the clinical content with a nurse having expertise in HIV care and MI to ensure that the simulation reflects the nursing practice and the validity of the theory injected in preprogrammed interaction Meeting a clinician nurse specialist who is an expert in HIV care to discuss real-life situations of people living with HIV having difficulty taking their medication to identify nursing actions, in partnership with physicians and pharmacists, in nonadherence situations Validating the content with healthcare professionals

	Working with pedagogical engineering to make sure that good educational practices are met
Emotional and experiential fidelity	Promoting a positive learning experience and relatedness by creating messages that value and respect nurses' competencies and current practice. In doing so, clinical content inventors must themselves be consistent with the MI values in their way of translating the educational content to the simulation
	Creating opportunities for reflection on action (virtual practice) by incorporating quizzes and feedback that represent what nurses do in their current practice
	Establishing a fiction contract with nurses (Dieckmann et al., 2007; Rudolph et al., 2007). The following message in the prebriefing video is intended to create such a contract: "The relational aspect of the practice of caring cannot be simulated to perfection. Needless to say, human beings are not preprogrammed to respond to a nurse this way or that. I invite you, then, to immerse yourself in this virtual simulation as if it were real and to pay attention to the interactions between Mr Wilson and the nurse."

[a]VP: virtual patient.
[b] SBN: strengths-based nursing.
[c] MI: motivational interviewing.

7.1.5 Discussion

Challenges and strategies

Thus far, we have described the VP simulation development methods and the deliverable of each phase and subphase, including the theory-informed content. We now turn to a discussion of the main challenges and the strategies used to overcome them.

The most salient challenges and strategies will be discussed in this section. The second phase (ie, designing the content, sequence, and format of the VP simulation) was the most challenging because of the difficulty in tying down realistic clinical content in a virtual learning environment. We had to preserve the philosophy and values of SBN and the collaborative partnership that shaped the nurse-patient relationship. We were also concerned with translating relational skills informed by MI within the simulated nurse-patient dialogue while ensuring that the functionalities of the VP platform could support the content. *We also had to find a balance between a nursing-driven approach and a technology-driven approach while optimizing the learning experience.*

Challenge 1. Starting the project with divergent conceptions of virtual patient simulation approaches

At the beginning of the project, the VP simulation team suggested a generic template that could help structure and organize the clinical content into pre-established categories consistent with virtual simulators already developed by the company. However, the two clinical inventors (GR & JP) felt such a template would not be helpful because it reflected a problem-solving (Bearman, 2003; Bearman et al., 2001) or procedural (Cant et Cooper, 2014) simulation approach. This is appropriate for teaching, for instance, clinical reasoning and diagnosis. To perform these tasks, learners must, for example, collect data and make diagnoses and treatment decisions based on their anamneses. In such simulations, learners are given a set of information from which they must draw conclusions (eg, in patient-facing problems with adherence to antiretroviral therapy, the nurse's identification of solutions drives the direction of the VP simulation script). However, this approach didn't mesh with a collaborative partnership as a form of the nurse-patient relationship, and thus with the nature of relational skills that are consistent with a narrative approach to simulation (Bearman, 2003; Bearman et al., 2001). The ways of seeing the approach to the VP simulation diverged between the simulation team (who perceived it a procedural one) and the clinical team (who perceived it as a narrative one).

The narrative approach, also called *situational simulation* (Cant et Cooper, 2014), is generally found in a personal story line that progresses over time around a logic of cause and effect and that involves a decision-making process that yields different *outcomes* (or effects). The script is anchored in a strengths-based approach, consistent with MI, in which the virtual nurse's role is that of a facilitator, using relational skills to open up the dialogue with the patient (eg, where a patient is facing problems with adherence to antiretroviral therapy, the identification of solutions *by the patient* drives the direction of the VP simulation script). At the time we started the VP simulation project, it would have been helpful to rely on the paper of Peddle et al (2019) because it describes the development of VP to support undergraduate nursing students in learning nontechnical skills such as communication. The authors give an overview of the narrative approach and the *choose-your-own-adventure* game structure used to design the VP simulation.

Strategies: Getting a mutual understanding of the VP simulation approach that is aligned with the philosophy and values of a collaborative nurse-patient relationship

We first consulted some virtual clinical cases on the MedicActiv platform to familiarize ourselves with the possibilities and limitations of the virtual learning environment and to understand how it works. It helped to understand how the VP simulation team perceived the simulated clinical situations and then pinpoint the differences between our different VP simulation approaches (procedural vs narrative). We collaborated closely with the project manager of the VP simulation team from the outset of the project. It was essential to make sure that the narrative approach, the SBN, the relational skills informed by MI, the principles of adult learning theories, and the functionalities of the simulation platform all meshed together. Holding regular meetings with the working committee allowed us to gain a better understanding of each other's roles, responsibilities and evolving perspectives on the VP simulation.

Challenge 2. Struggling with the complexity of designing realistic relational skills into preprogrammed and simulated nurse-patient dialogue while preserving an immersive learning experience

This challenge was three-fold: (1) translating complex actions (uptake of relational skills) within fully automated and preprogrammed nurse-patient dialogue, (2) having insufficient guidance in integrating such skills in this form of virtual simulation, and (3) designing the proper immersive and realistic 2D learning environment.

Writing the scripts with high-quality motivational responses is not just about wording. It is about creating a natural flow of interactions that involves great sensitivity and attention to verbal and non-verbal aspects of communication while respecting values such as empathy, collaborative partnership, acceptance, affirmation, and so on. Such an endeavor is easier to put into action spontaneously in real-time interactions. This challenge is well summarized by Villaume, Berger & Barker (2006): "While the processes and skills of MI are theoretically understandable, using them in individual utterances requires a considerable adjustment of vocabulary, grammar, emotional tone, and rhetorical strategy. Trying to work through these adjustments in real time with a standardized patient is difficult."

Adding to the complexity of the actions to be performed is the lack of guidance on how to create and translate preprogrammed interpersonal nurse-patient interactions. It is easy to become quickly overwhelmed by the multiplicity of alternative scenarios and the growing decision tree (arborescence) if we do not limit the number of points at which learners can make choices as well as the number of options they have.

At the same time, as we were writing the script, SimforHealth had to design immersive and realistic nurse-patient interactions in a virtual learning environment, which was challenging. The decision tree is a kind of backbone for the nursing content, but it needs to be enhanced with graphic design, such as representing the real appearance of the VP's digital facial expression and behavior. This is key to getting a better commitment from the learners.

Strategies: Creating a collaborative and work-in-progress writing template

It is certain that we cannot make the nature of relational skills less complex, be they consistent with MI or not. However, the VP simulation's clinical inventors, as educators, were accountable for being skilled with using MI to be able to transfer theoretical knowledge in an understandable way within the VP simulation and allow for an optimal learning experience. The quality of the VP simulation depends partly on the inventors' expertise. In the working committee, the *codevelopment* involved knowledge transfer and an opportunity for discussion between these 2 members, given that one (JP) has expertise in MI whereas the other (GR) was new to this theory.

We had to build up our own method and find our own guidance to develop the VP simulation. The writing journey required a high level of creativity and inductivism. The flow of the storyline evolved over time, with a concern for making connections with theory and practice, so that nurses would benefit from a constructive and positive learning experience. In doing so, teamwork was the most important success element. To begin with, the 2 members of the working committee (GR & JP) worked in close collaboration to write the content for the nurse-patient consultation. We created a writing template (Multimedia Appendix 4) that evolved over time and represented a guide for both the clinical and the VP team. We wrote the script as a *choose-your-own-adventure* book, that is, by starting to write the green pathway, and then adding the red pathways. In addition, the role of the learners' emotions and feelings was taken into account.

> *From our perspective, the conception of the clinical content (scenario) had to depict the nursing practice (ie, what nurses actually do) without falling into stereotypes or judgments. The clinical content inventors themselves had to be consistent with MI principles and values in their way of translating the educational content to the simulation. Learners had to recognize themselves in the whole scenario (including traps and roadblocks) to be engaged with and immerged in the learning experience (fidelity).*

This principle is comparable to what Yardley, Morrison, Bradbury, & Muller (2015) call "promotion of a learner's positive experience and relatedness."

Strengths of the virtual patient simulation

We believe our VP simulation has a long life span because the action of adopting relational skills consistent with MI is stable, and does not need regular updates, as it would if the simulation focused on pharmacological treatment, where scientific breakthroughs happen frequently. Behavioral change counseling techniques (eg, asking open-ended questions, summarizing) are timeless. Another strength is that communication is a transversal skill used by all nurses, from novice to expert, and also by all other healthcare professionals. Relational skills are then applicable independently of the healthcare professionals' roles, the context of practice or level of experience, and of the population they care for. Focusing on this clinical behavior is a good avenue to ensure the adaptability, sustainability, and efficiency of this VP simulation. We ensured the integrity and quality control (Lavoie et al., 2014) of the MI intervention by relying on original work by authors on MI (Miller et Rollnick, 2013b) and by involving nurses who are experts in this approach: one nurse was involved in the design of the French content and a certified trainer in MI revised the English version. Furthermore, the involvement of a patient-partner added value at the early stage of the project, adding insight into the credibility and fidelity of the storyline and about the graphic design of the VP simulation. It is a theory-informed intervention, and thus, we are confident in the quality of the clinical content and its potential to induce a practice change.

7.1.6 Conclusions

The knowledge gained from our experience of VP simulation codevelopment has the potential to optimize the development process of other VP simulations, particularly those using a narrative approach. VP simulation is only the means to support learning; it is not the technology per se that generates learning (Clark et Mayer, 2016). Many elements were put together to create favorable conditions for generating a positive learning experience. We strongly believe that the duration of the codevelopment process can be shorter if developers have a clear idea of the theories to use to structure the VP simulation (eg, SBN, MI, adult learning theories) and if they know which approach fits (eg, narrative, problem-based) with their perspective of the clinical behavior or action to address. This paper offers concrete examples of how to translate behavior change counseling techniques deriving from MI into an asynchronous and preprogrammed nurse-patient dialogue. The inductive approach used in codeveloping the content of the VP simulation was a transformative learning experience for the working committee.

With a view to professional development, nurses will have the opportunity to try this VP simulation, informed by experiential, theoretical and empirical knowledge, and thereby help evaluate it. The standardized nature of the intervention is a strength of this approach that could be helpful for evaluation purposes. If the nurses' relational competencies are enhanced, then the quality of the therapeutic relationship between nurse and patient may benefit and, ultimately, this can have positive repercussions on the health of people living with HIV.

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Conflict of interest

JC, the University of Montréal Hospital Research Centre and SimforHealth are linked by a partnership contract. SimforHealth is the owner of the MedicActiv platform that supported the VP simulation and

was involved throughout the codevelopment process. GR and JP codeveloped the clinical content of the VP simulation and JC validated it.

Abbreviations

2D: two-dimensional
CIHR: Canadian Institutes of Health Research
CPD: continuing professional development
FRQS: Fonds de recherche du Québec–santé
MI: motivational interviewing
SBN: strengths-based nursing
VP: virtual patient

Multimedia Appendix 1. Definitions and concrete examples of relational skills that are consistent with the proficient use of motivational interviewing

Behavioral change counseling techniques	Definitions	Concrete examples of the simulated nurse-patient dialogue
Asking open-ended questions	The purpose of this type of question is manifold: to invite patients to reflect and elaborate; to gain an understanding of the patient's frame of reference; to strengthen the collaborative/working relationship; to explore the situation in order to then find a clearer direction toward a possible change; to contribute to evoking the patient's own motivation, goals and values; and to help plan the change goal.	Nurse: "What else is going on in your life these days?"
Affirming	Nurses place the emphasis on one of the patient's positive aspects (strength, resource).	Nurse: "Yes, you do have experience and you stuck to your treatment very well for a long time."
Reflective listening	Reflective listening is an essential MI[a] skill in which reflection is used. A reflection is a nurse's affirmation or hypothesis based on their understanding or interpretation of what the patient said, which then allows the patient to validate or adjust the meaning ascribed by the nurse.	(See the examples below)
Simple reflection	A simple reflection consists of repeating a patient's words, remaining very close to what they say without adding any content or additional meaning. It is essentially an invitation to pursue or develop an idea further.	Patient: "I don't want to change medication anymore… I'll be retiring soon, and I really want to enjoy it to the fullest." Nurse: "You want to be healthy in order to enjoy your retirement and to face all of your other responsibilities."
Complex reflection	A complex reflection entails using the patient's words and adding meaning or a hypothesis about what the person seems to be feeling. It can add impetus to the exploration process centred on the patient's situation.	Patient: "I'm really busy at work. The stock market is constantly moving, I have a lot of meetings and there's staff turnaround too. We're very focused on performance and productivity. It's intense…" Nurse: "You are overloaded at work lately. That causes you a lot of stress."

Double-sided reflection	This sort of reflection serves to render both sides of the patient's ambivalence explicit. Nurses might pick up what patients say as follows: "On the one hand, you're saying that… and on the other hand, you're saying that…"	Nurse: "On one hand, you would like to share your HIV status with your mother. It would make life easier and it would allow you to share what you're going through with her, which is important to you. On the other hand, it's not the right time. According to you, your mother is not ready to learn that you are HIV positive. And this is a time in your life when you do not feel that you can manage her reaction; the situation would be worse if she knew."
Summarizing	Summarizing serves to expose patients to various elements that might be linked to one another. By presenting these elements in this manner, patients are afforded an overview of their experience. It is also a way of showing them that you are paying attention to what they say.	(See examples related to each type of summary)
Linking summary	This serves to tie elements together and to integrate one or more elements touched upon previously (during the same meeting or at a previous one).	Nurse: "So, to recap the situation, taking care of your mother is very important to you. You are doing everything you can to protect her wellbeing: even going as far as hiding your own health status to protect her."
Collecting summary	This serves to dig deeper into the patient's situation.	Nurse: "I understand you are very tired and stressed. Your work is very demanding with the stock markets fluctuating, meetings added on, a new co-worker to supervise, and all that on top of your regular duties. What else is going on in your life these days?"
Transitional summary	This serves to group together everything that seems important and to prepare a shift to another subject.	Nurse: "To summarize, first there's work which takes a lot of your energy and even more so these days because of the stock markets and having to supervise a new co-worker. Then there's your family which also takes a lot of your time: you are adjusting to living with your mother, and things are tense between you and your brother and sister. Your private life is also affected. Would you add anything to that? (open-ended question)

Providing information and advice using the "Elicit-Provide-Elicit" approach	Elicit-Provide-Elicit is a technique recommended in MI for exchanging information while affirming the patient's expertise and autonomy. This technique requires asking the patient for permission to elaborate, for example, a change plan with him, seeing what will work for him, listening to him and getting his feedback. For example, providing reading materials and leaflets is a good intervention in and of itself as long as the patient has given his permission to do so, and that it corresponds to his needs. The first "elicit" refers to all the questions that are put to patients PRIOR to providing any information. "Provide" corresponds to a small amount of information conveyed to patients, if necessary and with their permission. Finally, the second "elicit" aims to allow patients to integrate the new information into their decision-making process.	Nurse: "Is it all right if we go over your latest viral load results?" (*Asking permission*) Patient: "Yes, because I am worried about that." Nurse: "What might cause a viral load to increase?" *(Elicit)* Patient: "When the HIV becomes resistant to treatment. The medication doesn't work anymore, so the treatment has to be changed." Nurse: "Would you like me to share with you some tips and ideas which have been tried by other people living with HIV? (*Asking for permission*) Patient: "Yes, I'm listening." Nurse: "Then it'll be up to you to determine which of these work best for you."(*Autonomy*) Patient: "Alright." Nurse: "Based on your experience, you could continue to set your alarm. You could leave a few pills at work in a different bottle than the original one, and leave them in a locked drawer. And at home, you could have some of the pills in your briefcase."(*Provide*)
Eliciting change talk by using confidence and change scales	Using a scale from 0 to 10 allows patients to express themselves on, notably: perceived confidence in one's ability to make changes (confidence ruler), and one's willingness to make changes (readiness ruler and change ruler).	Nurse: "On a scale from 0 to 10, how confident are you in your ability to take your medication: 0 being not at all confident and 10 being totally confident?" Patient: "I would say…6 out of 10." Nurse: "What makes you say 6 and not 2 out of 10?"
Evoking a hypothetical change	Evoking a hypothetical change allows patients to project themselves into a future different from the present and to imagine its advantages. Here is an example of such a nursing intervention.	Nurse: "Right now, you're keeping your condition hidden from your mother. But let's imagine she knew: What difference would it make?"
Using guiding style of counselling	The guiding style is the one preferred for MI. It stands midway between the directing style and the following style. Nurses who guide patients possess good listening skills	This guiding style is used throughout the virtual patient simulation by the use of relational skills that are consistent with MI.

	and mobilize their expertise when necessary. Nurses nevertheless have a strategic goal when guiding patients in exploring their motivation for a potential change and their ability to make it. The spirit of a conversation about change should be more akin to dancing than to wrestling, whereas the former affirms the patient's freedom to make their own choices. The guiding style is preferred by the virtual nurse in the digital simulation.	

[a]MI: motivational interviewing

Multimedia Appendix 2. Definitions and concrete examples of relational skills that are inconsistent with motivational interviewing -traps or roadblocks-

Healthcare providers can fall into these traps despite their best intentions to help their patients. A limitation of these written concrete examples is their inability to portray the friendly and respectful tone of voice of the nurses who want to support their patients.

Traps	Definitions	Concrete examples used in the simulated nurse-patient dialogue
Counseling style of directing	Nurses provide information and give advice without it being solicited by the patient. Implicitly, the directing counselling style implies "I know what you should do, and here's how to do it." (Miller et Rollnick, 2013b). It is understood that patients who receive the information should follow the nurse's (good) advice and comply.	Mr. Wilson has decided to keep his HIV status hidden from his mother. How does he plan to continue to take his medication as prescribed? In that case, if the nurse offers and provides solutions based on her experience, without first asking the patient how he plan to address this obstacle, then, this is an example of directive or prescriptive counselling style.
Expert trap	The nurse is the expert directing the structure and the content of the conversation. Mr. Wilson is invited (implicitly) to follow her lead. The nurse prioritizes what she feels is most problematic and offers resources without the patient expressly asking for them. There is a risk that the patient may disengage from the relationship, if not discontinue it entirely.	Patient: "I might have missed a dose... But it really doesn't happen often. It's human to forget sometimes. Even though it rarely happens..." Nurse: "Even though it happens rarely, you have to try not to forget."
Righting reflex trap	This is an instinctive intervention driven by good intentions on the part of nurses in favour of change (eg, for ART intake). However, "argue for one side and the ambivalent person is likely to take up and defend the opposite" (Miller et Rollnick, 2013b). When people are ambivalent about two options, the fact is that they already have two voices confronting one another inside their head (change talk and sustain talk). When nurses take a stand in favour of change within this "internal committee" ("You should do this… It is important that you understand that…"), they invite patients to justify themselves ("yes, but… it's because…"). In a way, these nurses cede the floor to sustain talk and	As its name suggests, this is a reflex commonly used in the nursing practice, albeit in good faith, by nurses who wish to correct a problem. The nurse therefore suggests resources even though the patient hasn't asked for any. This may cause, on the part of the patient, resistance and/or disengagement from the therapeutic relationship. Rather than offering solutions to the perceived problems, it is preferable to first encourage the patient to talk about his experience and his needs. Solutions can be explored at a later time.

	patients hear themselves go through reasons for maintaining the status quo instead of reasons for changing. Even when it is driven by the best intentions in the world, the righting reflex can elicit shame, anger and discouragement in patients.	
Assessment trap	Nurses with the best intentions ask questions in order to find out a load of information that will allow them, in their opinion, to help their patients. This puts nurses in an active role and patients in a passive role. Insisting with an active assessment affords patients little opportunity to explore their motivation and their reasons (for example) for taking their medication and to share their own arguments in favour of this behaviour. The role of patients thus boils down to answering the questions put to them. This being said, assessments obviously fall within the scope of nursing practice and they are necessary. In certain emergency situations (eg, assessing risk for health deterioration or suicide risk), assessment is essential and fundamental.	Here are the key signs (or cues) of the assessment trap: Questions centre primarily on factual elements (eg, medication intake, intake conditions, omissions, side effects, conditions that might prevent medication absorption, interactions with other substances). Questions are closed (did you, have you) or prompt patients to justify themselves (why…).
Closed questions trap	As an extension of the assessment trap, the purpose of closed questions is to obtain specific information. This type of question generally generates short answers.	Nurse: "If I understand correctly, you can't rely on them (brother and sister) for support?"
Premature focus trap	Nurses fall into this trap when they make an issue a priority, which is not necessarily a priority for the patient. Nurses insist on talking about the "real" problem at the expense of the patient's priorities. Nurses do this with no ill intent, they just want to help. However, patients may disengage from the relationship and even put an end to the follow-up.	(*Mr. Wilson arrived at the nurse's office a few minutes ago.*) Patient: "I've had it up to here lately. It's really not the right time for that." Nurse: "Mr. Wilson, since I've known you a long time, I know you've already been through a period when your viral load was detectable because your medication intake was irregular. Would you say this is a similar situation?"
Blame trap	Nurses fall into this trap when they focus their intervention on the cause of the problem (e.g. detectable viral load, adherence questioned). They prompt patients to explain why the problem is so instead of asking them what	Nurse: "Your brother and sister are not very motivated to take care of your mother."

	could be done for things to be different. Patients tend to be defensive and may apprehend this dynamic even before the consultation	
Chat trap	Nurses and patients are just chatting beyond what is appropriate when the discussion takes place, leading to insufficient direction in the conversation. A large amount of "small talk" has little chance of having a positive impact on the individual changes a patient should make. This type of off-topic information should be kept within reasonable limits in the conversation.	Patient: "Well, I just have less time to think of everything, with work and taking care of my mother. I have a hectic schedule. I try to prioritize as best as I can but, let's just say I'm under a lot of pressure." Nurse: "Your situation reminds me of something else. If you don't mind, I'd like to make a slight digression before coming back to our conversation. My cousin works in finance. I agree that your working conditions are not reasonable."
Fear trap	A message of fear can evoke sustain talk from the patient (Miller et Rollnick, 2013b), which in turn can lead them to the path of avoiding rather than approaching change, inspired by (Godin, 2012).	Patient: "My viral load is 1000. I just can't believe it…You remember: before my treatment changed, my viral load had been undetectable for 6 years…" Nurse: "It is important to act fast to reduce the viral load. As you know there is a risk of resistance linked to a detectable viral load. In this case, changing the treatment is sometimes necessary."

Multimedia Appendix 3. Key elements of the virtual patient simulation

Intervention		
Elements	**Subelements**	**Descriptor**
Simulation codevelopment	Duration	The codevelopment of the VP[a] simulation was undertaken over a 16-month period [August 2017 to December 2018]; the English adaptation, over a six-month period [December 2018 to June 2019].
Simulation approach	Simulation type	Narrative approach (Bearman, 2003) or situational e-simulation (Cant et Cooper, 2014).
	Simulation modality – Virtual patient	A Web- and screen-based program, available on computer or tablet, that allows learners to interact with a two-dimensional animated human character called the "virtual patient." Learners emulate the role of the healthcare providers, within a first-person perspective.
	Simulation functionality	Some choices made by the learners in the simulation impact the virtual patient's reaction/response (cause and effect), and then the flow of the nurse-patient conversation, while other choices don't bring any change. Learners can make many mistakes and are always invited to make different choices to go back to the "good" pathway.
	Simulation access	Learners have to create an account on the MedicActiv platform. In doing so, a secured URL was given to the nurses to allow them to create an individual account. The simulation is not accessible via mobile phone.
Learner orientation	Orientation to the simulation environment	As a self-directed learning process that is provided individually, the introduction (prebriefing) to the simulation is video and text based. The video introduction is facilitated by the nursing student–researcher in charge of the project. Written information is given to orient the learners' navigation on the MedicActiv platform.
Simulation environment	Location	It is planned that nurses can use the simulation in a convenient location (eg, from the workplace, home).
	Equipment	The virtual patient simulation is available in two versions: 1) online, and 2) application. Both versions are accessible with computer/laptop or tablet devices with stable internet connectivity with additional audio-visual display equipment. The application version supports higher-quality graphics than the online version does.
Simulation event script	Event description	The simulation is supported by written instructions to guide the learner's navigation.
	Learning objectives	Spot traps in nursing interventions that can shut down communication with the patient and that enable sustain talk.

		Identify and apply nursing interventions that optimize openness to the patient's experience. Identify cues in the patient's speech that reflect change talk. Choose and apply nursing interventions that elicit change talk. Describe the principles consistent with motivational interviewing that structure information sharing with the patient. Target the key elements that are important to include in providing information to the patient. Identify principles to build an action plan with the patient.
	Mode of evaluation	Within the MedicActiv platform, a functionality allowing a choice between two evaluation modes: 1) summative evaluation, with a final "score," in which learners cannot change their choices/answers during the learning activity; 2) formative evaluation, which allows learners to change their answers throughout the simulation. These evaluation modes may impact the learners' experience during the simulation. We didn't want learners to feel as if they were in an "exam period," but rather we wanted to create a constructive environment and a low level of stress. We set functionalities so that nurses can change their answers to the quizzes throughout the simulation to allow them to learn from their mistakes. This formative evaluation is in line with the clinical team's vision of continuing professional development.
	Preparation of actors	Voice-overs of the virtual nurse and patient were produced by French- and English-speaking professional actors. They were guided to use a respectful, empathic, nonjudgmental tone of voice and to share feelings in an authentic way (eg, patient's concerns) for both communication skills, consistent or not with motivational interviewing. All dialogues were scripted.
Exposure	Duration	There is one consultation session. The duration of the VP simulation is expected to vary depending on: the good/bad choices made by the learners; the time spent carefully reading the feedback and additional information materials (such as the glossary). The duration is around 45 minutes.
Participant group	Frequency/repetitions	Learners may stop their participation at any time and then reconnect to continue at the same place as they left off the previous time.
	Predictability of simulation	The VP simulation is consistent with predictable storyline progression based on branching algorithms across all learners. The story has the same end for everyone.
	Learner characteristics	The simulation is applicable to all nurses (and potentially healthcare providers), from novice to expert, as long as they have minimal computer literacy skills.

	Learner roles	The learner is compelled to act as 1) an observer of the situation, in which the virtual nurse may be seen as a role model, and 2) an active participant.
Simulation element design	Introduction: prebriefing	The prebriefing video (https://youtu.be/hE4oVY-EZ7c) lasts 12 minutes and contains seven sections: 1) nursing student–researcher's background and a summary presentation of the project; 2) qualitative research findings based on HIV nurses' experiences (origin of the project); 3) definition and functioning of the VP simulation; 4) introduction to motivational interviewing; 5) four cores values (or the spirit) of motivational interviewing; 6) general learning objectives; and 7) invitation to be on the lookout for certain interactions between the virtual nurse and the patient.
	Patient's electronic record	Learners are invited to look at the six rubrics of the patient's electronic record before starting the consultation: 1) psychosocial history and vulnerability factors; 2) lifestyle; 3) HIV history; 4) medication history; 5) clinical notes from the microbiologist and nurse; and 6) purpose of the consultation.
	Full script of the nurse-patient consultation	The script is divided into the four processes (Table 2) of motivational interviewing: 1) engaging; 2) focusing; 3) evoking; and 4) planning. Multimedia Appendix 5 contains an excerpt of the full script.
	Fidelity and its modes: physical/conceptual/ emotional and experiential	See the section "Modes of fidelity to ensure learners' engagement and immersion in the VP simulation."
	Quizzes	There are 14 quizzes, allowing learners to reflect on the most appropriate intervention to elicit change talk and to open up on the patient's experience. Most of questions are multiple-choice, while a few are open-ended. The quizzes are practice-based: "What would you do in this case and how would you respond to Mr. Wilson?" Usually, there is only one good answer (green pathway) consistent with motivational interviewing and a couple of traps (red pathway) that are often used reflexively by healthcare providers.
	Feedback – Timing	Synchronous written feedback provided right after the learner has made a choice (quiz).
	Feedback – Source	Feedback mechanisms are organized in two ways: 1) the learners' answer following a quiz does not change the flow of the nurse-patient conversation because learners have to redo the quiz until they select the right answer; 2) the learners' answer changes the flow of the dialogue and then they have to observe the effect of the chosen intervention on the patient's reactions and speech. After a short observation period,

		learners are invited to redo the quiz until the right answer is chosen.
	Feedback – Content	The structure of the written feedback is: 1) the name of the communication skill or behavior change counseling technique or trap (eg, directive counseling style); and 2) the reason why this intervention is consistent or not with motivational interviewing, and the consequences of using it in relational (dis)engagement with the patient.
	Visual cues – green and red labels	Labels are represented with green or red insets that appear during the dialogues. A green label means the learner is on the right track, that is, the intervention is appropriate; a red label means it's not. In other words, these labels, developed specifically for this project, are a form of constructive feedback.
	Glossary	The glossary is a supplementary electronic educational material containing 20 pages on motivational interviewing theoretical concepts, definitions and applications, with concrete examples from the simulation (see Table of Contents in Multimedia Appendix 5).

[a] VP: virtual patient

Multimedia Appendix 4. Excerpt of the final writing template

ENGAGING PROCESS (first step of the nurse-patient consultation)	FEEDBACK (including green & red labels)
(In blue : automated dialogue) Introduction	
Nurse: Hello Mr. Wilson. How are you?	
Patient: (*Visibly bothered or worried*): I'm OK…but I'm in a bit of hurry.	
Nurse: The doctor spoke to you about the results of your viral load and CD4 count.	
Patient *(Visibly flabbergasted*): Yeah…My viral load is 1000. I just can't believe it…You remember: before my treatment changed, my viral load had been undetectable for 6 years… (*silence*)	
# 1. QUIZ (single choice question)–React to detectable viral load Which of these interventions seems most appropriate to you in response to Mr. Wilson's remarks? *"My viral load is 1000. I just can't believe it…You remember: before my treatment changed, my viral load had been undetectable for 6 years…"* For additional information refer to the glossary. Note for VP simulation team: When user clicks on one option or the others, the automated dialogue starts, attached with the corresponding label, and the written feedback is given.	
Answer 1: (*Reassuring, soothing tone*[a]) You really weren't expecting this. You are shocked by the results of your viral load this morning. (True)	✓ Complex reflection (Good answer) The style of communication used aims to guide the conversation. A complex reflection is a way of adding meaning or hypothesis to what Mr. Wilson said. Click on "Continue" to return to dialogue.
Answer 2: (*Reassuring, soothing tone*) I can imagine it's difficult to follow a new course of treatment. But don't worry, many people living with HIV go through this. I can suggest some tips. (False)	X Directive communication style and expert trap The directive communication style places the nurse in the role of the expert. The patient is (implicitly) invited to follow her lead. There is little room given for the patient's own experience. Select another answer ("Continue") which aims to explore Mr. Wilson's reaction to the results of his viral load.
Answer 3: (*Nurse's reassuring tone: Wants to express to the patient that there is no need to feel threatened)*	X Directive communication style and expert trap The directive communication style places the nurse in the role of the expert. The patient is (implicitly) invited

I know you were undetectable for a long time. And actually, we are going to look at ways to get you back to being undetectable. You're in the right place and I'm going to help you. Let's start by discussing how you take your medication. (False)	to follow her lead. There is little room given for the patient's own experience. Select another answer ("Continue") which aims to explore Mr. Wilson's reaction to the results of his viral load.
Answer 4: (*Reassuring tone*) It is important to act fast to reduce the viral load. As you know there is a risk of resistance linked to a detectable viral load. In that case, changing the treatment is sometimes necessary. (False)	X Fear trap This message can cause a sense of fear leading the patient on the path of avoidance rather than change. Select another answer ("Continue") which aims to explore Mr. Wilson's reaction to the results of his viral load.
Note for the VP simulation team: Go back to automated dialogue following quiz no. 1 (Mr. Wilson overwhelmed by the situation)	
Patient: *(overwhelmed by the situation)* No…well…It's just that…I've had it up to here lately. This really isn't the right time for that.	
The "Engaging" process is completed. Now choose the next step, "Focusing", to continue the interview.	
FOCUSING PROCESS	FEEDBACK (including green & labels)
#2. QUIZ – Opening up about patient's experience (single choice question) In the case of Mr. Wilson's clinical picture, it seems appropriate to address the topic of medication with him. The following options are all designed to address this topic one way or another. However, taking into account what Mr. Wilson has said: *"I've had it up to here lately. It's really not the right time for that",* which would be the priority action to take to most likely encourage him to open up about what he's going through?	
Answer 1: First, I have to reassure Mr. Wilson and normalize the fact that he has a lot to handle, by saying for example: "I do understand, we are all very busy this time of year! But don't worry, the holidays will soon be here." (False)	X Traps – False reassurance, non-recognition of emotions In response to Mr. Wilson' emotional remarks, rational arguments are stated. This is a form of normalization of emotions. Select another answer ("Continue") which aims to encourage Mr. Wilson to open up about his experience
Answer 2: I should first assess the possible causes that would explain his blood test results. For example: "Mr. Wilson, allow me to go over with you what could be causing your viral load to be detectable." (False)	X Trap – Assessment Beginning a consultation by assessing the possible causes of a detectable viral load places the nurse in the role of the expert, and the patient in a passive role which can jeopardize the engagement in the relationship. Select another answer ("Continue") which aims to encourage Mr. Wilson to open up about his experience
Answer 3: First, I need to understand and explore the patient's concerns. I can pick-up from Mr.	✓ Simple reflection

Wilson' comment: "It's really not the right time for that." (True)	The use of simple reflection consists in repeating the patient's last words or statement to allow them to go on with the conversation. Mirroring the preceding emotion expressed by Mr. Wilson, rather than immediately attempting to find causes to the increased viral load, improves the chances of opening up the dialogue. Continue the dialogue ("Continue") and pay close attention to Mr. Wilson's remarks.
Answer 4: First, I must subtly approach the topic of treatment adherence as the main cause of his detectable viral load: "Mr. Wilson, since I've known you a long time, I know you've already been through a period when your viral load was detectable because your medication intake was irregular. Would you say this is a similar situation?"	X Premature focus trap, blaming trap, directive style trap, expert trap Premature focus arises when focusing on and determining too quickly the purpose of the consultation. Despite her best intentions, the nurse prioritizes what she sees is most problematic for Mr. Wilson (addressing his viral load), when in fact he has not made it a priority. There is a risk the patient may disengage from the relationship, if not discontinue it entirely. Select another answer ("Continue") which aims to encourage Mr. Wilson to open up about his experience

[a] This is an example of guidance provided to actors for the recording of voice-overs. Learners don't see this type of comment.

Multimedia Appendix 5. Table of contents of the glossary

Multimedia Appendix 6. Prebriefing video

- https://youtu.be/hE4oVY-EZ7c (link to the video)

Multimedia Appendix 7. Demonstration of the virtual patient simulation

- https://youtu.be/IFi4CH77s5Q (link to the video)

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8 Chapitre 8. Résultats – Volet 3

8.1 Article 5. Virtual patient simulation to improve nurses' relational skills in a continuing education context: A convergent mixed methods study[13]

8.1.1 Résumé

Ce cinquième et dernier article de la thèse expose les résultats découlant de la réalisation d'une étude mixte à devis convergent pour évaluer l'acceptabilité de la simulation numérique auprès des infirmières dans un contexte de formation continue. Bien que, pour aborder les habiletés relationnelles, la simulation numérique avec patient virtuel demeure un champ connu et documenté, il a été peu exploré auprès des infirmières en soutien à leur développement professionnel. Les objectifs de recherche nous ont permis de décrire les perceptions qu'ont les infirmières de la simulation à différents égards (ex. : rôle de la simulation pour soutenir la pratique, pertinence et nécessité des éléments composant la simulation), d'explorer leur expérience d'apprentissage de même que la contribution de la simulation pour le renforcement des habiletés relationnelles. Les résultats sont présentés en respect de leur séquence dans la collecte de données. Dans les annexes suivant l'article, nous avons rapporté des informations additionnelles pour assurer la transparence de notre démarche, pour justifier le devis mixte et l'approche d'intégration des résultats quantitatifs et qualitatifs, en plus de fournir des tableaux détaillés des résultats quantitatifs.

8.1.2 Abstract

Background: Nurses must meet professional standards by attending continuing education activities. Despite the potential of virtual patient simulation in nursing education, it has rarely been used in nurses' continuing education to address relational skills. We developed an automated virtual patient simulation informed by motivational interviewing to enhance nurses' relational skills. The simulation features an HIV-positive man struggling to adhere to his medication. Quizzes and feedback loops embedded in the simulation allow learners to observe the consequences of their choices. This study aimed to assess nurses' perception of simulation's acceptability. Specific objectives were: to measure the simulation

[13] Rouleau, G., Gagnon, M-P., Côté, J., Richard, L., Chicoine, G., & Pelletier, J. *(Under revision).* Virtual patient simulation to improve nurses' relational skills in a continuing education context: A convergent mixed methods study. *BMC Nursing.*

design elements, its role in supporting practice, its quality and technology acceptance, and the achievement of learning objectives; to explore nurses' learning experience.

Methods: We performed a convergent mixed methods study by combining a quantitative pre-experimental, one-group post-test design and a qualitative exploratory study. We used convenience and snowball sampling approaches to select registered nurses (n=49) working in Quebec, Canada, who self-reported as having basic computer literacy skills. Participants completed an online sociodemographic questionnaire, consulted the simulation, and filled out an online post-test survey. Descriptive statistics (mean, SD, median, interquartile range) were used to present quantitative findings. From the 27 participants who completed the simulation and post-test survey, five participated in a focus group to explore their learning experience. The discussion transcript was subjected to thematic analysis.

Results: Nurses perceived the simulation to be highly acceptable. They rated the global system quality and the technology acceptance with high scores. They reported having enjoyed the simulation and recommended other providers use it. Four qualitative themes were identified: motivations to engage in the simulation-based research; learning in a realistic, immersive, and non-judgmental environment; perceived utility of the simulation; and perceived difficulty in engaging in the simulation-based research.

Conclusions: The simulation contributed to knowledge and skills development on motivational interviewing and enhanced nurses' self-confidence in applying relational skills. Simulation holds the potential to change practice, as nurses become more self-reflective and aware of the impact of their relational skills on patient care. Relational skills are fundamental to high-quality nursing care.

Trial registration: ISRCTN18243005, retrospectively registered on July 3 2020.

Keywords: computer simulation, communication, nursing continuing education, motivational interviewing, mixed method, nurses, relational skills, simulation training, virtual patient simulation, HIV

8.1.3 Background

Throughout their career, healthcare professionals including nurses must meet professional standards by attending continuing education (CE) activities (Bakenko et al., 2017; Fleet et al., 2008). Fostering professional growth, career satisfaction and goal achievement, these CE activities allow nurses to maintain and update their competencies, and ultimately, to provide high quality and safe nursing care

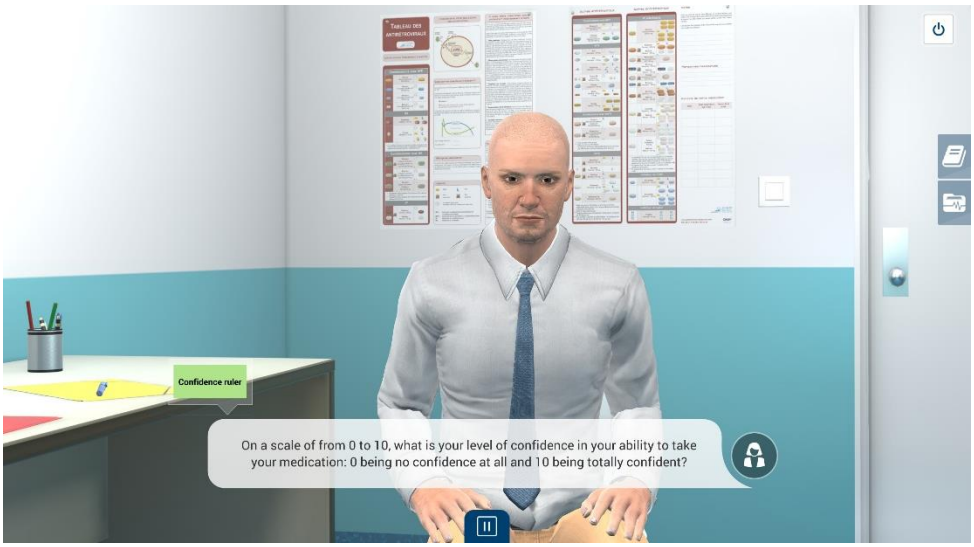
to patients (Fleet et al., 2008; Price et al., 2017). Considering the barriers that keep some healthcare professionals from attending CE activities, such as staff shortage, cost, travel time, and competing demands (Coventry et al., 2015), the use of virtual patient (VP) simulation in health professions education is a promising training modality to consider. VP simulation can be defined as an interactive computerized simulation that relies on real-world patient scenarios for the training, education, and assessment of healthcare professionals (Ellaway et al., 2006). VP simulation makes learning flexible and convenient, as users choose the time and space where training occurs. It can also reduce the use of costly resources, and be disseminated to a broad range of healthcare professionals in various settings across far ranging geographical areas (Cant et Cooper, 2014; Peddle et al., 2019). Simulation gives nurses the opportunity to practice with a VP in a safe learning environment; indeed, they can make mistakes without causing real patients any harm (Kaplonyi et al., 2017).

Use of VP simulation in health professional training has grown exponentially in the past decade, as many literature reviews in the field have shown (Bracq et al., 2019; Cant et Cooper, 2014; Consorti et al., 2012; Cook, Erwin, et al., 2010; Kononowicz et al., 2019; Peddle et al., 2016). Medical education is the most targeted context in these reviews, followed by nursing. When the discipline of nursing is explored, the studies included in the reviews have mainly focused on undergraduate nursing students; the uptake of VP simulation for practicing nurses remains low. Simulation-based learning experience showed a smaller effect size of simulation-based research among staff nurses than among nursing students (Cantrell et al., 2017). One possible explanation of this difference lies in the challenges that nurses experience in the clinical setting (e.g. supplies, time, costs) that could hinder simulation-based research in practice and, consequently, reduce its potential effectiveness.

In an integrative review (n=18 studies) focusing on web-based simulation used in nursing education programs (Cant et Cooper, 2014), most of them (n=10) focused on procedural skills (procedural e-simulation) involving nurses' use of clinical reasoning in various situations such as cardiac resuscitation, recognition and management of critically ill patients, and care for children. In eight programs, nurses or nursing students were taught about communication and interpersonal skills (situational e-simulation) or technical skills (technical e-simulation), such as intravenous cannulation (Cant et Cooper, 2014). The use of VP simulation to improve relational skills is documented among students and other healthcare providers (Bracq et al., 2019; Peddle et al., 2016), but it is less common among graduate nurses in a CE context (Cant et Cooper, 2014).

In response to the paucity of this type of educational intervention for nurses, and based on a previous qualitative study exploring nurses' practice and challenges in the context of HIV care (Rouleau, Richard, et al., 2019), we developed a VP simulation with the aim to improve nurses' relational skills (Rouleau et al., 2020). The clinical case scenario is the story of Mr. Wilson, an HIV-positive man having difficulty taking his antiretroviral therapy. The clinical content is informed by motivational interviewing (MI) (Miller et Rollnick, 2013b). The core of the simulation is then focused on applying relational skills consistent with MI (e.g., asking open-ended questions, using reflective listening), rather than acquiring HIV-specific knowledge. The screen-based simulation allows users to interact with a two-dimensional animated VP character (See Figure 1). The simulation includes a prebriefing video and text, an electronic patient record, a glossary, and a simulated nurse-patient consultation. The narrative-simulated consultation encompasses quizzes and feedback loops, in which the learners' choices and decisions can influence the VP's speech. Green and red labels were also used as visual and theoretical cues to qualify the nurse-patient dialogue and acted as feedback. Key elements of the simulation are described elsewhere (Rouleau et al., 2020) and are summarized in Additional file 1 in the CONSORT-EHEALTH (Eysenbach et CONSORT-EHEALTH Group, 2011).

Figure 1. Screenshot of the virtual patient simulation



8.1.4 Aims and objectives

This study aimed to quantitatively and qualitatively assess the acceptability of a VP simulation to improve nurses' relational skills in a CE context. Acceptability is defined as "a multi-faceted construct

that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention"(Sekhon et al., 2017, p. 4).

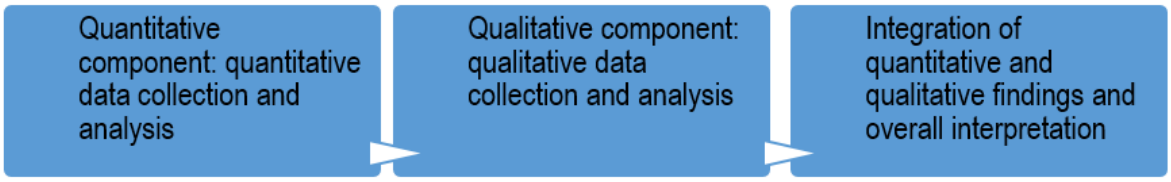
Our specific research objectives were: a) to measure the extent of the VP simulation nurses' perceived acceptability in regards of the simulation design elements, of the global system quality and the technology acceptance, of the role simulation plays in supporting nurses' professional practice, and of the achievement of learning objectives; b) to explore nurses' learning experience; c) to deepen understanding of how the VP simulation can contribute to nurses' uptake of relational skills, to overall learning and its transfer into practice.

8.1.5 Methods

Study design

We conducted a convergent mixed methods study (Figure 2) (Creswell et Creswell, 2018). First, we carried out a pre-experimental study with a one-group post-test design (Campbell et Stanley, 1963) to measure nurses' perceptions of the VP simulation. Second, we used a qualitative exploratory design (Deslauriers et Kérisit, 1997) to describe nurses' learning experience and to further nuance and deepen our understanding of the acceptability of the intervention by using complementary topics that were not covered by the quantitative component. The purpose of the integration of quantitative and qualitative findings was to compare and contrast both components to provide a comprehensive picture of the VP simulation's contribution to nurses' learning. The samples from the quantitative and qualitative components were interdependent as participants were required to complete the VP simulation and the post-test survey before being invited to take part in the focus group.

Figure 2. Convergent mixed methods design



Various reporting guidelines are presented (see Additional file 1). We reported the quantitative component including the simulation description with the CONSORT-EHEALTH (Eysenbach et CONSORT-EHEALTH Group, 2011) and the guidelines for healthcare simulation research (Cheng et

al., 2016). We used the CHERRIES for Internet e-surveys (Eysenbach, 2004); COREQ for the qualitative component (Tong et al., 2007) and GRAMMS for the mixed methods study (O'Cathain et al., 2008).

Quantitative component

Sampling and recruitment

We used convenience and snowball sampling approaches to select registered nurses working in Quebec (Canada) who self-reported having basic computer literacy skills. We used in-person and online recruitment strategies. We distributed leaflets at a conference involving nurses interested in HIV care and at clinical settings. Information was also communicated via online professional newsletters and e-mail to members of the Quebec Order of Nurses (2019) and of the HIV mentoring program (2020). Nurses were also asked to share the information with their colleagues (snowballing). Table 1 contains a summary describing the nurses' journey in the research process.

Table 1. Nurses' journey in the research process

Enrollment, intervention and data collection	Activities
Enrollment: pre-intervention and recruitment [March 22–August 5, 2019]	• Received online information about the study and the consent form (LimeSurvey) • Agreed to previously meet eligibility criteria to get access to the sociodemographic questionnaire: holding a valid nurse's practice licence (participants had to click this criterion online on LimeSurvey) • Filled out online pre-intervention questionnaire, including sociodemographic characteristics, computer literacy skills, MI training, and recruitment strategies (LimeSurvey)
Virtual patient simulation intervention (approximately 45 minutes) [March 22–August 5, 2019]	• Received access to the MedicActiv (SimforHealth, 2020b) simulation platform via a secure URL that contained a unique code for the study • Created an online account • Watched prebriefing video or read scripted text • Had unlimited access and exposition to full simulated scenario (including the patient's electronic record, glossary, and the preprogrammed nurse-patient consultation) during the study period
Data collection (post-intervention) Quantitative component [March 22–August 5, 2019]	• Received online post-test survey (LimeSurvey); completion was mandatory to receive a certificate for three hours of accredited CE o Participants who finished all the VP simulation and filled out the post-test survey were qualified as "completers." The others were called "non-

Qualitative component [September 2019]	completers (i.e. they completed at least the pre-intervention questionnaire, but did not finish the VP simulation). • Online focus group (voluntary)

Outcome measures

We collected quantitative data with LimeSurvey (LimeSurvey Project Team / Carsten Schmitz, 2020) with online post-test survey totalizing 80 closed questions on: 1) VP simulation design elements; 2) global system quality and technology acceptance; 3) role of simulation in supporting nurses' professional practice; 4) achievement of learning objectives. We used a 4-points Likert scale (1 = Strongly disagree; 2 = Disagree; 3 = Agree; 4 = Strongly agree). We developed the majority of the questionnaire for this study (Additional file 2), except the Technology Acceptance Model.

Virtual patient simulation design scale

This scale development was informed by *Simulation Design Scale* (Jeffries, 2005) to measure nurses' perceptions of the simulation design elements (23 items) : 1) context of the VP simulation / prebriefing (3 items); 2) glossary (4 items); 3) electronic patient record (1 item); 4) quizzes, feedback, and labels (11 items); 5) fidelity (4 items). Fidelity is the extent to which the VP simulation approaches reality (Cant et al., 2019).

Global system quality and technology acceptance

We slightly adapted the French-language version (Fontaine et al., 2016) of the *Technology Acceptance Model* (Cheng, 2012) to measure these two main dimensions (total: 27 items): 1) global system quality and 2) technology acceptance. Global system quality is divided into the following constructs: system quality (5 items); information quality (3 items); service quality (3 items); and, user interface design quality (3 items). Technology acceptance includes: perceived usefulness (3 items); perceived ease of use (3 items); perceived enjoyment (3 items); and, intention to use (4 items). The higher the score (range of averages: 1–4), the greater the overall acceptance. The reliability of the original instrument (Cheng, 2012) is demonstrated by a Cronbach alpha of 0.70 to 0.96 while our adapted version of the scale showed these psychometric properties: 0.68 to 1.00.

The simulation's role in supporting nurses' professional practice

Inspired by a validated French translation (Simoneau et al., 2012) of the *Role of Simulation in Nurse Education Questionnaire* (McCaughey et Traynor, 2010) targeting the clinical preparation of students

graduating from nursing programs, we developed a 22 item-tool. It evaluated the actual and anticipated impact of simulation on the nurse-patient relationship and on nurses' communication skills, learning, and confidence in their ability to transfer the relational skills into practice.

Achievement of the learning objectives

This tool was developed to assess nurses' agreement with the achievement of learning objectives (8 items) following their participation in the simulation.

Other questions, measures, and data

Open-ended questions were asked in the post-test survey to gain complementary insights about: a) the VP simulation design elements (e.g. comments about the electronic patient record, fidelity); b) the achievement of additional learning objectives; c) the most and least appreciated elements of the VP simulation; d) recommendations to improve the simulation.

The pre-intervention questionnaire included information on nurses' sociodemographic characteristics, such as age group, gender, education level, workplace setting, previous MI training, and computer literacy skills.

Sample size

A total of 30 participants was targeted to take part in the simulation and fill out the post-test survey. This sample size was determined according to recommendations for pilot studies (Hertzog, 2008; Thabane et al., 2010), considering that acceptability is often an element that is assessed in these type of studies (Sidani et Braden, 2011).

Quantitative data analysis

A descriptive statistical analysis was conducted using Microsoft Excel 2013 (Microsoft Corporation). Means (m), standard deviations (SD), median (med), and interquartile range (IQR) were calculated for continuous variables as well as for counts and percentages for the categorical variables. Fisher's exact test was performed to compare the proportions of participants' characteristics at baseline between completers and non-completers. This statistical test is justified when the sample size is small (Kim, 2017).

Qualitative component

Data collection

The focus group used a semi-structured conversational approach. It aimed to describe in greater detail and further nuance participants' experience of the VP simulation as well as deepen our understanding of particular quantitative items, such as the utility of the VP simulation. The questions used to guide the focus group (Table 2) covered these topics: motivations, perceived difficulties for study participation, and concrete implications for nursing practice. The data collection was performed online through synchronous interactions using the Zoom videoconferencing platform (Zoom Video Communications Inc., 2016). The discussion was recorded after receiving participants' consent.

Table 2. Examples of questions used to guide the focus group

- I'd like to hear about what led up to your participation.
    - How did you hear about the project?
    - What motivated you to take part?
    - How did you get the idea of participating in the simulation?
- In the survey you filled out, everyone agreed or strongly agreed that participating in the virtual simulation was a useful learning experience for their ongoing professional development. How was the simulation useful in your respective work contexts? What did you gain from it?
- What are the strengths of this simulation? What are its weaknesses or areas that could be improved?
- In your opinion, what could explain why some people did not finish their participation in the simulation? What difficulties did you yourself encounter?
- What tangible effects did your participation in the simulation have on your practice? What do you take away from this training activity?

Qualitative data analysis

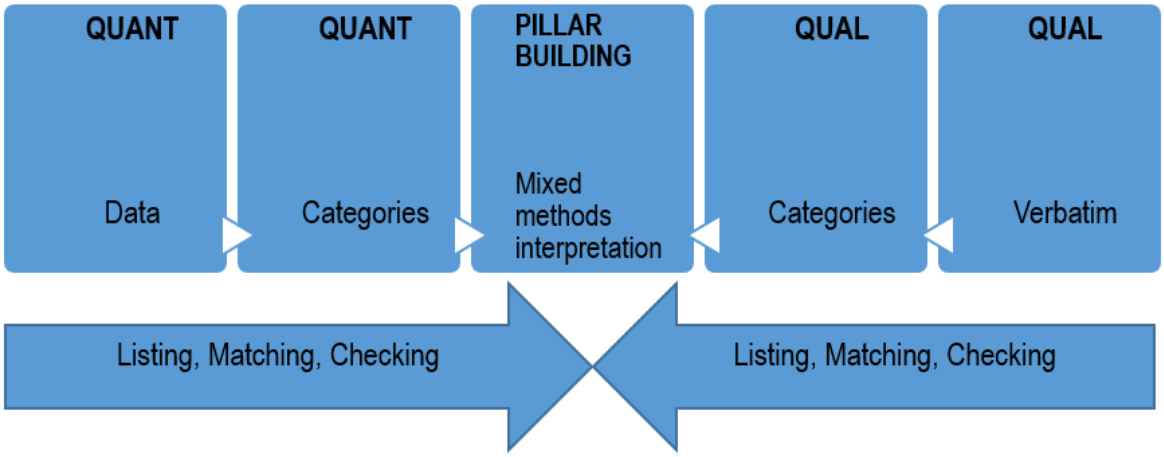
The focus group recording was transcribed verbatim. Qualitative data analysis followed an inductive and iterative process. We thematically analyzed narratives from the focus group (Braun et Clarke, 2006; Paillé et Mucchielli, 2016a). Coding was led by GR and involved comparison across transcripts. The team members were involved in discussions of preliminary thematic findings and throughout the data interpretation process. NVivo Software Pro 12 (QSR International Pty Ltd, 2018) was used to facilitate data management and organization.

Mixed methods integration

Once quantitative and qualitative data were collected and analyzed separately, both components were integrated using a comparison of results strategy (Pluye et al., 2018). We first used a weaving

technique, inspired by Fetters et al. (2013; 2015), that aims to narratively group both quantitative and qualitative findings under a mixed methods interpretation. For this interpretation process, we utilized the four stages of the Pillar Integration Process (Figure 3) (Johnson et al., 2019) to visually compare quantitative and qualitative components and integrate them into a joint display (Additional file 3).

Figure 3. Pillar Integration Process, adapted from Johnson et al. (2019)



8.1.6 Results

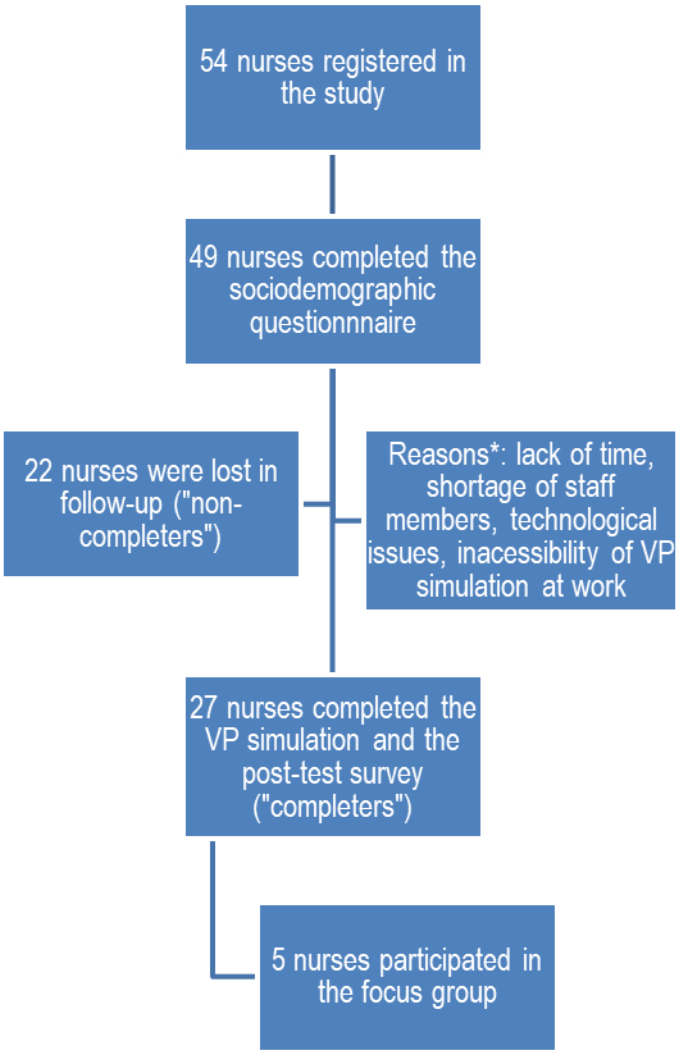
Participants' flow chart and characteristics

The participant flow chart of completers (n=27) and non-completers (n=22) is presented in Figure 4.

Most of the completers held a bachelor's degree. They had been working as nurses for an average of 18 years. Eighteen nurses (66.67%) had experience as HIV nurses. Eight nurses (30%) had previous MI training. Majority of participants (25/27, 93%) reported being confident in their computer skills.

From these 27 completers, five nurses took part in the qualitative component: two men and three women. They worked with different clienteles, including people living with HIV (PLHIV). Four nurses were trained in MI. Additional completers and non-completers' characteristics are presented in Table 3.

Figure 4. Flow chart of the completers and non-completers



Legend *: The student-researcher and most of the participants kept in touch via e-mail during the research period. Reminders were sent to participants to invite them to complete the VP simulation. During asynchronous e-mail communications, some participants indicated the reasons for not completing the study.

Table 3. Nurses' sociodemographic characteristics, computer literacy skills, MI training and recruitment strategies

Characteristics	Completers (n=27)	Non-completers (n=22)	*p* value[a]	Focus group (n=5)
Age group, n (%)			0.89	
25–34	7 (25.93)	5 (22.73)		1 (20.00)
35–44	8 (29.63)	7 (31.81)		0 (0.00)
45–54	8 (29.63)	5 (22.73)		4 (80.00)
55 and over	4 (14.81)	5 (22.73)		0 (0.00)
Gender, female, n (%)	22 (81.48)	18 (8.82)	0.74	3 (60.00)
Education levels, n (%)			0.58	
Associate's degree	3 (11.11)	5 (22.73)		0 (0.00)
Certificate/ Bachelor's degree	19 (70.37)	13 (59.09)		3 (60.00)
Specialized graduate diploma/Master's degree/Ph.D	5 (18.52)	4 (18.18)		2 (40.00)
Employment, n (%)			0.06	
Full time	19 (70.37)	20[b] (90.91)		5 (100.00)
Part time	8 (29.63)	1(4.55)		0 (0.00)
Title, n[c] (%)			0.56	
Nurse-clinician	14 (48.28)	8 (32.00)		2 (33.32)
Nurse	4 (13.79)	7 (28.00)		0 (0.00)
Research nurse	4 (13.79)	2 (8.00)		0 (0.00)
Assistant head nurse/head nurse	2 (6.90)	4 (16.00)		1 (16.67)
Professor	1 (3.45)	2 (8.00)		1 (16.67)
Researcher	1 (3.45)	0 (0.00)		1 (16.67)
Other[d]	3 (10.34)	2 (8.00)		1 (16.67)
Years of practice as nurse, mean (range)	18.37 (1–42)	18.59 (3–37)		23(8–32)
Quebec area, n (%)			0.77	
Montreal	14 (51.85)	13 (59.09)		4 (80.00)
Outside Montreal	13 (48.15)	9 (40.91)		1 (20.00)
Experience as HIV nurse, n (%)			1.00	
No	9 (33.33)	8 (36.36)		2 (40.00)
Yes	18 (66.67)	14 (63.64)		3 (60.00)
Years of practice as HIV nurse Mean (range)	9.87[e] (0.17[f] –23)	6.92[g] (1–19)		13.5[h] (4–23)
Previous MI training, n (%)			0.75	
I don't know	0 (0.00)	1 (4.55)		0 (0.00)
No, I haven't received training	17 (62.97)	12 (54.55)		1 (20.00)
No, I haven't received training, but I have done self-training (autodidact)	2 (7.40)	3 (13.63)		1 (20.00)

Yes	8 (29.63)	6 (27.27)		3 (60.00)
Previous experience with VP simulation, n (%)			0.72	
No	26 (96.30)	20 (90.90)		5 (100.00)
Yes	1 (3.70)	1 (4.55)		0 (0.00)
Don't know	0 (0.00)	1 (4.55)		0 (0.00)
Confidence in using technology, n (%)			0.82	
I do not at all feel confident in my skills	0 (0.00)	0 (0)		(0.00)
I feel somewhat confident in my skills	2 (7.41)	1 (4.55)		(0.00)
I feel confident in my skills	13 (48.15)	13 (59.09)		(0.00)
I very feel confident in my skills	12 (44.44)	8 (36.36)		5 (100.00)
Participation in this web-based research is stressful, n (%)			0.60	
Strongly disagree	15 (55.56)	10 (45.45)		4 (80.00)
Disagree	11 (40.74)	11 (50.00)		1 (20.00)
Agree	1 (3.70)	0 (0.00)		0 (0.00)
Strongly agree	0 (0.00)	1 (4.55)		0 (0.00)
Recruitment strategies, n (%)			0.80	
In person [i]	16 (59.26)	11 (50.00)		5 (100.00)
HIV mentoring program	6 (22.22)	5 (22.73)		0 (0.00)
Quebec Order of Nurses	5 (26.32)	6 (27.27)		0 (0.00)

[a] The p value was calculated with Fisher's exact test
[b] One person indicated "retired". We considered it as a missing value in the Fisher's exact test calculation
[c] The *n* per category of participants is calculated by the total numbers of responses instead of the sample size, because some participants indicated more than one title. Completers indicated 29 responses, the non-completers, 25, and the participants of the focus group indicated 6 responses.
[d] Pharmaceutical representative, senior advisor/specialized clinical analyst, manager, nurse practitioner
[e] 4 missing values
[f] 0.17 year: 2 months
[g] 3 missing values
[h] 1 missing value
[i] Nurses heard about the project through student-researcher or by coworkers.

All participants' recruitment strategies

Participants were recruited in person (28/49, 57.14%) i.e. by being informed by a colleague or by the student-researcher; by e-mails sent by the Quebec Order of Nurses (11/49, 20%) and the HIV mentoring program (10/49, 20%).

Quantitative findings of completers

The detailed quantitative findings regarding the simulation design elements, the global system quality and technology acceptance, the role of the simulation, and the learning objectives achievement are presented in Additional files 4, 5, 6, and 7, respectively. Highlights are presented in each subsection.

Simulation design elements

A great majority (93%) of participants watched the video content and 78% read the corresponding text on the context of the simulation. Most of participants (89%) felt that, to understand this context, it was key to have access to both text and video.

All participants agreed that the labels constructively supported their learning. Some 96% found that these cues were key to qualifying the content of the nurse-patient dialogue.

All participants agreed that quizzes made them reflect on their nursing practice and they saw themselves in the quiz answers.

Almost all participants (96%) agreed that the feedback was provided in a timely manner (i.e. as the consultation progressed). All participants agreed that the feedback allowed them to make connections between the simulated situations and the theoretical elements of MI.

A majority of participants agreed with the simulation's fidelity: the patient's story (96%), the HIV-positive man's appearance (96%), the nurse-patient interactions (93%), and the nurse's office (85%) were all perceived as authentic.

Global system quality and technology acceptance

The mean score was rated a 3.65 (±0.48) for the *service quality* construct among participants who used the VP simulation support services (11/27). The *interface design quality* (3.54 ±0.55) was the second construct with the highest score of the global system quality dimension, followed by *system quality* (3.51±0.54) and by *information quality* (3.49±0.50).

Participants had a good *intention to use* (3.53±0.60) the VP simulation. Nurses *perceived enjoyment* (3.47±0.57) and an *ease of use* (3.42±0.67) with the simulation. The lowest mean score of the technology acceptance dimension was the *perceived usefulness* (3.35±0.71), which is, above all, highly acceptable. The role of simulation in supporting nurses' professional practice

The items with the highest scores were: simulation led nurses to reflect on their practice in general, not just with PLHIV (3.58±0.58); the content will lead nurses to improve their communication skills with clienteles other than PLHIV (3.50±0.51), the health of PLHIV (3.50±0.51), and the quality of therapeutic relationships with PLHIV (3.50±0.51).

Achievement of learning objectives

Scores on the achievement of objectives ranged from 3.35 to 3.58, indicating a favourable assessment by participants. These two learning objectives had the highest scores: identification of traps within nursing interventions that can shut down communication with the patient (3.58±0.50), and those that can optimize openness to the patient's experience (3.54±0.51).

Qualitative findings

Four main themes are presented: 1) Motivations to engage in the simulation-based research; 2) Learning in a realistic, immersive, and non-judgmental environment; 3) Perceived utility of the simulation; and, 4) Perceived difficulty in engaging in the simulation-based research.

Motivations to engage in the simulation-based research

Participants identified several reasons for taking part in the simulation-based research. First, the simulation offered accreditation and was free of charge, which were appealing incentives. Second, nurses reported that their interest and curiosity had been stirred by the learning modality, which was perceived as innovative, stimulating, and interactive, and by the way MI could be transposed into technology:

> I was curious to see this new training modality because I have already followed MI training, and sometimes we'd practice with a coworker. I was curious to see how far we could get with the simulation. (Female nurse-manager)

Nurses perceived that the simulation could be applicable and coherent in their own practice with different clienteles (e.g. youth, people with hepatitis C), and, more broadly, to a variety of contexts:

> [The simulation] was addressing the issue of adherence to HIV treatment and I felt that [the topic] fit in well with my practice. (Male assistant head nurse)

> I thought [the simulation] was something that was interesting and not just about HIV [...] it was something that could be transferred to other areas of activity. (Female school nurse)

Finally, the desire to learn new knowledge or strengthen existing knowledge about MI and HIV were factors motivating nurses' participation.

Learning in a realistic, immersive, and non-judgmental environment

Two nurses who were experienced in providing HIV care reported the VP's story to be an uncommon one for non-adherence, but felt that it was nonetheless credible and realistic. What they felt to be most important was the nurse-patient interaction, which allowed to immerse themselves in the simulation:

> Maybe this is because I've done a lot of work around the issue of taking antiretroviral treatment, so I found the [VP's] situation ... maybe less typical... At the same time, I realized that it was not necessarily very important. Eventually, you forget about the situation, you know, because [the learning activity] is more about how to react to interactions with the patient [...] I was more focused on what he was saying than the image. I think it's a really strong point of [the learning activity] that we got really into it. (Female nurse-researcher)

One nurse's first impression was the VP's resemblance to a puppet, which lead him to wonder about the seriousness of the learning activity. The patient's appearance could have caused this participant to lose interest in the learning experience, but eventually this image of the VP gave way to a more human and realistic impression:

> At first, I thought [the VP] looked like a puppet [...] I kind of wondered if [the simulation] was for real. I don't really want to question its seriousness… Beyond the caricature, I could see the patient asking himself questions; he was squinting a little. Human beings do that. They're not puppets [...] And as I went along doing the interview, I saw there was communication between the nurse and the patient. And [my impression] faded away. (Male nurse case-manager)

Two participants compared the simulation to physical presence-based group learning, where MI must be practiced through role-playing with a coworker. The simulation was seen as an advantageous way to reproduce a real interaction with a VP, reducing the discomfort and bias of practicing with someone, and fostering the learning progress:

> In classic training activities, we practice with a coworker. I find that quite biased because we've both just learned the theory; we try to apply it; the other person has just learned the same thing so, in the end, well, we help each other only a little bit. But here, we were faced with a virtual character who is very realistic. I find it even more real than with, shall we say, another trainee. But for people who are shy in groups, [the simulation] is really very accessible and allows them to progress. (Male assistant head nurse)

Compared to group training activities, the simulation provides freedom while targeting individual learning and performance:

> I think that doing it one by one, well, alone, allows something that is not necessarily possible in a group training activity. It's even more in-tune with what you would actually do. There is no judgment. There are no right or wrong answers. [The simulation] allows you to answer more freely. (Female nurse-researcher)

Finally, this participant summed up her experience: *"I feel like I got real practice."* (Female school nurse).

Perceived utility of the virtual patient simulation

Developing reflective learning and transferring it to practice

All the nurses mentioned the simulation's capacity to promote mistake-based learning through quizzes and feedback loops:

> It was fun because it's like action/reaction. It was immediately obvious if you asked the question wrong, you could see the effect. I found it interesting because if you took a wrong action, you could get back on track. That way, we could understand why it was a mistake. (Female nurse-manager)

This participant, who did the entire virtual simulation twice, reported a progression of his learning, building on the mistakes he had made:

> The first time, I made a lot of mistakes because I told myself that I was going to go with my knowledge and experience. The second time, I did it with my new knowledge. It gives you parallel vantage point onto yourself, onto your own beliefs. (Male nurse case-manager)

The simulation thus allowed participants to reflect and take a critical look at themselves and their practice, becoming aware of past mistakes and the impact of their interventions on their relationship and interactions with patients:

> You're never neutral in a MI. Yes, you're the care provider, but you're a person. It can set certain limits or can even make you get stuck in it. [The simulation] makes you aware of who you are through all this. (Male nurse case-manager).

> Look, if patients don't react or aren't motivated, well, maybe it's because I too am playing a part as the care provider: maybe I am not addressing them in the right way, maybe I am not considering them in their entirety, according to their beliefs and values. (Female nurse-manager)

The interactivity inherent to the simulation supports this reflexive process, which in turn can lead to transferring learning to real practice, and thus improve it:

> When you're one-on-one [with a young person], sometimes you'll answer off the cuff because you're in a hurry. If you've practiced [the situation] in simulation, you're going to know that whatever you said was not so great, you know, you're going to question yourself. So, you're going to be more careful when a similar situation occurs in reality [...] I'm going to try saying it differently to help the person get a little further. It makes you better. (Female school nurse)

This participant questioned his past interventions, in which he hastily presumed the cause of non-adherence (e.g. relapse, substance abuse) when interacting with his clientele. After participating in the simulation, this nurse stated his intention of changing his way of intervening so that he better understands the patient's situation, before drawing conclusions:

> Do I go too fast sometimes? Telling myself that, well, he didn't take it [his treatment], that he must have relapsed, always jumping to my conclusions first. Don't I miss things sometimes, too? I was thinking that maybe now I will be more careful and try to understand the patient's reasons and stop just saying 'Ah, well, he didn't take it.' (Male assistant head nurse)

Being present and revisiting relational skills

The simulation helped to underscore the importance of listening to patients. This meant being present, available during the consultation and living in the "here and now":

> It helps nurses understand or realize that it's important to listen, to be there in the here and now. More and more, we have our electronic medical records, we write in the record and don't even look at the patient. We no longer take the time to actually look at the patient because we are so busy on our computer... It's really worth it to sit down and look at the patient and just be present with them. (Female nurse-manager)

The simulation had a positive influence on revisiting ways of communicating and asking patients the right questions to support them in reflecting and identifying their own solutions:

> I'd say it's more in the way the questions are asked. It's really focused on open-ended questions, and solutions that come from the patient. We [nurses] may have solutions, but they have to come from them [the patients], and that's when they are most effective [...] How can we ask questions that bring out the best in the patient? (Male nurse case-manager)

The simulation alerted the nurses and raised their awareness of how they relate to patients, creating optimal conditions for successful relational practice and mobilizing communication skills that allow patients to express themselves and, especially, to find their own solutions.

Acquiring and consolidating motivational interviewing knowledge and skills

One participant with no prior MI training considered the simulation to be an effective and efficient way to achieve intensive learning:

> I'd read a little about MI, but I'd never done any training. I didn't expect to learn so much in such a short time. (Female nurse-researcher)

Moreover, for another participant, who had received training in MI and who does not practice directly with patients, the key lays in putting theoretical elements into action with the VP. Consequently, the simulation-facilitated practice helped reinforce her knowledge and feelings of competence in applying MI:

> I had already had some MI training. [The simulation] reassured me a bit that, actually, I was competent and that I would have been good, face-to-face, with a patient. So, it just confirmed this for me. Because there's always a doubt about MI being this huge thing. But in the end, you know, we just lack practice. And I found that the platform meant that I was able to strengthen my nursing practice and my past theoretical learning, since I don't see patients every day. (Female nurse-manager)

For the other three participants who had previous MI training, the simulation helped them better understand the theory and refresh their knowledge, as well as learn how to better apply it. Simulation as a learning modality thus seemed to benefit nurses with various levels of MI training and knowledge.

Perceived difficulty in engaging in the simulation-based research

We asked participants in the focus group to reflect on the difficulties they experienced in completing the study, or those they heard their coworkers mention. Technical difficulties were noted as one of the main potential explanations of some participants' withdrawal, either because of the complexity of creating an account, the delay between the characters' words and movements, or the system's slowness. Individual perseverance became important in this context:

> I'm not saying the workflow was slow... but maybe that's why some people didn't finish the training activity. I'm not saying it was repetitive, but maybe if they feel it was too slow...

> When the patient talks, he moves his arms around, and sometimes there was a little delay. This was maybe a feeling I had, since I was persistent at first. (Female nurse-manager)

One participant did not like the simulation's lack of progress indicators, which she felt might also have discouraged others. Individual and time-related elements were another hypothesis for some participants' withdrawal:

> Perhaps a lack of time or a drop in motivation along the way. When I start something, I like to finish it. So maybe it's question of personality, too. (Female school nurse)

Integration of quantitative and qualitative findings into mixed method interpretations

Four mixed method interpretation findings describe how the VP simulation quality and element designs contributed to nurses' learning experience (see the joint display in Additional file 2 for further detail).

Influence of the simulation's fidelity on nurses' impression of getting a real practice and of having an immersive learning experience

While various simulation design elements were assessed quantitatively as being realistic, the qualitative results provide insight into how fidelity contributed to nurses' immersion in their learning experience, among other gains. The quantitative and qualitative results are therefore complementary. Participants were able to overcome the VP's appearance and become immersed in the scenario to focus on the nurse-patient interactions. They also felt the simulation gave them an opportunity for real practice.

Simulation's perceived flexibility, efficacy, and control over one's learning led to a positive learning experience

As described in Additional file 4, global system quality and technology acceptance were rated with high scores. VP simulation offers flexibility for when and where learning occurs, it gives users control over their learning, and it was generally perceived as more effective than other types of training. These aspects all positively influenced participants' learning experience. The qualitative findings supported the quantitative results. All participants in the focus group appreciated being able to use the simulation during or outside of work hours and even from home. The flexibility of the learning modality allowed them to consult the simulation more than once. Compared to face-to-face training that requires trainees to practice with a colleague, the simulation gave them practice with the VP that was both more realistic

and less intimidating. This modality therefore allows users to express a sincere response, without fear of making a mistake in front of a group. Simulation also facilitates the evaluation of individual knowledge and performance, rather than collective ones.

Taping self-awareness and reflection in relational practice

The quantitative results indicate that the high scores in favour of the role of simulation, quizzes, and feedback prompted the participants to reflect on their nursing practice, make connections between theory and practice, learn from mistakes, and raise their awareness of elements that can facilitate or hinder therapeutic relationships with patients. The qualitative results also enriched the quantitative results when nurses gave concrete examples of their own communication styles that had been less effective in the past (e.g. leading the consultation, making recommendations to the patient without asking permission, jumping to conclusions too quickly) and that could be improved. The nurses said that practicing with the VP and getting synchronous feedback that mirrors their actual practice would help them avoid replicating ineffective patterns. The simulation therefore contributed to educating and raising awareness of self, as nurse, and of others (i.e. patients), and underscored the importance of nurses' presence, open-mindedness, availability, and good listening.

Acquiring new knowledge and building self-confidence

By assessing the *role of simulation in supporting nursing practice*, participants reported having learned something new. They also expressed having built self-confidence. Indeed, they felt capable of applying communication skills and of facing similar situations with PLHIV and other clienteles in the future. The qualitative results reinforce these findings, reflecting the simulation's influence on nurses feeling better prepared and equipped to apply MI with their clienteles, to consolidate their practice, and thus to reinforce their sense of confidence and competence.

8.1.7 Discussion

Statement of main findings

Overall, nurses perceived that VP simulation is highly acceptable, if we consider that the great majority of means were above 3, on the 4-point Likert scale. The quantitative results were highly consensual in favour of simulation design elements, global system quality and technology acceptance, the simulation's role in supporting nursing practice, and the achievement of learning objectives. The qualitative results nuanced, deepened, and even added new elements (e.g. motivation to participate

and difficulties encountered) to the quantitative results. The integration of quantitative and qualitative findings drew a full portrait of the continuum of the nurses' simulation-based experience, the VP elements that contributed to their immersive learning, and its potential transfer to their practice. Four mixed method interpretations were described: 1) Influence of the simulation's fidelity on nurses' impression of getting a real practice and having an immersive learning experience ; 2) Simulation's perceived flexibility, efficacy, and control over one's learning led to a positive learning experience; 3) Taping self-awareness and reflection in relational practice; 4) Acquiring new knowledge and building self-confidence.

Comparison with existing literature

The qualitative theme *motivations to engage in the simulation-based research* brings a new element to the quantitative results, which could not capture this perspective. We created and reinforced what Moore et al. (2018) call a *teachable moment* in order to influence the enrollment, participation, and engagement of nurses in this learning activity. To do so, we shared information about the project via different channels, with a view to reaching a variety of nurse profiles. The majority of nurses who completed the VP simulation was recruited through in-person strategy (16/27). The *social influences*, such as recommendations by colleagues, are recognized as facilitators to the self-directed learning of physicians in CE, alongside with affective attitude (e.g. professional interest, motivation, willingness) and training accreditation (Jeong et al., 2018). Learners' characteristics/qualities, like perseverance and the desire to finish what has been started, are also considered to be elements that can affect both learning and the motivation to engage in the simulation (Billett, 2009; Jeffries, 2005).

VP simulation led to immersive, realistic, active, and constructive learning experiences. Prebriefing was planned in the VP simulation codevelopment process (Rouleau et al., 2020) and is considered a best practice (INACSL, 2016; Page-Cutrara, 2014). Prebriefing is known as a facilitation method and a preparatory activity to ready learners for the simulation-based experience. The red and green labels were cues that served as feedback, and were also used as a facilitation method to orient learners through the simulation (INACSL, 2016).

Feedback is considered to be the most important feature of effective learning (Cook, Erwin, et al., 2010; Issenberg et al., 2005). Indeed, it can support learners' self-assessment of their skills and allow the progression, development, and maintenance of those competencies (Issenberg et al., 2005). In the

quantitative results, participants reported appreciating the timing of the synchronous feedback. The timing of feedback can indeed play a role in learning, as can its source (how it is provided, by whom) and type (i.e. outcome or process-based). One other meaningful feature of the simulation is the opportunity of deliberate and repetitive practice, which can impact learning (Chee, 2014; Issenberg et al., 2005), unlike other educational interventions, such as conferences or lectures in which learners are often passive recipients of "inert" information (Bennett-Levy, 2006).

In light of our results and when comparing with the literature, it is reasonable to believe that different modes of fidelity, be it physical, conceptual, emotional/experiential (Dieckmann et al., 2007; Rudolph et al., 2007), not only affected participants' learning, but also their engagement, overall experience, and immersion in the simulation (Chiniara et al., 2013; Dieckmann et al., 2007; Issenberg et al., 2005; Rudolph et al., 2007). Physical fidelity refers notably to the VP's appearance and the nurse's virtual office. In the VP simulation, conceptual fidelity is illustrated by the if/then concept (Dieckmann et al., 2007; Rudolph et al., 2007): *if* the learner adopts a relational skill consistent with MI (e.g. a guiding style of counseling vs a directing one), *then* it will open the dialogue with the patient. One participant clearly expressed this mode of fidelity by the "action/reaction principle." Finally, participants in the focus group reported the sense of having truly practiced; they found that simulation was an effective learning approach, reflecting the emotional and experiential mode of fidelity (Dieckmann et al., 2007). This mode refers to the learner's emotions, feelings, and beliefs relating to their entire experience of participating in the simulation (Dieckmann et al., 2007; Rudolph et al., 2007).

It would seem that the benefits of the simulation extend beyond the learning of the recommended communication techniques to encompass a relational component: being present, taking the time to listen carefully and understanding patients without falling prematurely into professional preconceptions. This relational component is aligned with partnership, one of the vital aspects of MI (Miller et Rollnick, 2013b) that has to do with seeing the world through the patient's eyes without imposing the nurse's view. Another important finding of this study is the reflective learning developed during nurses' simulation-based experience. Reflection was indeed central to the learning experience because it played a double role, as both a reflective methodology (i.e. synchronous feedback used to promote reflection and to learn from one's mistakes) and a learning outcome (Moon, 2000) (i.e. VP simulation allowed nurses to develop reflective learning). Reflection is considered to be a means of supporting

professional development (Gustafsson et Fagerberg, 2004) and has the potential to transform experience into new learning (Tremblay et al., 2014).

Our findings also corroborate those of a qualitative study that explored how VP simulation influenced the non-technical skills (such as communication) of undergraduate nursing students (Peddle et al., 2019) and undergraduate health professional education (Peddle et al., 2016). The findings suggest that students acknowledged the importance of communication and listening to their patients. The VP "opened their eyes" to the impacts either effective or poor communication had on healthcare (Peddle et al., 2016). VP simulation exerted a positive influence on students, by reinforcing or teaching new communication skills, providing opportunities for practicing those skills and for building their confidence in applying them, and developing specific verbal and nonverbal communication skills (Peddle et al., 2019).

Strengths and limitations

As far as we are aware, this is the first study to examine the acceptability of a VP simulation informed by MI to improve nurses' relational skills in a CE context. This mixed methods study led to a gain in complementary and rich data, providing a comprehensive picture of nurses' learning experience. The convenience sampling and snowball approaches allowed us to recruit nurses with various profiles who work in different settings, thus adding to the richness of the findings. It would have been useful to also explore the reasons why nurses abandoned the simulation; but this was unfortunately not possible. The findings may have been tainted with participation bias, given our sample had to complete 100% of the simulation and the post-test survey. This could explain the consensual findings in favour of the VP simulation.

Implications for research

The variety of the nurses' profiles provided insight into the transferability of the VP simulation beyond the field of HIV care. In the post-test survey, nurses recommended the simulation to other healthcare professionals. Further research could focus on simulation acceptability for a variety of providers. Subsequent research would be necessary to explore the influence of contextual enablers/barriers (e.g. resources, structure, organizational culture) and those that are related to healthcare professionals themselves (e.g. role, work structure, habits, competing demands) when using VP simulation to apply the resulting MI-inspired relational skills. Considering that reflective learning was an important finding,

this aspect could be deepened by exploring the underlying causal mechanisms that lead users to improve their relational skills and to put these latter into practice. Future work could be guided by these research questions: What are the contexts and mechanisms that allow healthcare professionals to integrate MI-consistent relational skills into their professional practice? How does the VP simulation produce different outcomes?

8.1.8 Conclusions

Relational skills are fundamental to high-quality nursing care. Findings from this mixed methods study provided critical insight into nurses' perception of the simulation's high acceptability. It holds potential to change practice, as nurses become more self-reflective and aware of the impact of their relational skills on patients. VP simulation particularly contributed to knowledge development on MI, on how self-confidence in applying relational skills can be increased by practicing with the VP. Nurses' participation in the simulation contributed to immersive, positive, and constructive learning experiences. The study highlights the value and novelty of VP simulation for CE in nursing.

List of Abbreviations

CE: continuing education
CHERRIES: CHEcklist for Reporting Results of Internet E-Surveys
CIHR: Canadian Institutes of Health Research
CONSORT-EHEALTH: Consolidated Standards of Reporting Trials of Electronic and Mobile HEalth Applications and onLine TeleHealth
COREQ: Consolidated Criteria for Reporting Qualitative Studies
GRAMMS: Good Reporting of A Mixed Methods Study
INACSL: International Nursing Association for Clinical Simulation and Learning
IQR : interquartile range
M : means
Med : median
PLHIV: people living with HIV
QUAL: qualitative
QUANT: quantitative
MI: motivational interviewing
SD: standard deviation
VP: virtual patient

Ethics approval and consent to participate

The project received ethics approval from the Institutional Review Board of the University of Montreal Hospital Center [#18.243]. A process for the evaluation of multicenter projects was undertaken to recruit

nurses working in various settings [MP-02-2019-8082]. Participation in the study was voluntary. Two electronic consents were obtained prior to nurses: 1) answering the pre-intervention questionnaire; 2) participating in the focus group. The study was a low risk ethics concern.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

JC, the University of Montreal Hospital Research Centre and SimforHealth are linked by a partnership contract. SimforHealth owns the MedicActiv platform that supported the simulation and was involved throughout the codevelopment process. GR, JP, and JC developed the VP simulation.

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Authors' contributions

GR conceived and designed the study, acquired, analyzed and interpreted the data, drafted the manuscript, revised it and wrote the submitted version. MPG and JC supervised the entire study and contributed to data interpretation. JC was involved in the creation of the VP simulation. LR was a contributor in conceiving and designing the qualitative component of the study and in interpreting the data. GC was a contributor in integrating quantitative and qualitative findings and gave insights on the study design (mixed methods). JP was involved in data interpretation and was a major contributor in

creating the VP simulation. All authors revised substantively the manuscript and approved the submitted version.

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Additional file 1. Reporting guidelines

CONSORT-EHEALTH: Consolidated Standards of Reporting Trials of Electronic and Mobile HEalth Applications and onLine TeleHealth

We adapted the CONSORT-EHEALTH (Eysenbach et CONSORT-EHEALTH Group, 2011) for reporting information about eHealth and mobile Health trials. CONSORT EHEALTH has been developed for reporting randomized controlled trials. We then adapted the CONSORT E-HEALTH to fit with the pre-experimental design, and we included some statements of the reporting guidelines for Health Care Simulation Research (Cheng et al., 2016).

	Recommendations/ statements	**Page numbers and/or description**
Title and abstract	Indicate the study's design with a commonly used term in the title or the abstract.	Done. We used "convergent mixed methods study" both in the title and in the abstract (p.X).
	Identify the mode of delivery (e.g. web-based, online) in the title.	We used "Virtual patient simulation" (p.X)
	Mention primary condition or target group in the title.	We used "Nurses in continuing education" (p.X)
	Mention key features/functionalities/ components of the intervention in the abstract. If possible, also mention theories and principles used for designing the site. Keep in mind the needs of systematic reviewers and indexers by including important synonyms.	We mentioned this information: "virtual patient simulation to improve nurses' relational skills, informed by motivational interviewing". The simulation features an HIV-positive male struggling to adhere to his antiretroviral treatment. Quizzes and feedback loops embedded in the simulation allowed learners to observe the consequences of their choices (p.X).
	In abstract or key terms, the MeSH or searchable keyword term must have the word simulation or simulated.	MeSH: Computer simulation; Simulation training (p.X)
Introduction		
Background/ rationale	Explain the scientific background and rationale for the investigation being reported.	pp.X-X
	Clarify whether simulation is the subject of research or the investigational method for research. (SBR)	In our project, VP simulation falls within the category of "subject of research." According to Cheng et al. (2014), simulation as a training methodology examines whether the specific features of simulation contribute to overall

		educational effectiveness. In our study, we were interested in examining how VP simulation contributed to nurses' learning experiences, uptake of relational skills, and its transfer to practice.
Objectives	State specific objectives, including any prespecified hypotheses	p. X No hypothesis was formulated.
Methods		
Study design	Present key elements of study design	pp. X-X
	A description of changes to methods includes important changes made on the intervention during the trial (e.g. major bug fixes or changes in the functionality or content) and other "unexpected events" that may have influenced study design.	Within the MedicActiv platform, there are two evaluation modes: 1) summative evaluation (or examination mode), with a final "score," in which learners cannot change their answers during the learning activity; and 2) formative evaluation, which allows learners to change their answers throughout the simulation. The initial evaluation mode was summative evaluation. We discovered this when a participant asked for technical support and then we realized that users could not change their answers. We didn't want learners to feel as if they were in an "exam period"; rather, we wanted to create a constructive learning experience and low level of stress. We set functionalities so that nurses could change their answers to the quizzes throughout the simulation to allow them to learn from their mistakes (i.e. formative evaluation). This formative evaluation is in line with the clinical team's vision of continuing professional development. About 50 % had access to one of the other modes of evaluation. These evaluation modes may have impacted the learners' experience during the simulation.
Setting	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	pp. X-X; Table 1. Nurses' journey in the research process, p.X
	Clearly report if outcomes were self-assessed through online questionnaires	Yes, the outcomes were self-reported in the online post-test survey.
Participants	Give the eligibility criteria, and the sources and methods of selection of participants.	pp. X-X
	Specify the recruitment strategies, e.g. open vs. closed,	(p. X) The recruitment strategies were hybrid. Online strategies used were: mailing lists (targeting the key

	web-based vs. face-to-face assessment. In online-only trials, clarify if participants were quasi-anonymous and whether having multiple identities was possible, and whether technical or logistical measures (e.g. cookies, email confirmation, phone calls) were used to detect/prevent these.	population), web banners, and referrals to an open access website with information about the study. Offline strategies consisted of presenting the project during an educational meeting and in nurses' workplace. Leaflets were distributed. The study was not anonymous as a way of confirming the eligibility criteria (being a nurse) and to make sure that nurses met the requirements for the three-hour accredited CE. Nurses had to provide their name and their email address. Access to the VP simulation was given only when identity of the participant was confirmed.
Intervention	Mention names, credentials, and affiliations of the developers, sponsors, and owners (if authors/evaluators are owners or developers of the software, this needs to be declared in a "Conflict of interest" section or mentioned elsewhere in the manuscript).	The conflict of interest statement contains this information (p.X).
	Describe the theoretical and/or conceptual rationale for the design of each intervention.	Our VP simulation is a narrative approach (Bearman, 2003) that depicts a personal story line that progresses over time around the logic of cause and effect, and that involves a decision-making process that yields different "outcomes" or effects. The "good" answers selected by the users are the relational skills that are essential to the proficient practice of MI. These create optimal conditions for relational engagement with patients: asking open-ended questions, using reflective listening, summarizing, affirming the patients' strengths, providing information and advice, evoking a hypothetical change, eliciting and scaling change talk, setting patient-determined goals, and arriving at a plan. These relational skills are called *behaviour change counselling techniques* because they are active ingredients that allow providers to initiate or maintain communication about health behaviour change (Dragomir et al., 2019; Fontaine et al., 2019; Michie et al., 2017). The "bad answers" are the traps or roadblocks (e.g. expert and blame traps, directive style of counselling) that are inconsistent with MI, and that can cause relational disengagement with the patients. The logic of the VP simulations is as follows: if the nurse uses relational skills consistent with MI, this will open up dialogue with the VP. If the nurse uses relational skills

		inconsistent with MI, then, the VP will react accordingly (e.g. defensive attitude). Decisions made by users lead to different patient responses. Written standardized feedback is provided at each branching (or decision), in addition to the visualisation of the consequences of these decisions on patient's speech. The VP simulation has been developed so that users can develop awareness of the impact of relational skills on patient care.
	Describe the history/development process of the application and previous formative evaluations (e.g. focus groups, usability testing), as these will have an impact on adoption/use rates and help with interpreting results	The development process of the VP simulation has been published elsewhere (Rouleau et al., 2020) but will be summarized here. A collaborative and creative approach was used to codevelop the VP simulation. Two main phases were performed: 1) Planning the VP simulation development; and 2) Designing the content, sequence and format of the VP simulation. Phase 1 includes these sub-phases: 1.1) Assessing training needs by understanding HIV nursing practice and its challenges; 1.2) Selecting approaches and theories to inform VP simulation development; 1.3) Negotiating a detailed partnership contract between the research institution, the researcher and the VP simulation company; and 1.4) Assembling an interprofessional team. Phase 2 encompassed these sub-phases: 2.1) Setting the learning objectives and cocreating the clinical content; 2.2) Recording the nurse and patient voice-overs; 2.3) Designing and validating the two-dimensional learning environment; and 2.4) Integrating modes of fidelity to ensure learner engagement and immersion in the VP simulation. No previous formative evaluation has been performed. This mixed methods acceptability study is a first step in assessing nurses' acceptance of this newly developed VP simulation.
	Revisions and updating. Clearly mention the date and/or version number of the intervention evaluated, or describe whether the intervention underwent major changes during the evaluation process, or whether the development and/or content was "frozen" during the study/trial. Describe dynamic	The content of the VP simulation was frozen during the research process.

	components such as news feeds or changing content which may have an impact on the replicability of the intervention	
	Ensure replicability by publishing the source code, and/or providing screenshots/screen-capture video, and/or providing flowcharts of the algorithms used. Replicability is a hallmark of scientific reporting.	A demonstration of the VP simulation is available at: https://youtu.be/IFi4CH77s5Q
	Access: Describe how participants accessed the application, in what setting/context, if they had to pay (or were paid) or not, and whether they had to be a member of a specific group. If known, describe how participants obtained "access to the platform and Internet". To ensure access for editors/reviewers/readers, consider providing a "backdoor" login account or demo mode for reviewers/readers to explore the application.	Once participants filled out the online sociodemographic questionnaire, their identities were verified using their names and email addresses. Then, the student-researcher gave research participants (i.e. nurses) a secured access to the web-based MedicActiv platform (SimforHealth, 2020b). Participants were invited to create an individual account to consult the VP simulation, accessible with a computer/laptop or a tablet device with stable Internet connectivity and audio-visual display software. The VP simulation was free of charge and nurses could use the simulation in a convenient location (e.g. workplace, home). A login account can be provided to editors/reviewers/readers upon request.
	Describe mode of delivery, features/functionalities/components of the intervention and the theoretical framework used to design them. This includes an in-depth description of the content (including where it is coming from and who developed it), "whether [and how] it is tailored to individual circumstances and allows users to track their progress and receive feedback". This also includes a description of communication delivery channels and – if computer-	The in-depth description of how MI has been translated into the VP simulation, as well as the composition of the interprofessional team who developed it, are presented elsewhere (Rouleau et al., 2020). Feedback is standardized, i.e. is provided according to users' decisions to the various quizzes. Users can get a summary of their decisions and feedback at the end of the VP simulation. This educational intervention is fully automated and represent a set of nurse-patient interactions within a whole consultation, lasting about 45 minutes.

	mediated communication is a component – whether communication was synchronous or asynchronous.	
	Describe use parameters (e.g. intended "doses" and optimal timing for use). Clarify what instructions or recommendations were given to the user, e.g. regarding timing, frequency, heaviness of us (if any), or whether the intervention could be used ad libitum.	(p.X, Table 1) During the study, participants were informed that they had unlimited access to the VP simulation. Users could use it *ad libitum* during the research period (March 2019 to August 2019).
	Clarify the level of human involvement (care providers or health professionals, or technical assistance) in the VP simulation. Detail frequency and expertise of professionals involved, if any, as well as "type of assistance offered, the timing and frequency of the support, how it is initiated, and the medium by which the assistance is delivered".	The student-researcher in charge of the research project was available for technical assistance (e-mail, phone, and videoconference) and for providing additional information about the research process according to users' need. The owner of the MedicActiv platform, the company SimforHealth, offered online technical assistance if users clicked on the "Help" button within the VP simulation. To our knowledge, only one nurse used this functionality.
	Report any prompts/reminders used: Clarify if there were prompts (letters, emails, phone calls, SMS) to use the VP simulation, what triggered them, frequency, etc.	E-mails were sent by the student-researcher to nurses at two points in time for different purposes: 1) to invite them to create an account to encourage participants' uptake, i.e. logins (one initial invitation e-mail was sent and a maximum of three e-mail reminders); 2) to invite them to complete the VP simulation; and 3) to foster their engagement (one initial invitation e-mail was sent and a maximum of three e-mail reminders). As an incentive the complete the study, three 100$ CAD gift-certificate 300$ CAD total) were raffled off at two points in time.
	Describe any co-interventions (incl. training/support): Clearly state any "interventions that are provided in addition to the targeted eHealth intervention."	No co-intervention was provided.
Outcomes	Define pre-specified outcome measures, including how and when they were assessed. If	pp.X-X See CHERRIES checklist reporting guidelines.

	outcomes were obtained through online questionnaires, describe if they were validated for online use and apply CHERRIES items to describe how the questionnaires were designed/deployed.	
	Describe whether and how "use" (including intensity of use/dosage) was defined/measured/monitored (logins, logfile analysis, etc.). Use/adoption metrics are important process outcomes that should be reported in any eHealth trial.	When we planned the project, this engagement measure was used to assess the nurses' acceptability of the VP simulation: they had to complete 100 % of the intervention. The "use" was described in terms of completing or not completing the overall VP simulation ("completers" vs "non-completers"). We knew that participants completed the VP simulation because at the end of it, there was a hyperlink that redirected nurses towards the online post-test survey (on LimeSurvey).
Data sources/ measurement	For each variable of interest, give sources of data and details of methods of assessment (measurement).	pp. X-X For additional information, see CHERRIES checklist reporting guidelines.
Study size	Explain how the study size was arrived at.	p.X
Statistical methods	Describe all statistical methods used.	p.X
Ethics & Informed Consent	Outline informed consent procedures as well as safety and security procedures.	Ethics approval and consent to participate are described at the end of the manuscript. Consent was obtained online by clicking on a checkbox. Data retrieved from account creation within the VP simulation (i.e. the information needed for account creation, such as name, email address, workplace) were hosted on professional server of Google Compute Platform at Saint-Ghislain, Belgium https://www.google.com/about/datacenters/inside/locations/st-ghislain/ Data gathered from baseline questionnaires and post-test surveys were stored in Canadian server hosted by LimeSurvey, with a privacy policy stated in https://www.limesurvey.org/policies/privacy-policy All nurses consented to the focus group being recorded.

Results		
Participants	Report numbers of individuals at each stage of study – e.g. numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completed follow-up, and analyzed	Figure 4. Flow chart of the completers and non-completers, p.X
	Give reasons for non-participation at each stage	
	Consider use of a flow diagram	
Baseline descriptive data	In describing characteristics of study participants, include their previous experience with simulation and other demographics associated with digital divide issues, such as age, education, gender, social-economic status, and computer/Internet/eHealth literacy of the participants, if known	Table 3. Nurses' sociodemographic characteristics, computer literacy skills, MI training and recruitment strategies, pp.XX-XX
	Indicate number of participants with missing data for each variable of interest	There was no missing data because all of the questions were selected as mandatory in LimeSurvey.
Recruitment	Dates defining the periods of recruitment and follow-up	Table 1, p. X
Numbers analyzed	Report multiple "denominators" and provide definitions: Report N's (and effect sizes) "across a range of study participation [and use] thresholds", e.g., N exposed, N consented, N used more than x times, N used more than y weeks, N participants "used" the intervention at specific pre-defined time points of interest. Always clearly define "use" of the intervention.	This criterion is not fully applicable to our study. We had two groups: 1) completers; 2) non completers. Completers (n=27/49) finished the VP simulation. Among the non-completers, 12 out of 22 created an account in the MedicActiv platform. Only one of these participants (1/12) consulted a part of the VP simulation.
Main findings	Presentation of quantitative findings	pp. XX-XX, Additional files 4,5,6 &7
	Presentation of qualitative findings	pp. XX-XX

	Presentation of mixed method interpretations	pp. XX-XX
Discussion		
Key results	Summarize key results with reference to study objectives	p.XX
Limitations	Discuss typical limitations of an eHealth trial and limitations of simulation-based research. Discuss biases due to non-use of the intervention/usability issues, biases through informed consent procedures, and unexpected events.	p.XX, see the GRAMMS checklist. Some "non-completers" wrote the student-researcher to inform her of the difficulty in accessing the VP simulation from their workplace and technical issues that prevented them from completing the intervention.
Interpretation	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence.	The results must be interpreted with caution. Firstly, the sample was highly motivated in participating in the study and had strong computer literacy skills. In general, the participants' answers were consistently in favor of the VP simulation. This may be explained by the fact that the nurses were highly engaged and motivated to take part in simulation-based research. Secondly, the sample size for the quantitative component was modest, i.e. 27 nurses. See the GRAMMS checklist.
Generalizability	Describe generalizability of simulation-based outcomes to patient-based outcomes (if applicable).	We believe that the simulation-based outcomes are transferable to other French-speaking nurses because the participants' profiles were varied in terms of sociodemographic characteristics. Another study could be done to assess the extent to which simulation-based training offered to healthcare professionals may influence patients' outcomes.
Other information		
Funding	List simulator brand and if conflict of interest for intellectual property exists.	Competing interests and funding are described at the end of the manuscript.

VP simulation: Virtual patient simulation; CE: Continuing education; MI: Motivational interviewing

CHERRIES: CHEcklist for Reporting Results of Internet E-Surveys

We used this reporting guideline (Eysenbach, 2004) regarding the data collection method used (online post-test survey) for the quantitative component.

Item Category	Checklist Item	Explanation	Strategies used in our VP simulation-based research
Design			
	Describe survey design	Describe target population, sample frame. Is the sample a convenience sample? (In "open" surveys this is most likely.)	We used a combination of convenience and snowballing sampling strategies. We wanted a sample of nurses that were interested in and available to spend time participating in the simulation-based research. p.X
IRB (Institutional Review Board) approval and informed consent process			
	IRB approval	Mention whether the study has been approved by an IRB.	Yes- approval from University of Montreal Hospital Center IRB [#18.243].
	Informed consent	Describe the informed consent process. Were the participants told the length of time of the survey, which data were stored and where and for how long, who the investigator was, and the purpose of the study?	Participants had online access to the information and consent form, and they could have downloaded an electronic copy. All of the following information was presented: the principal investigators, co-investigators and collaborators; purpose of the study; number of study participants and length of the participation; nature of the participation requested; conduct of the study/procedures; risks and inconveniences; benefits; confidentiality; communication of overall results; funding of the project; compensation; voluntary participation and the right to withdraw; and identification of contact people. Information about which specific data related to their registration on

			the MedicActiv platform as well as the data retrieved from the baseline questionnaire and post-intervention survey was provided (LimeSurvey), along with the servers that host/store these data. Two URL were provided for further information of privacy policies. After this, participants had to consent by clicking "approve" at the bottom of the consent screen. Then, they had to click on whether or not they possessed a valid nurse's practice license. If they answered "yes", they were directed to the baseline or pre-intervention questionnaire that contains this information: sociodemographic, computer literacy skills, MI training, recruitment strategies.
	Data protection	If any personal information was collected or stored, describe what mechanisms were used to protect unauthorized access.	The sociodemographic questionnaire and the post-test survey were not anonymous, given our need to know participants' identities to be able to assign them their CE credits. Identifiable information (complete name and e-mail address) was collected in order to verify the identity of nurses and to check their registration to the VP simulation platform. The data were stored on a secure database on the LimeSurvey server (for the online baseline questionnaire and post-test survey) and on the MedicActiv server.
Development and pre-testing			

	Development and testing	State how the survey was developed, including whether the usability and technical functionality of the electronic questionnaire had been tested before fielding the questionnaire.	Two rounds of survey pre-tests were conducted before the survey. The first was on paper and/or electronic versions, and was done by seven people with expertise in research, nursing care, and/or learning program development and evaluation. Participants' comments in the first round led us to clarify some statements, improve the visual presentation, divide statements containing multiple ideas, and withdraw the midpoint response. Afterwards, five potential end users and one research-coordinator completed the online questionnaire on LimeSurvey. They found the navigation to be user-friendly and deemed the visual interface to be suitable. Their comments led us to clarify the content of certain statements. We removed the midpoint response from the Likert-scale (neither disagree nor agree) based on suggestions of experts in program evaluation that participated in the survey pre-test and in the literature (Raaijmakers, 2000). The midpoint response may have various interpretations; possible neutral responses were either "no opinion" or "I don't know". These midpoint responses provided very little information (for example, identifying areas for future improvement of the simulation).
Recruitment process and description of the sample having access to the questionnaire			
	Open survey versus closed survey	An "open survey" is a survey open for each visitor of a site, while a closed survey is only	Information about the study was sent out to target groups. The URL to access the baseline questionnaire was available once

		open to a sample which the investigator knows (password-protected survey).	participants consented to take part in the study and met the eligibility criteria. The access to the VP simulation platform was closed and protected by a unique URL that was sent manually by the student-researcher after participant's identity was confirmed.
	Contact mode	Indicate whether or not the initial contact with the potential participants was made on the Internet. (Investigators may also send out questionnaires by mail and allow for Web-based data entry.)	The initial contacts were either by email or in-person.
	Advertising the survey	How/where was the survey announced or advertised? Some examples are offline media (newspapers), or online (mailing lists – If yes, which ones?) or banner ads (Where were these banner ads posted and what did they look like?). It is important to know the wording of the announcement as it will heavily influence who chooses to participate. Ideally the survey announcement should be published as an appendix.	The study was advertised online and offline (in person). Study information was sent through mailing lists and newsletters with banners ads, all sent by the HIV mentoring national program and by the Quebec Order of Nurses. Text of the banner ads: "Better care through better communication: three hours of accredited online training. Sign up."
Survey administration			
	Web/E-mail	State the type of e-survey (e.g. one posted on a website, or one sent out through e-mail). If it is an e-mail survey, were the responses	The URL that provided access to the study was sent out through e-mail, and was available by clicking on the banner ads as well as on the leaflet. The Web-based data entry was an

		entered manually into a database, or was there an automatic method for capturing responses?	automatic method used by the LimeSurvey platform.
	Context	Describe the website (for mailing list/newsgroup) in which the survey was posted. What is the website about, who is visiting it, what are visitors normally looking for? Discuss to what degree the content of the website could pre-select the sample or influence the results. For example, a survey about vaccination on an anti-immunization website will have different results from a Web survey conducted on a government website	Participants receiving study information through e-mail could access the study directly through the (*hyperlink*). If participants clicked on the banner ads, they were directed to a page within the website of the Research Chair in Innovative Nursing Practices. This Research Chair is grounded in a high-quality research program in nursing and in interdisciplinary fields of research; this is a credible website.
	Mandatory/voluntary	Was it a mandatory survey to be filled in by every visitor who wanted to enter the website, or was it a voluntary survey?	Participants could choose to take part in the study or not. The post-test survey was mandatory if participants wanted to obtain their CE credits.
	Incentives	Were any incentives offered (e.g. monetary, prizes, or non-monetary incentives such as an offer to provide the survey results)?	Participants gained three hours of accredited CE for completing the post-test survey and the VP simulation. They were also entered into prize draws (three 100$ gift-certificates).
	Time/Date	In what timeframe were the data collected?	The data were collected for the baseline questionnaire, for account registration into the VP simulation platform, and for the baseline questionnaire, without any specified interval over a five-month

			period.
	Randomization of items or questionnaires	To prevent biases items can be randomized or alternated.	The questions were not randomized.
	Adaptive questioning	Use adaptive questioning (certain items, or only conditionally displayed based on responses to other items) to reduce number and complexity of the questions.	Adaptive questioning was used.
	Number of Items	What was the number of questionnaire items per page? The number of items is an important factor for the completion rate.	The baseline questionnaire included 14 questions. The number of items per page varied depending on the structure of the post-test survey. A total of 80 items had to be completed.
	Number of screens (pages)	Over how many pages was the questionnaire distributed? The number of items is an important factor for the completion rate.	This information is no longer available.
	Completeness check	It is technically possible to do consistency or completeness checks before the questionnaire is submitted. Was this done, and if "yes", how (usually JAVAScript)? An alternative is to check for completeness after the questionnaire has been submitted (and highlight mandatory items). If this has been done, it should be reported. All items should provide a non-response option such as "not applicable"	All questions had to be completed. We used non-response options "not applicable", or "I prefer to not answer" for both the baseline questionnaire and the post-test survey.

		or “rather not say”, and selection of one response option should be enforced.	
	Review step	State whether respondents were able to review and change their answers (e.g. through a Back button or a Review step which displays a summary of the responses and asks the respondents if they are correct).	Respondents were able to go back and review questions.
Response rates			
	Unique site visitor	If you provide view rates or participation rates, you need to define how you determined a unique visitor. There are different techniques available, based on IP addresses or cookies or both.	N/A
	View rate (Ratio of unique survey visitors/unique site visitors)	Requires counting unique visitors to the first page of the survey, divided by the number of unique site visitors (not page views!). It is not unusual to have view rates of less than 0.1 % if the survey is voluntary.	N/A
	Participation rate (Ratio of unique visitors who agreed to participate/unique first survey page visitors)	Count the unique number of people who filled in the first survey page (or agreed to participate, for example by checking a checkbox), divided by visitors who visit the first page of the survey (or	This information is not available.

		the informed consents page, if present). This can also be called "recruitment" rate.	
	Completion rate (Ratio of users who finished the survey/users who agreed to participate)	The number of people submitting the last questionnaire page, divided by the number of people who agreed to participate (or submitted the first survey page). This is only relevant if there is a separate "informed consent" page or if the survey goes over several pages. This is a measure for attrition. Note that "completion" can involve leaving questionnaire items blank. This is not a measure for how completely questionnaires were filled in. (If you need a measure for this, use the word "completeness rate".)	Of the 54 participants that started to fill out the baseline questionnaire, 49 completed it. From that point, 27 completed their overall participation into the Web-based study (i.e. completed the VP simulation as well as the post-intervention questionnaire). See Figure 4. Flow chart of the completers and non-completers.
Preventing multiple entries from the same individual			
	Cookies used	Indicate whether cookies were used to assign a unique user identifier to each client computer. If so, mention the page on which the cookie was set and read, and how long the cookie was valid. Were duplicate entries avoided by preventing users' access to the survey twice; or were duplicate	No cookies were used. The student-researcher carefully checked for duplicate participants, because they provided their name and e-mail address. Two participants completed the study twice. We considered only their first entry.

		database entries having the same user ID eliminated before analysis? In the latter case, which entries were kept for analysis (e.g. the first entry or the most recent)?	
	IP check	Indicate whether the IP address of the client computer was used to identify potential duplicate entries from the same user.	N/A
	Log file analysis	Indicate whether other techniques to analyze the log file for identification of multiple entries were used. If so, please describe.	N/A
	Registration	In "closed" (non-open) surveys, users need to login first and it is easier to prevent duplicate entries from the same user. Describe how this was done.	N/A
Analysis			
	Handling of incomplete questionnaires	Were only completed questionnaires analyzed? Were questionnaires which terminated early (where, for example, users did not go through all questionnaire pages) also analyzed?	We analyzed only completed questionnaires.
	Questionnaires submitted with an atypical timestamp	Some investigators may measure the time people needed to fill in a questionnaire and exclude questionnaires	N/A

		that were submitted too soon. Specify the timeframe that was used as a cut-off point, and describe how this point was determined.	
	Statistical correction	Indicate whether any methods such as weighting of items or propensity scores have been used to adjust for the non- representative sample; if so, please describe the methods.	N/A

CE: continuing education; N/A: not applicable; VP simulation: virtual patient simulation

COREQ: Consolidated Criteria for Reporting Qualitative Studies

We used this reporting guideline for the qualitative component (Tong et al., 2007).

No.	Item	Description
Domain 1: Research team and reflexivity		
Personal characteristics		
1.	Interviewer/facilitator	The Student-Research, GR
2.	Credentials	GR – Student-Researcher – MSc, Ph.D. candidate (Nursing)
		MPG– Ph.D. (Public Health)
		JC – Ph.D. (Nursing)
		LR – BSc (Hons), Ph.D. (Nursing)
		GC – MSc, Ph. D. candidate (Nursing)
		JP – MSc, Ph. D. candidate (Nursing)
3.	Occupation	GR – RN, Ph. D. candidate in nursing (Université Laval, Canada); Research Chair coordinator (University of Montreal Hospital Research Centre, Canada).
		MPG – Full Professor (Nursing Faculty, Université Laval, Canada), Researcher and Chair Holder (Research Centre in Quebec City, Canada)
		JC – RN, Full Professor (Nursing Faculty, University of Montreal, Canada); Researcher and Chair Holder (University of Montreal Hospital Research Centre, Canada)
		LR – RN, Research Fellow (University of Otago, New Zealand); Associate Professor (Nursing Faculty, University of Montreal, Canada); Hon. Research Fellow (University of Melbourne)
		GC – RN, Ph. D. candidate (Nursing Faculty, University of Montreal); Research and clinical advisor (University of Montreal Hospital Centre)
		JP – RN, Professor (Université du Québec à Rimouski, Canada); Ph. D. candidate in nursing (Université Laval)
4.	Gender	Five female-identifying and two male-identifying (interviewer: female-identifying).
5.	Experience and training	GR –has experience in developing and evaluating virtual nursing interventions in ART adherence, in conducting qualitative research, and in knowledge synthesis.
		MPG – has expertise in implementation science, mixed methods methodologies, knowledge-transfer, evidence-based decision-making, and evaluation of ICTs.
		JC – has expertise in developing and evaluating nursing and no-nursing interventions among people living chronic conditions, such as PLWH, in the context of ART adherence.

		LR – has expertise in qualitative research and methodologies, including refugee health services research, and access to primary health care for vulnerable populations.
		GC – has clinical expertise with clientele having concurrent disorders, and has interests in mixed methods methodologies and in nurses' continuing education.
		JP – has clinical experience with PLWH, is interested by HIV-related stigma, and has experience in using motivational interviewing.
Relationship with participants		
6.	Relationship established	GR animated the focus group. She knew the majority of participants prior to this study. GR was directly involved in participant recruitment, data collection and analysis. She encouraged participants to express themselves freely, by sharing their *true* impressions of the VP simulation and not what they thought the student-researcher wanted to hear (in order to reduce the desirability bias). Knowing about the elements they least appreciated can help improve the VP simulation.
7.	Participant knowledge of interviewer	GR introduced herself to participants as a Ph.D. nursing student at Université Laval who leads the simulation-based research. She also introduced the research team.
8.	Interviewer characteristics	RN, Ph.D. candidate, simulation-based research leader and principal investigator, under the supervision of MPG and JC.
Domain 2: Study design		
Theoretical framework		
9.	Methodological orientation and theory	We used a qualitative exploratory design to take into account nurses' description of their simulation-based learning experience. We performed a thematic analysis.
Participant selection		
10.	Sampling	p.X
11.	Method of approach	Twelve nurses out of 27 that completed the VP simulation and the post-test survey didn't accept to be re-contacted for the qualitative component. The remaining 15 participants were contacted by email to invite them to take part in the qualitative component.
12.	Sample size	Five nurses participated in the focus group.
13.	Non-participation	N/A
Setting		
14.	Setting of data collection	p. X Zoom videoconferencing platform.
15.	Presence of non-participants	N/A
16.	Description of sample	pp. XX-XX; Table 3. Nurses' sociodemographic characteristics, computer literacy skills, MI training and recruitment strategies.
Data collection		

17.	Interview guide	Some examples from the focus group topic guide are presented in Table 2. GR sent the guide to the five nurses prior to the focus group, allowing them to look at the questions.
18.	Repeat focus group	No
19.	Audio/visual recording	Audio and visual recording (with Zoom)
20.	Field notes	Field notes were taken during the focus group by a research coordinator who was a "non-participant observer".
21.	Duration	The focus group lasted 75 minutes.
22.	Data saturation	We achieved an inductive and a priori thematic saturation (Saunders et al., 2018). The first type of saturation, inductive saturation, means that new themes/topics emerged from those initially identified in the focus group guide (e.g. the difference between learning MI through VP simulation and face-to-face). The second type, a priori saturation, relates to the degree to which identified themes/topics covered in the focus group guide are exemplified by each participant.
23.	Transcripts returned	No participant received the focus group transcript.
Domain 3: Analysis and findings		
Data analysis		
24.	Number of data coders	Coding was led by GR and involved comparison across transcripts.
25.	Description of the coding tree	We didn't describe the coding tree, but we clearly defined the themes.
26.	Derivation of themes	GR assessed the descriptive value of the themes against the transcripts. The other team members were involved in discussions of preliminary thematic findings and in the qualitative and mixed methods interpretation findings.
27.	Software	NVivo Pro version 12
28.	Participant checking	N/A
Reporting		
29.	Quotations presented	Illustrative quotes support the presentation of findings while participants' anonymity was respected.
30.	Data and findings consistent	The findings are strongly supported by the qualitative data.
31.	Clarity of major themes	Major themes are clearly identified.
32.	Clarity of minor themes	Subthemes are clearly identified and related to major themes.

ART: antiretroviral therapy; I: Investigator; ICTs: information and communication technologies; N/A: not applicable; PLWH: people living with HIV; RN: registered nurse

GRAMMS: Good Reporting of A Mixed Methods Study

We added complementary information in the GRAMMS (O'Cathain et al., 2008) to support the rationale behind our choice of a mixed methods study.

Criteria	Complementary information and reference to the manuscript
1. Describe the justification for using a mixed methods approach to the research question.	There is a paucity of evidence regarding the use of VP simulation to support nurses' continuing education. We developed a novel VP simulation with a view to improving nurses' relational skills. It is recommended to assess the acceptability of an intervention (Sidani et Braden, 2011) before planning a larger evaluative study. By combining two complementary types of methods, data and results, the mixed methods approach was therefore an appropriate research type for gathering richer descriptions and a broader understanding nurses' perception of the VP's acceptability and their learning experiences during this innovative training technique. The main rationale for a mixed methods study was based on its completeness (Bryman, 2006), and complementarity: we sought a comprehensive account of nurses' perceptions of the VP's acceptability, and a greater understanding of how VP simulation can contribute to their learning progression and transfer of such learning into practice (mixed methods integration research question).
2. Describe the design in terms of the purpose, priority, and sequence of methods.	Convergent mixed methods design occurs when both quantitative and qualitative data are collected and analyzed in the same phase of the research process. The two sets of results are then merged to produce an overall interpretation. Quantitative and qualitative methods have an equal priority and both play an important role in exploring the research question (Creswell et Creswell, 2018). Quantitative and qualitative components were interdependent (Pluye et al., 2018) due to the concurrent timing of the methods, the engagement of the same student-researcher throughout the research process, and the research participants. In our case, we collected and analyzed quantitative data first because nurses had to complete the VP simulation and post-test survey before taking part in the qualitative data collection. The timing of the methods was concurrent because both were part of a single research phase. The student-researcher was involved in both the quantitative and qualitative strands. She was not blinded from the quantitative data and findings when she undertook the qualitative component. The other interdependence was that the same group of participants was involved in both strands. The qualitative sample was drawn from the quantitative component. The data are therefore interdependent.
3. Describe each method in terms of sampling, data collection, and analysis.	pp. X-X
4. Describe where integration has	We aimed to merge the quantitative and qualitative results in order to understand how the quality and design elements of the VP simulation contributed to nurses'

occurred, how it has occurred, and who has participated.	learning experience, their acquisition or consolidation of relational skills, and the transfer of these latter into practice. Integration occurred when both quantitative and qualitative data were collected and analyzed. We used a comparison-of-results strategy using the pillar process technique (Johnson et al., 2019) and a joint display (see Additional file 3). The student-researcher led the overall integration, supported by the co-authors' input. Two of the co-authors were skilled in mixed methods studies.
5. Describe any limitation of one method associated with the present of the other method.	The mixed methods study approach has strengths and weaknesses pertaining to quantitative research, qualitative research, and mixed research (Johnson et Onwuegbuzie, 2004). In other words, the strengths of the two methods are cumulative, as are their limitations (Chicoine, 2018). An important limitation related to the quantitative component was the lack of conceptual clarity regarding the items covered in the overall questionnaire. With the exception of the Technology Acceptance Model (Cheng, 2012), the questionnaire was not validated. For example, in the *role of simulation to support nurses' practice* tool, many items could have been conceptualized and operationalized around distinct variables (e.g. self-efficacy, perceived effectiveness). The mixed methods design is a strength because the interviews covered aspects that were little or not at all covered in the measurement tools. This helped to refine our understanding of the nurses' learning experience. In the qualitative component, the five-participant sample size was relatively small. The student-researcher led this focus group. She knew the quantitative results, and led the overall mixed methods study. Although she was aware of her potential personal biases, she may nonetheless have unconsciously influenced the research process. However, the co-authors, including the thesis supervisors, were involved in the entire research process. Two main challenges were encountered during the integration. The first was dealing with huge numbers of items and data in the quantitative survey (n=80 items) and comparing these to the qualitative data that was focused on circumscribed thematic. The second was the unequal sample size (27 in the quantitative component; and 5 in the qualitative part). Use of the joint display was helpful in putting together data and results that can be compared and discussed. Furthermore, collecting quantitative and qualitative data from the same participants may have mitigated the limitations of the non-validated questionnaire. Contradictions between quantitative and qualitative results is a challenge or a limitation of the convergent mixed-methods study design (Creswell et Creswell, 2018). However, we did not find any major discrepancies or contradictions, considering the results were strongly in favour of the virtual simulation, and this somewhat facilitated the integration of the results.
6. Describe any insights gained from mixing or integrating methods.	See the mixed methods interpretation findings (p.XX-XX). The use of the quantitative method made it possible first to measure a great number of items on the simulation acceptability and then to obtain a descriptive picture of nurses' perception of the acceptability of this educational intervention. However, the quantitative data did not lead to understanding nurses' learning experience—a gap that justified the use of a qualitative component. The added value of this latter was

	to nuance and provide an understanding of the simulation experience, particularly with respect to its usefulness for learning. The insights of combining methods allowed us to connect and provoke interactions between the simulation's features and elements and their contribution to learning progression. By integrating the two components, we highlighted the convergence of the results. They were not surprising, considering the high averages and high level of agreement in favour of the simulation in the quantitative results that were subsequently supported by the transcript/themes.

Additional file 2. Questionnaire

Hello, nurses.

Thank you for filling out this online questionnaire, which we estimate will take between 15 and 30 minutes of your time.

The following questions are about the virtual patient simulation's components: the context, glossary, electronic patient record, quizzes, feedback process, labels, and level of fidelity.

You will be asked to rate your degree of disagreement/agreement related to each item.

Your answers are key to helping us understand your impressions and perceptions of using the virtual patient simulation.

Once you have completed the questionnaire, you will have access to your three-hour accredited training session.

PART A. Your identification

At any time, you can click the "Complete Later" button to finish the questionnaire at a later date. You will then have to choose a pseudonym and a password to use when logging into the questionnaire again.

Your first and last names are mandatory for the accredited training in the Faculty of Nursing at the Université de Montréal.

Your e-mail (personal or professional) is also required so we may communicate with you and ensure the follow-up to your participation.

Please present your information in the following format
First name, Last name, E-mail.

PART B. Context of the virtual simulation

The context of the virtual simulation was presented in two formats: by video introduction (12 min.), led by the student researcher, and by text introduction, which included the transcription of the video. Both the video and the text presented background information: the origins of the project, a definition of virtual simulation, its objectives and functioning, the limitations of the approach, and general information on motivational interviewing.

The following questions relate only to these video and text introductions (which have the same content, just different formats).

Items	Strongly disagree	Disagree	Agree	Strongly agree	N/A I didn't consult or watch it
CONTEXT OF THE VIRTUAL PATIENT SIMULATION/ PREBRIEFING					
The student-researcher's animated video introduction was key to fully understanding the context of the virtual simulation.					
The textual introduction (which repeated the same content as the video introduction) was key to fully understanding the context of the virtual simulation.					
I think it is important to have access to both information formats (text and video) to understand the context of the virtual simulation.					

If you have additional comments on the context of the project, you can write it down here:

PART C. Glossary

The glossary refers to the definition and the application of the main terms used in the virtual simulation.

Items	Strongly disagree	Disagree	Agree	Strongly agree	N/A I didn't consult or watch it
GLOSSARY					
The glossary was useful to my learning.					

The glossary is a key resource for complementary information about the whole nurse-patient consultation (including quizzes and feedback).					
The glossary contained technical terms that were difficult for me to understand. (*negative item*)					
I intend to use the glossary as a reference document in the future.					

Conditional question:

- You indicated that you did not consult the glossary. Would you have consulted it if there had been (click one or more answers): directions that were more visible at the beginning?
- frequent reminders?
- an electronic version of the glossary you would have received by email?
- a hyperlink in each quiz to consult the glossary?
- Other (please provide an answer): _____

If you have additional comments on the glossary, you can write it down here:

PART D. Electronic patient file

The patient's file is made up of the follow sections: the patient's profile, psychosocial history and vulnerability factors; the patient's lifestyle, HIV history, and medication history; clinical notes, and the purpose of the consultation.

Items	Strongly disagree	Disagree	Agree	Strongly agree	N/A I didn't consult or watch it
I received enough information in all the different sections of the "Patient Record" to fully understand the patient's situation.					

Conditional questions:

Which section(s) did you feel had insufficient information? Check all that apply and indicate the missing information:

- Patient's profile

Comment:

- Psychosocial history and vulnerability factors

Comment:

- Lifestyle

Comment:

- HIV history

Comment:

- Medication history

Comment:

- Clinical notes

Comment:

- Purpose of the consultation

Comment:

You have indicated not having consulted the patient's electronic file. What would have incited you to consult it? Click on one or many answers:

- directions that were more visible at the beginning?
- frequent reminders?
- an electronic version of the patient's file you would have received by email?
- a hyperlink in each quiz to consult the patient's electronic file?
- Other (please provide an answer): _____

If you have additional comments on the patient's file, you can write it down here:

PART E. Quizzes, feedback, and labels

Throughout the interview with the virtual patient, you participated in quizzes. You then received written feedback based on your answers. At certain points in the simulation, labels were shown to you. Illustrated as green and red rectangles, the labels presented keywords to show the nature of the virtual nurse or patient's interventions. The following questions refer to these quizzes, feedback, and labels.

Items	Strongly disagree	Disagree	Agree	Strongly agree
QUIZZES				
The quizzes required I take time to reflect before choosing my answers.				

I saw myself in some of the quiz answers.				
The quizzes made me reflect on my nursing practice.				
There were a sufficient number of quizzes.				
FEEDBACK				
The feedback allowed me to make the connections between the simulated situation and the theoretical elements of MI.				
Feedback was provided in a timely manner (as the consultation progressed).				
Getting the feedback right after the quizzes was disruptive to my learning.				
I would have preferred to get the feedback at the end of the interview.				
I would have liked to have been able to select the format of feedback (audio and/or text).				
VISUAL CUES/LABELS				
I found that the green and red labels next to the dialogue constructively supported my learning.				
Red or green labels were key to qualifying the content of the nurse-patient dialogue.				

If you have additional comments on quizzes, feedback and labels, you can write it down here:

PART F. Fidelity

"Fidelity" signifies the virtual simulation's level of realism, i.e. how much the virtual simulation is like a real-life healthcare situation.

Items	Strongly disagree	Disagree	Agree	Strongly agree
The story of the virtual patient who had difficulty following his treatment was realistic.				
The environment in which the interview took place resembled a nurse's office.				
The virtual patient's appearance resembled of a typical man living with HIV.				
Virtual simulation realistically reproduced nurse-patient interactions.				

If you have additional comments on fidelity, you can write it down here:

PART G. The role of simulation in supporting my professional practice

The following questions relate to how the simulation supported your professional practice in two contexts where medication is taken: 1) among people living with HIV, and 2) among other clienteles.

Rate your disagreement/agreement on a scale ranging from 'strongly disagree' to 'strongly agree'.

Click "not applicable" when the item does not apply to you.

Items	Strongly disagree	Disagree	Agree	Strongly Agree	N/A I work exclusively with PLHIV or I don't work with PLHIV
The virtual simulation led me to reflect on my nursing practice in the overall healthcare context offered to PLHIV.[a]					
The virtual simulation led me to reflect on my nursing practice as part of antiretroviral treatment support.					
Integration of teaching assisted by the virtual simulation will allow me to improve my communication skills with PLHIV.					
Integration of teaching assisted by virtual simulation will allow me to improve the health of PLHIV.					
Integration of teaching assisted by virtual simulation will allow me to improve the quality of therapeutic relationships with PLHIV.					
I feel capable of applying the communication skills seen in the virtual simulation to PLHIV.					
My participation in the virtual simulation has made me more confident about facing similar situations with others PLHIV.					
The virtual simulation led me to reflect about my nursing practice in general, not just with PLHIV.					

Integration of teaching assisted by virtual simulation will lead me to improve my communication skills with clientele other than PLHIV.					
Integration of teaching assisted by virtual simulation will allow me to improve the health of other clientele than PLHIV.					
Integration of teaching assisted by virtual simulation will lead me to improve the quality of therapeutic relationship with other clientele than PLHIV.					
I feel capable of applying the communication skills seen in virtual simulation to other clientele than PLHIV.					
My participation in the virtual simulation has made me more confident about facing similar situations with clientele other than PLHIV.					
I learned from the mistakes I made in the virtual simulation.					
As a result of my virtual simulation, I have identified certain aspects of my professional practice that I could improve.					
I learned something new by participating in this virtual simulation.					
Integration of teaching assisted by virtual simulation will allow me to increase the use of change talk.					
Integration of teaching assisted by virtual simulation will allow me to decrease the use of sustain talk.					
The virtual simulation raised my awareness of elements that can facilitate therapeutic relationships with patients.					
The virtual simulation has made me aware of the “traps” that can make therapeutic relationships with patients difficult.					
My participation in teaching assisted by the virtual simulation has helped me understand how the theoretical notions (from MI[c]) could be applied in my practice.					
My participation in teaching assisted by the virtual simulation has been a useful learning experience for my continuing professional development.					

[a] PLHIV: people living with HIV

[b] N/A: not applicable

[c] MI: motivational interviewing

If you have additional comments on the role of simulation to support nurses’ professional practice, you can write it down here:

PART H. Your perspective on the achievement of learning objectives

Rate your disagreement/agreement as to the extent to which your participation in the virtual simulation allowed you to reach the learning objectives.

Items	Strongly disagree	Disagree	Agree	Strongly agree	N/A I already mastered the topic
Spot traps in nursing interventions that can shut down communication with the patient.					
Identify nursing interventions that optimize openness to the patient's experience.					
Apply nursing interventions that elicit change talk.					
Spot traps in nursing interventions that enable the statu quo (sustain talk).					
Identify cues in the patient's speech that reflect change talk.					
Target the key elements that are important to include in providing information to the patient.					
Identify principles to build an action plan with the patient.					
Describe the principles consistent with MI that structure information sharing with the patient.					

[a] N/A: Not applicable means, "I already mastered the topic.".

Did your participation in the virtual simulation allow you to achieve other learning objectives that have not been previously mentioned?

- Yes (please specify)
- No

If you have additional comments on the learning objectives, write them here:

PART I: Acceptability questionnaire

The following questions focus on your appreciation of the virtual simulation.

These questions are not intended to verify your knowledge. There are no bad or good answers. On a scale ranging from 'strongly disagree' to 'strongly agree,' indicate your disagreement/agreement with each item.

Items	Strongly disagree	Disagree	Agree	Strongly agree	N/A
System quality					
The virtual simulation can give learners control over their learning activity.					
The virtual simulation presented course materials in a multimedia and readable format.					
The virtual simulation can offer flexibility in learning as to time.					
The virtual simulation can offer flexibility in learning as to place.					
The digital simulation was interactive.					
Information quality					
The content of the virtual simulation was innovative.					
The virtual simulation met my learning needs.					
The level of difficulty of the virtual simulation learning content was appropriate.					
Service quality					
I acquired adequate support within the virtual simulation to help my learning (e.g. user guide).					
I acquired adequate support from the virtual simulation's administrators for the app's technical aspects.					
Overall, support services of the virtual simulation were satisfactory.					
User-interface design quality					
The layout of the virtual simulation was user friendly.					
The layout of the virtual simulation was well structured.					
Overall, user-interface design of the virtual simulation was satisfactory (e.g. overall design, 3D images, colours, consultation processes).					
Perceived usefulness					
Using the virtual simulation seemed to me to be more effective than other types of training I might have received.					

Using the virtual simulation enhanced the effectiveness of my learning.					
I found the virtual simulation to be useful in my learning.					
Perceived ease of use					
Using virtual simulation did not require a lot of mental effort.					
I have found the virtual simulation to be easy to use.					
I quickly developed ease in using the virtual simulation.					
Perceived enjoyment					
I have found using the virtual simulation enjoyable.					
The navigation within the virtual simulation was pleasant.					
I have had fun using the virtual simulation.					
Intention to use					
I would use the virtual simulation on a regular basis in the future, if it were available online.					
I would use the virtual simulation frequently in my practice, if it were available online.					
I would strongly recommend the virtual simulation be made available to other nurses.					
I would strongly recommend the virtual simulation be made available to other healthcare professionals.					

PART J. Open-ended questions

What were the elements that most caught your interest?

Which elements did you like the least?

What recommendations would you make with a view to improving the virtual simulation?

Do you have anything else to add (optional)?

PART K. Your advice on the questionnaire

Throughout the questionnaire, the answers scales were formulated as: strongly disagree, disagree, agree and strongly agree:

There was no choice of a neutral value (i.e. neither disagree nor agree).

Please indicate, pour each statement, the answer that best reflects how you feel:

Items					
Throughout the questionnaire, selecting an answer without being able to position myself "neutrally" (neither disagreeing nor agreeing) was:	Very difficult	Difficult	Neither difficult nor easy	Easy	Very easy
Throughout the questionnaire, if I had had the opportunity to choose a neutral option (neither in disagree nor agree), this position would have:	Definitely changed my answers.	Slightly changed my answers.	Made no difference to my answers.		
Since I did not have the opportunity to choose a neutral option when filling out the questionnaire, I felt:	Completely forced to take a position.	Forced to take a position.	Neither forced nor free to take a position. (I was indifferent and didn't think about it.)	Free to take a position.	Completely free to take a position.

Additional file 3. Description of the Pillar Integration Process and excerpt of the joint display

We used the four stages of the Pillar Integration Process as the strategy for integrating the quantitative and qualitative findings (Johnson et al., 2019): 1) Listing; 2) Matching; 3) Checking; 4) Pillar building.

Stage 1 – Listing: This involves selecting the relevant raw quantitative data that can be listed in the column (QUANT data), i.e. percentage, items in the survey, as well as grouped data in the QUANT categories (e.g. variables). We began with the quantitative data-based on the timing of this study component (i.e. done before the qualitative one).

Stage 2 – Matching: QUAL data (transcript) and categories (themes) are then listed in their respective columns to match the QUANT data and categories columns. The organization and comparison of the data and categories can identify patterns, similarities or differences. If no match is found between QUANT and QUAL, a mention “not identified” can be written.

Stage 3 – Checking: This stage is about cross-checking the QUANT and QUAL data and their emerging patterns (or lack thereof), for quality-integration purposes. An iterative process makes it possible to go back to the data and look for the accuracy, appropriateness and completeness of the matches (or absence of matches).

Stage 4 – Pillar building: Here, the QUANT and QUAL findings are compared and contrasted from the listing, matching, and checking phases. Insights are conceptualized from the connection of the QUANT and QUAL columns. Both types of data and categories are integrated and connected to build inferences on patterns, themes, or insights, and possible explanations. When the pillar is finalized, the researcher can write a meaningful narrative to relate mixed evidence. This is what we did by using a weaving approach (Fetters et al., 2013; Fetters et Freshwater, 2015) and grouping quantitative and qualitative findings under mixed method interpretations.

Excerpt of the Pillar Integration Process

QUANT [a] data	**QUANT categories**	**Pillar building with mixed method interpretations**	**QUAL[b] categories (themes)**	**QUAL data – Verbatim**
Not identified	Not identified	Not identified because this is a new theme that came from the qualitative component	Being willing and motivated to engage in the simulation-based research	There was nevertheless a link between the patients (with hepatitis C) adhering to the treatment I'm following here and the motivational talk with patients with drug addiction. I could see the sense in it. (Male assistant head nurse, FG[c]) I don't really see any (patients with) HIV, but we do youth clinics, so we have screening. I found it important to do this training to learn things about HIV but also about motivational interviewing, which we do daily, enormously, at our office. (Female school nurse, FG)
The story of the virtual patient who had difficulty following his treatment was realistic. (3.56±0.58)	Fidelity	Influence of the simulation's fidelity on nurses' impression of getting real practice and of having an immersive learning experience	Enjoying the practice in a realistic, immersive and non-judgmental environment	The patient's story was really, um, it's real life, it's really believable; it's not something just pulled out of thin air. (Male head assistant nurse, FG) Maybe this is because I've done a lot of work around the issue of taking antiretroviral treatment, so I found the [VP's [d]] situation ... maybe less typical. (Female nurse-researcher, FG).
Virtual simulation realistically reproduced nurse-patient interactions (3.26±0.59)	Fidelity	Fidelity of the simulation including nurse-patient interactions' impacts on immersive learning experience	Enjoying the practice in a realistic, immersive and non-judgmental	It's virtual but at the same time there was an interaction, which was fairly realistic. I wonder if, even if there had been no character but only the audio—honestly, I was really "in" the situation; I was in all of it. It was very well performed—the voices and all. I found

			environment	it super well done. (Male assistant head nurse, FG)
The feedback allowed me to make the connections between the simulated situation and the theoretical elements of MI[e]. (3.52 ±0.51)	Feedback	Acquiring new knowledge and building self-confidence	Acquiring and consolidating motivational interviewing knowledge and skills	I found that the platform allowed me to consolidate my nursing practice and my past theoretical learning, since I don't see patients every day. (Female nurse-manager, FG)
My participation in teaching assisted by the virtual simulation has helped me understand how the theoretical notions (from MI) could be applied in my practice. (3.22±0.51)	Simulation's role in supporting nurses' professional practice			I felt that, toward the end (of the simulation), I had gotten better. I had probably internalized the theory. (Male nurse case manager, FG) I felt it allowed me to better understand (MI); it's kind of the practical aspect of the real-life approach. (Female nurse-researcher, FG)
The quizzes made me reflect on my nursing practice. (3.48±0.51)	Quizzes	Tapping self-awareness and reflection in relational practice	Theme: Perceived utility of the virtual patient simulation Sub-theme: Developing reflective learning and transferring it to practice	The first time, I made a lot of mistakes because I told myself that I was going to go with my knowledge and experience. The second time, I did it with my new knowledge. It gives you parallel vantage point onto yourself, onto your own beliefs. (Male nurse case manager, FG)
I learned from the mistakes I made in the virtual simulation. (3.37±0.49).	Simulation's role in supporting nurses' professional practice	Tapping self-awareness and reflection in relational practice		It was fun because it's like action/reaction. It was immediately obvious if you asked the question wrong; you could see the effect. I found it interesting because if you took a wrong action, you could get back on track. That way, we could understand why it was a mistake. (Female nurse-manager, FG)
The virtual simulation has made me aware of the "traps" that can make therapeutic relationships with patients difficult. (3.30 ±0.47)	Simulation's role in supporting nurses' professional practice	Tapping self-awareness and reflection in relational practice		Do I go too fast sometimes? Telling myself that, well, he didn't take it [his treatment], that he must have relapsed, always jumping to my conclusions first. Don't I miss things sometimes, too? I was thinking that maybe now I will be more careful and try to understand the patient's reasons and stop just saying "Ah, well, he didn't take it." (Male assistant head nurse, FG)

The virtual simulation raised my awareness of elements that can facilitate therapeutic relationships with patients. (3.22±0.42).	Simulation's role in supporting nurses' professional practice	Tapping self-awareness and reflection in relational practice	Theme: Perceived utility of the virtual patient simulation Sub-theme: Being present and revisiting relational skills	I'd say it's more in the way the questions are asked. It's really focused on open-ended questions and on solutions that come from the patient. We [nurses] may have solutions, but they have to come from them [the patients]: that's when they are most effective [...] How can we ask questions that bring out the best in the patient? (Male nurse case manager, FG)
The virtual simulation led me to reflect about my nursing practice in general, not just with PLHIV[f]. (3.58±0.58).	Simulation's role in supporting nurses' professional practice	Tapping self-awareness and reflection in relational practice	Theme: Perceived utility of the virtual patient simulation Sub-theme: Developing reflective learning and transferring it to practice	Look, if patients don't react or aren't motivated, well, maybe it's because I too am playing a part as the care provider: maybe I am not addressing them in the right way; maybe I am not considering them in their entirety, according to their beliefs and values. (Female nurse-manager, FG) Doing it interactively leads you to self-reflection: how would you have reacted? You said something spontaneously, and then it made you reflect on what you answered. (Female school nurse, FG)
The virtual simulation raised my awareness of elements that can facilitate therapeutic relationships with patients. 3.22 (±0.42)	Simulation's role in supporting nurses' professional practice	Tapping self-awareness and reflection in relational practice	Theme: Perceived utility of the virtual patient simulation Sub-theme: Being present and revisiting relational skills	(VP simulation) helps nurses understand or realize that it's important to listen, to be there in the here and now. (Female nurse-manager, FG)
The virtual simulation can offer flexibility in learning as to time. (3.63±0.49)	System quality	Simulation's perceived flexibility, efficacy, and control over one's learning led to a positive	Accessibility and flexibility in learning	What I find interesting in fact is that you can do it in your living room or at home or at the office, and you can test your wrong answers and see what you get. (Female nurse manager, FG)

The virtual simulation can offer flexibility in learning as to place. (3.48± 0.64) The virtual simulation can give learners control over their learning activity. (3.41 ±0.57)		learning experience.		I did the whole thing in one go, but I came back later for some aspects that I had understood less clearly or that I had later asked myself questions about. (Female nurse-researcher, FG)
Using the virtual simulation seemed to me to be more effective than other types of training I might have received. (3.33±0.78)	Perceived usefulness (technology acceptance)	Simulation's perceived flexibility, efficacy, and control over one's learning led to a positive learning experience.	Enjoying the practice in a realistic, immersive and non-judgmental environment	In classic training activities, we practice with a co-worker. I find that quite biased, because we've both just learned the theory and we're trying to apply it. The other person has just learned the same thing, so, in the end, well, we help each other only a little bit. But here, we were faced with a virtual character who is very realistic. I find it even more real than with, say, another trainee. But for people who are shy in groups, [the simulation] is really very accessible and allows them to progress. (Male assistant head nurse, FG)
Using the virtual simulation enhanced the effectiveness of my learning. (3.26 ±0.81) I learned something new by participating in this virtual simulation. (3.48±0.51).	Simulation's role in supporting nurses' professional practice	Simulation's perceived flexibility and efficacy, and control over one's learning led to a positive learning experience.	Acquiring and consolidating motivational interviewing knowledge and skills	I'd read a little about MI, but I'd never done any training. I didn't expect to learn so much in such a short time. (Female nurse-researcher, FG)
Not identified	Not identified	Not identified because this is a new theme that emerged in the qualitative component	Perceived difficulty in engaging in the simulation-based research	I'm not saying the workflow was slow... but maybe that's why some people didn't finish the training activity. I'm not saying it was repetitive, but maybe if they felt it was too slow... When the patient talks, he moves his arms around, and sometimes there was a little delay. This was maybe a feeling I had, since I was persistent at first. (Female nurse-manager, FG)

[a] QUANT: quantitative
[b] QUAL: qualitative
[c] FG: focus group
[d] VP: virtual patient
[e] MI: motivational interviewing
[f] PLHIV: people living with HIV

Additional file 4. Virtual patient simulation design elements

Items	m (SD)[a]	Med (IQR) [b]	1 - Strongly disagree n (%)[c]	2 - Disagree n (%)	3 - Agree n (%)	4 - Strongly agree n (%)	N/A[d]
CONTEXT OF THE VIRTUAL PATIENT SIMULATION/ PREBRIEFING							
The student-researcher's animated video introduction was key to fully understanding the context of the virtual simulation.	3.44 (0.77)	4 (1)	1 (4)	1 (4)	9 (33)	14 (52)	2 (7)
The textual introduction (which repeated the same content as the video introduction) was key to fully understanding the context of the virtual simulation.	3.14 (0.73)	3 (1)	0 (0)	4 (15)	10 (37)	7 (26)	6 (22)
I think it is important to have access to both information formats (text and video) to understand the context of the virtual simulation.	3.15 (0.6)	3 (0.5)	0 (0)	3 (11)	17 (63)	7 (26)	0 (0)
GLOSSARY							
The glossary was useful to my learning.	2.91 (0.79)	3 (0.5)	1 (4)	5 (19)	12 (44)	5 (19)	4 (15)
The glossary is a key resource for complementary information about the whole nurse-patient consultation (including quizzes and feedback).	2.96 (0.88)	3 (0.5)	2 (7)	3 (11)	12 (44)	6 (22)	4 (15)
The glossary contained technical terms that were difficult for me to understand. (*negative item*)	1.74 (0.75)	2 (1)	9 (33)	12 (44)	1 (4)	1 (4)	4 (15)
I intend to use the glossary as a reference document in the future.	2.89 (0.97)	3 (0.5)	4 (15)	2 (7)	14 (52)	7 (26)	0 (0)
ELECTRONIC PATIENT RECORD							
I received enough information in all the different sections of the "Patient Record" to fully understand the patient's situation.	3.56 (0.58)	4 (1)	0 (0)	1 (4)	10 (37)	16 (59)	0 (0)
QUIZZES							
The quizzes required I take time to reflect before choosing my answers.	2.93 (0.68)	3 (0)	2 (7)	1 (4)	21 (78)	3 (11)	0 (0)
I saw myself in some of the quiz answers.	3.37 (0.49)	3 (1)	0 (0)	0 (0)	17 (63)	10 (37)	0 (0)

The quizzes made me reflect on my nursing practice.	3.48 (0.51)	3 (1)	0 (0)	0 (0)	14 (52)	13 (48)	0 (0)
There were a sufficient number of quizzes.	3.33 (0.62)	3 (1)	0 (0)	2 (7)	14 (52)	11 (41)	0 (0)
FEEDBACK							
The feedback allowed me to make the connections between the simulated situation and the theoretical elements of MI.	3.52 (0.51)	4 (1)	0 (0)	0 (0)	13 (48)	14 (52)	0 (0)
Feedback was provided in a timely manner (as the consultation progressed).	3.59 (0.5)	4 (1)	0 (0)	0 (0)	11 (41)	16 (59)	0 (0)
Getting the feedback right after the quizzes was disruptive to my learning. (*negative item*)	1.41 (0.57)	1 (1)	17 (63)	9 (33)	1 (4)	0 (0)	0 (0)
I would have preferred to get the feedback at the end of the interview.	1.33 (0.55)	1 (1)	19 (70)	7 (26)	1 (4)	0 (0)	0 (0)
I would have liked to have been able to select the format of feedback (audio and/or text).	1.89 (0.75)	2 (1)	8 (30)	15 (56)	3 (11)	1 (4)	0 (0)
VISUAL CUES/LABELS							
I found that the green and red labels next to the dialogue constructively supported my learning.	3.48 (0.51)	3 (1)	0 (0)	0 (0)	14 (52)	13 (48)	0 (0)
Red or green labels were key to qualifying the content of the nurse-patient dialogue.	3.33 (0.55)	3 (1)	0 (0)	1 (4)	16 (59)	10 (37)	0 (0)
FIDELITY							
The story of the virtual patient who had difficulty following his treatment was realistic.	3.56 (0.58)	4 (1)	0 (0)	1 (4)	10 (37)	16 (59)	0 (0)
The environment in which the interview took place resembled a nurse's office.	3.33 (0.55)	3 (1)	0 (0)	1 (4)	16 (59)	10 (37)	0 (0)
The virtual patient's appearance resembled of a typical man living with HIV.	3.07 (0.73)	3 (0.5)	1 (4)	3 (11)	16 (59)	7 (26)	0 (0)
Virtual simulation realistically reproduced nurse-patient interactions.	3.26 (0.59)	3 (1)	0 (0)	2 (7)	16 (59)	9 (33)	0 (0)

[a] m: mean, SD: standard deviations calculated on 4-point Likert scale (range: 1–4).

[b:] med: median, IQR: interquartile range.

[c]: Results presented as categorical variable. n: number of participants and % of participants.

[d] N/A: not applicable means “I did not watch or consult it.” Some virtual patient simulation design elements, such as the context (prebriefing video and text), the glossary and the patient’s electronic record, were not mandatory. In brackets (% of response)

Additional file 5. Global system quality and technology acceptance

DIMENSIONS **Constructs** Items	Cron-bach's alpha	m (SD)	Med (IQR)	1 – Strongly disagree n (%)	2- Disagree n (%)	3- Agree n (%)	4 - Strongly agree n (%)	N/A[a] n (%)
GLOBAL SYSTEM QUALITY [b]		3.53 (0.53)	4 (1)					
System quality	0.83	3.51 (0.54)	4 (1)					
The virtual simulation can give learners control over their learning activity.		3.41 (0.57)	3 (1)	0 (0)	1 (4)	14 (52)	12 (44)	0 (0)
The virtual simulation presented course materials in a multimedia and readable format.		3.44 (0.51)	3 (1)	0 (0)	0 (0)	15 (56)	12 (44)	0 (0)
The virtual simulation can offer flexibility in learning as to time.		3.63 (0.49)	4 (1)	0 (0)	0 (0)	10 (37)	17 (63)	0 (0)
The virtual simulation can offer flexibility in learning as to place.		3.48 (0.64)	4 (1)	0 (0)	2 (7)	10 (37)	15 (56)	0 (0)
The digital simulation was interactive.		3.59 (0.5)	4 (1)	0 (0)	0 (0)	11 (41)	16 (59)	0 (0)
Information quality	0.86	3.49 (0.50)	3 (1)					
The content of the virtual simulation was innovative.		3.56 (0.51)	4 (1)	0 (0)	0 (0)	12 (44)	15 (56)	0 (0)
The virtual simulation met my learning needs.		3.48 (0.51)	3 (1)	0 (0)	0 (0)	14 (52)	13 (48)	0 (0)
The level of difficulty of the virtual simulation learning content was appropriate.		3.44 (0.51)	3 (1)	0 (0)	0 (0)	15 (56)	12 (44)	0 (0)
Service quality	1.00[c]	3.65 [d] (0.48)	4 (1)					
I acquired adequate support within the virtual simulation to help my learning (e.g. user guide).		3.67[e] (0.49)	4 (1)	0 (0)	0 (0)	5 (19)	10 (37)	12 (44)

I acquired adequate support from the virtual simulation's administrators for the app's technical aspects.		3.73[f] (0.47)	4 (0.5)	0 (0)	0 (0)	3 (11)	8 (30)	16 (59)
Overall, support services of the virtual simulation were satisfactory.		3.57[g] (0.51)	4 (1)	0 (0)	0 (0)	6 (22)	8 (30)	13 (48)
User-interface design quality	0.68	3.54 (0.55)	4 (1)					
The layout of the virtual simulation was user friendly.		3.37 (0.56)	3 (1)	0 (0)	1 (4)	15 (56)	11 (41)	0 (0)
The layout of the virtual simulation was well structured.		3.89 (0.32)	4 (0)	0 (0)	0 (0)	3 (11)	24 (89)	0 (0)
Overall, user-interface design of the virtual simulation was satisfactory (e.g. overall design, 3D images, colours, consultation processes).		3.37 (0.56)	3 (1)	0 (0)	1 (4)	15 (56)	11 (41)	0 (0)
TECHNOLOGY ACCEPTANCE[a]		3.45 (0.64)	4 (1)					
Perceived usefulness	0.92	3.35 (0.71)	3 (1)					
Using the virtual simulation seemed to me to be more effective than other types of training I might have received.		3.33 (0.78)	4 (1)	0 (0)	5 (19)	8 (30)	14 (52)	0 (0)
Using the virtual simulation enhanced the effectiveness of my learning.		3.26 (0.81)	3 (1)	0 (0)	6 (22)	8 (30)	13 (48)	0 (0)
I found the virtual simulation to be useful in my learning.		3.44 (0.51)	3 (1)	0 (0)	0 (0)	15 (56)	12 (44)	0 (0)
Perceived ease of use	0.69	3.42 (0.67)	4 (1)					
Using virtual simulation did not require a lot of mental effort.		3.22 (0.8)	3 (1)	1 (4)	3 (11)	12 (44)	11 (41)	0 (0)
I have found the virtual simulation to be easy to use.		3.48 (0.64)	4 (1)	0 (0)	2 (7)	10 (37)	15 (56)	0 (0)
I quickly developed ease in using the virtual simulation.		3.56 (0.51)	4 (1)	0 (0)	0 (0)	12 (44)	15 (56)	0 (0)

Perceived enjoyment	0.92	3.47 (0.57)	4 (1)					
I have found using the virtual simulation enjoyable.		3.52 (0.58)	4 (1)	0 (0)	1 (4)	11 (41)	15 (56)	0 (0)
The navigation within the virtual simulation was pleasant.		3.37 (0.56)	3 (1)	0 (0)	1 (4)	15 (56)	11 (41)	0 (0)
I have had fun using the virtual simulation.		3.52 (0.58)	4 (1)	0 (0)	1 (4)	11 (41)	15 (56)	0 (0)
Intention to use	0.96	3.53 (0.60)	4 (1)					
I would use the virtual simulation on a regular basis in the future, if it were available online.		3.52 (0.64)	4 (1)	0 (0)	2 (7)	9 (33)	16 (59)	0 (0)
I would use the virtual simulation frequently in my practice, if it were available online.		3.44 (0.64)	4 (1)	0 (0)	2 (7)	11 (41)	14 (52)	0 (0)
I would strongly recommend the virtual simulation be made available to other nurses.		3.56 (0.58)	4 (1)	0 (0)	1 (4)	10 (37)	16 (59)	0 (0)
I would strongly recommend the virtual simulation be made available to other healthcare professionals.		3.59 (0.57)	4 (1)	0 (0)	1 (4)	9 (33)	17 (63)	0 (0)

[a] N/A: not applicable

[b] For the two dimensions, global system quality and technology acceptance, and their corresponding constructs, only the means and standard deviation are presented. The sum of categorical variables would be confusing because the n would become higher than the numbers of participants (n=27).

[c] The Cronbach alpha was calculated for participants (n=9) who answered the three items of the constructs. Otherwise, the descriptive statistics for each item were calculated per response (or entry).

[d] 41 entries were answered “not applicable,” representing 16 participants; this means that these did not require any service/support during their participation in the VP simulation.

[e] 12 entries were answered “not applicable” (n=12 participants)

[f] 16 entries were answered “not applicable”(n=16 participants)

[g] 13 entries were answered “not applicable” (n=13 participants)

Additional file 6. The role of simulation in supporting nurses' professional practice

Items	m (SD)	Med (IQR)	1 - Strongly disagree n (%)	2 – Disagree n(%)	3 – Agree n(%)	4 – Strongly Agree n(%)	N/A[b] n (%)
The virtual simulation led me to reflect on my nursing practice in the overall healthcare context offered to PLHIV.[a]	3.45 (0.51)	3 (1)	0 (0)	0 (0)	11 (41)	9 (33)	7 (26)
The virtual simulation led me to reflect on my nursing practice as part of antiretroviral treatment support.	3.55 (0.51)	4 (1)	0 (0)	0 (0)	9 (33)	11 (41)	7 (26)
Integration of teaching assisted by the virtual simulation will allow me to improve my communication skills with PLHIV.	3.45 (0.51)	3 (1)	0 (0)	0 (0)	11 (41)	9 (33)	7 (26)
Integration of teaching assisted by virtual simulation will allow me to improve the health of PLHIV.	3.50 (0.51)	3.5 (1)	0 (0)	0 (0)	10 (37)	10 (37)	7 (26)
Integration of teaching assisted by virtual simulation will allow me to improve the quality of therapeutic relationships with PLHIV.	3.5 (0.51)	3.5 (1)	0 (0)	0 (0)	10 (37)	10 (37)	7 (26)
I feel capable of applying the communication skills seen in the virtual simulation to PLHIV.	3.38 (0.5)	3 (1)	0 (0)	0 (0)	13 (48)	8 (30)	6 (22)
My participation in the virtual simulation has made me more confident about facing similar situations with others PLHIV.	3.29 (0.56)	3 (1)	0 (0)	1 (4)	13 (48)	7 (26)	6 (22)
The virtual simulation led me to reflect about my nursing practice in general, not just with PLHIV.	3.58 (0.58)	4 (1)	0 (0)	1 (4)	9 (33)	16 (59)	1 (4)
Integration of teaching assisted by virtual simulation will lead me to improve my communication skills with clientele other than PLHIV.	3:50 (0.51)	3.5 (1)	0 (0)	0 (0)	13 (48)	13 (48)	1 (4)
Integration of teaching assisted by virtual simulation will allow me to improve the health of other clientele than PLHIV.	3.38 (0.57)	3 (1)	0 (0)	1 (4)	14 (52)	11 (41)	1 (4)
Integration of teaching assisted by virtual simulation will lead me to improve the quality of therapeutic relationship with other clientele than PLHIV.	3.33 (0.62)	3 (1)	0 (0)	2 (7)	14 (52)	11 (41)	0 (0)
I feel capable of applying the communication skills seen in virtual simulation to other clientele than PLHIV.	3:30 (0.54)	3 (1)	0 (0)	1 (4)	17 (63)	9 (33)	0 (0)
My participation in the virtual simulation has made me more confident about facing similar situations with clientele other than PLHIV.	3.26 (0.59)	3 (1)	0 (0)	2 (7)	16 (59)	9 (33)	0 (0)

I learned from the mistakes I made in the virtual simulation.	3.37 (0.49)	3 (1)	0 (0)	0 (0)	17 (63)	10 (37)	0 (0)
As a result of my virtual simulation, I have identified certain aspects of my professional practice that I could improve.	3.22 (0.42)	3 (0)	0 (0)	0 (0)	21 (78)	6 (22)	0 (0)
I learned something new by participating in this virtual simulation.	3.48 (0.51)	3 (1)	0 (0)	0 (0)	14 (52)	13 (48)	0 (0)
Integration of teaching assisted by virtual simulation will allow me to increase the use of change talk.	3.19 (0.4)	3 (0)	0 (0)	0 (0)	22 (81)	5 (19)	0 (0)
Integration of teaching assisted by virtual simulation will allow me to decrease the use of sustain talk.	2.89 (0.64)	3 (0)	1 (4)	4 (15)	19 (70)	3 (11)	0 (0)
The virtual simulation raised my awareness of elements that can facilitate therapeutic relationships with patients.	3.22 (0.42)	3 (0)	0 (0)	0 (0)	21 (78)	6 (22)	0 (0)
The virtual simulation has made me aware of the “traps” that can make therapeutic relationships with patients difficult.	3.30 (0.47)	3 (1)	0 (0)	0 (0)	19 (70)	8 (30)	0 (0)
My participation in teaching assisted by the virtual simulation has helped me understand how the theoretical notions (from MI[c]) could be applied in my practice.	3.22 (0.51)	3 (0.5)	0 (0)	1 (4)	19 (70)	7 (26)	0 (0)
My participation in teaching assisted by the virtual simulation has been a useful learning experience for my continuing professional development.	3.33 (0.48)	3 (1)	0 (0)	0 (0)	18 (67)	9 (33)	0 (0)

[a] PLHIV: people living with HIV

[b] N/A: not applicable

[c] MI: motivational interviewing

Additional file 7. Achievement of learning objectives

Items (The virtual simulation makes it possible to…)	m (SD)	Med (IQR)	1 – Strongly disagree n (%)	2 – Disagree n(%)	3 – Agree n(%)	4 – Strongly agree n(%)	N/A[a] n(%)
Spot traps in nursing interventions that can shut down communication with the patient.	3.58 (0.5)	4 (1)	0 (0)	0 (0)	11 (41)	15 (56)	1 (4)
Identify nursing interventions that optimize openness to the patient's experience.	3.54 (0.51)	4 (1)	0 (0)	0 (0)	12 (44)	14 (52)	1 (4)
Apply nursing interventions that elicit change talk.	3.48 (0.51)	3 (1)	0 (0)	0 (0)	14 (52)	13 (48)	0 (0)
Spot traps in nursing interventions that enable the statu quo (sustain talk).	3.41 (0.5)	3 (1)	0 (0)	0 (0)	16 (59)	11 (41)	0 (0)
Identify cues in the patient's speech that reflect change talk.	3.42 (0.5)	3 (1)	0 (0)	0 (0)	15 (56)	11 (41)	1 (4)
Target the key elements that are important to include in providing information to the patient.	3.37 (0.56)	3 (1)	0 (0)	1 (4)	15 (56)	11 (41)	0 (0)
Identify principles to build an action plan with the patient.	3.38 (0.5)	3 (1)	0 (0)	0 (0)	16 (59)	10 (37)	1 (4)
Describe the principles consistent with MI that structure information sharing with the patient.	3.35 (0.49)	3 (1)	0 (0)	0 (0)	17 (63)	9 (33)	1 (4)

[a] N/A: Not applicable means, "I already mastered the topic.".

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8.1.10 Résultats additionnels de l'étude mixte (article 5)

8.1.10.1 Stratégies de recrutement

Le recrutement des participantes de l'étude mixte s'est échelonné sur une période de cinq mois (de mars à août 2019), selon un échantillonnage de convenance et par boule de neige. Tel que discuté dans l'article 5 et dans le cinquième chapitre « Considérations méthodologiques », nous avons opté pour des stratégies de recrutement hybrides qui combinaient des approches en face à face et en ligne. L'étudiante-chercheuse a fait des présentations dans deux milieux cliniques pour expliquer la nature du projet, incluant une démonstration de la simulation numérique. Les infirmières étaient invitées à partager l'information sur le projet à leurs collègues. Concernant les stratégies en ligne, nous avons d'abord ciblé les infirmières ayant un intérêt potentiel pour les soins aux PVVIH sous traitement, pour ensuite élargir auprès des infirmières, peu importe leur champ de pratique. Encore une fois, l'équipe de coordination du PNMVH a facilité la diffusion des informations de l'étude via un courriel ciblé auprès de ses membres[14] (n=450) et via une infolettre (n=1300 abonnés). Nous avons également sollicité l'OIIQ pour publiciser l'annonce du projet. Les « statistiques » étaient les suivantes : 9 708 infirmières-membres visées par l'envoi, 38 % de taux d'ouverture de l'infolettre et 81 clics sur la bannière. Par ailleurs, l'information du projet a été dispensée dans le *Bulletin emplois* de l'OIIQ. Pour cette stratégie, 12 989 envois ont été faits : un taux d'ouverture du courriel de 45 % a été noté et 89 clics ont été faits sur la bannière. Un nombre de 49 infirmières ont été recrutées.

En somme, 27 des 49 participantes (55.10%) ont été informées du projet soit par un collègue ou par l'étudiante-chercheuse : 11 (22.45 %) ont reçu des informations de la part de l'OIIQ et 11 (22.45 %) ont participé suite aux interventions du PNMVH. Le rapport coût-bénéfice d'un envoi massif par l'OIIQ est faible, considérant la publicité d'envoi qui est onéreuse et le petit nombre d'infirmières recrutées. Par contre, cela a permis d'obtenir une certaine variabilité au sein des caractéristiques des infirmières. Cela constitue un « résultat » intéressant illustrant que les stratégies de recrutement en présentiel, c'est-à-dire par la référence au projet soit par l'étudiante-chercheuse ou par un collègue, se sont avérées les plus « efficaces ».

[14] Les membres du PNMVH sont composés de professionnels de la santé et des services sociaux (dont les infirmières), de même que des intervenants communautaires, qui sont intéressés aux soins et services offerts aux PVVIH.

À l'exception de trois participantes sur 49 qui ont auto-rapporté avoir peu confiance en leurs habiletés technologiques, toutes les autres ont indiqué avoir confiance ou pleinement confiance en leurs capacités. Par ailleurs, les 27 infirmières ont rapporté des difficultés techniques au moment de la création du compte dans la plateforme de simulation et pendant la consultation virtuelle[15]. Il est ainsi possible de croire que ces infirmières, ayant complété la recherche basée sur la simulation, avaient un haut niveau de motivation, d'engagement et de persévérance, malgré les soucis techniques rencontrés.

8.1.10.2 Perceptions des participantes quant à l'absence de la position neutre dans le questionnaire

Nous avons sondé, à l'aide de trois questions fermées, l'impression des participantes quant à l'absence de la position neutre (ni en désaccord ni en accord) dans le questionnaire post-intervention (voir Figures 3, 4 et 5). Bien que les résultats obtenus ne reflètent qu'un portrait descriptif d'un échantillon de petite taille ayant auto-rapporté leurs perceptions, ceci nous laisse croire que cette modalité d'évaluation était appréciable. Encore une fois, en gardant l'idée que notre étude était exploratoire, il s'agissait d'une opportunité appropriée pour « sonder le terrain » en matière d'évaluation avec l'absence de la position neutre dans le questionnaire.

[15] Ces difficultés techniques ont été identifiées dans les questions ouvertes du questionnaire post-intervention de même que lors du groupe de discussion.

Figure 3. Niveau de difficulté à répondre aux questions en l'absence de la position neutre dans le questionnaire post-intervention

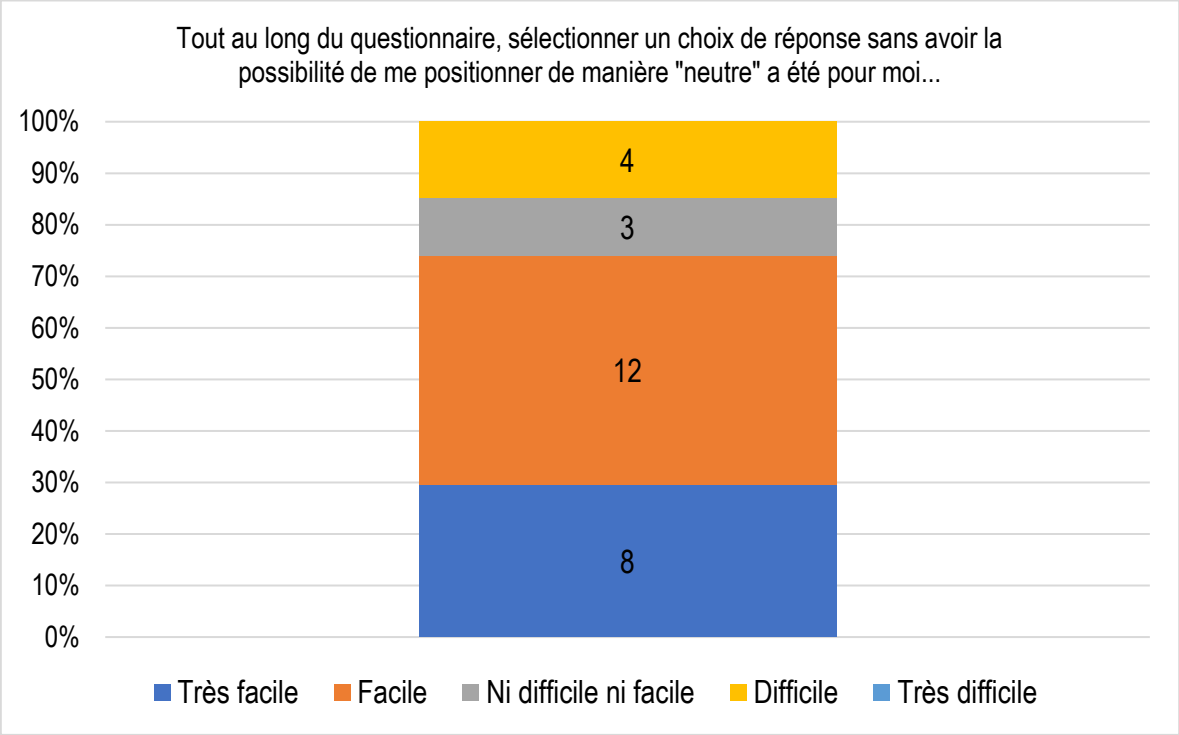


Figure 4. Anticipation des réponses si la position neutre avait été intégrée dans le questionnaire post-intervention.

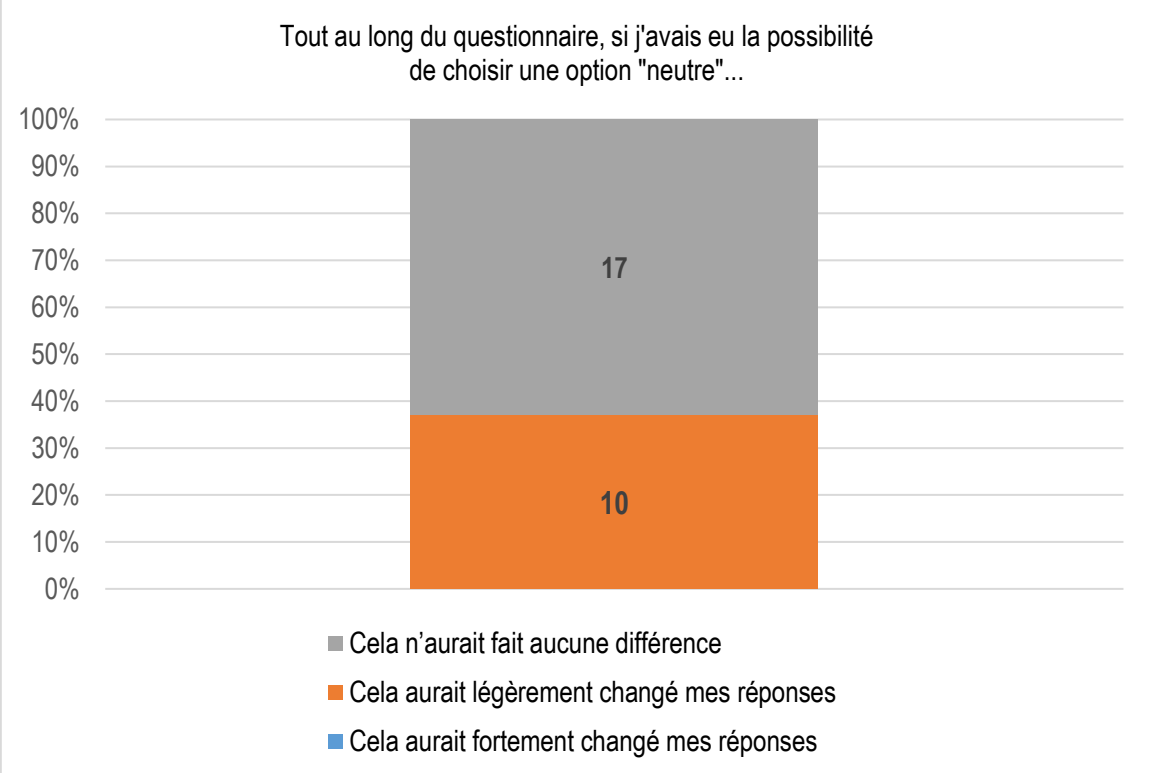
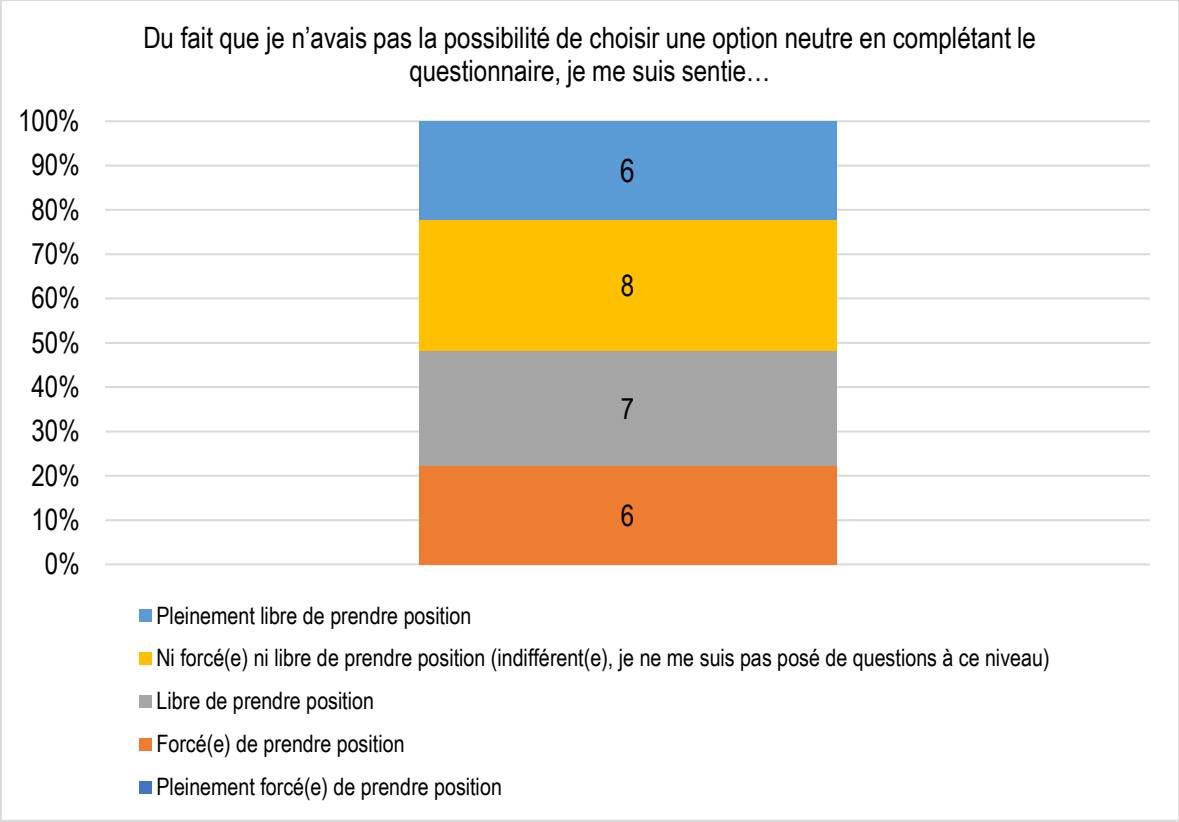


Figure 5. Sentiment relatif à la prise de position résultant de l'absence de la position neutre dans le questionnaire post-intervention



8.1.10.3 Profil de connexion à la plateforme de simulation pour les participantes qui n'ont pas complété la recherche

Considérant que le deuxième but du projet de thèse visait à évaluer l'acceptabilité de la simulation, nous avions établi que les participantes devaient avoir complété l'entièreté de la simulation afin de pouvoir dégager leurs perceptions sur l'intervention. En parallèle, nous avons recueilli quelques données nous permettant de décrire très sommairement le profil de ceux qui n'ont pas complété la simulation. Au total, 12 participantes ont créé un compte dans la plateforme de simulation numérique. Parmi ces 12, une personne seulement a consulté la quasi-totalité de la simulation (à 92 %, selon les données de progression disponibles dans la plateforme). Les 11 autres participantes semblent s'être seulement connectées à la plateforme, leur progression indiquant 0 %. Finalement, 10 des 22 participantes ne se sont pas connectées à la plateforme et n'ont pas créé de compte. Dans les études en ligne, ces notions d'adoption, d'utilisation, d'assimilation et d'engagement sont d'importance (Eysenbach et CONSORT-EHEALTH Group, 2011; Perski et al., 2017; Short et al., 2018). Nos quelques données nous indiquent que des stratégies devraient être mises en place à différents

moments de la trajectoire de participation pour encourager les utilisateurs à compléter la simulation. En effet, des incitatifs pourraient viser à susciter l'intérêt des utilisateurs pour se créer un compte, pour s'engager dans la simulation une fois le compte créé, et pour persévérer dans la complétion de la simulation. Surtout, l'important serait de bien prendre en compte ce qui freine l'utilisation à différents moments de la trajectoire de participation.

8.1.10.4 Questions ouvertes pour dégager les éléments les plus appréciés et les moins appréciables de la simulation, avec les recommandations des participantes

Toutes les participantes ayant complété la simulation ont répondu à un questionnaire post-intervention, composé en très grande majorité de questions fermées, auxquelles se sont ajoutées les trois questions ouvertes « obligatoires » suivantes : 1) Quels sont les éléments qui ont le plus suscité votre intérêt ? ; 2) Quels sont les éléments que vous avez les moins appréciés ? ; 3) Quelles sont les recommandations que vous suggéreriez pour améliorer cette simulation numérique ? Nous présentons ici brièvement les résultats, sous forme de thèmes et de sous-thèmes, lesquels pourraient nous donner des pistes pour l'amélioration future de la simulation numérique. Nous avons sélectionné judicieusement quelques extraits de verbatim tirés principalement des commentaires de participantes qui n'ont pas pris part au groupe de discussion.

8.1.10.4.1 Éléments liés à la simulation qui ont suscité l'intérêt

Les éléments les plus appréciés portent sur le contenu de la simulation, ses caractéristiques, les boucles de *quiz* et de rétroactions de même que l'interaction avec le patient virtuel. Le tableau 3 illustre les thèmes, les sous-thèmes et les extraits de verbatim qui décrivent succinctement les points d'intérêt des participantes.

Douze des 27 participantes (44 %) ont aimé le contenu théorique de l'EM, en indiquant entre autres les étapes spécifiques de l'EM transposées dans la simulation qu'ils avaient particulièrement appréciées, comme l'évocation et la planification. L'application de la théorie à une pratique simulée et crédible avec un patient virtuel était source de satisfaction. Les pièges liés à la communication dans lesquels les professionnels « peuvent tomber » (participant 26) font partie d'un élément qui a suscité l'intérêt.

Neuf participantes (33 %) se sont prononcées de manière générale sur les caractéristiques de la simulation, qu'elles qualifient comme étant réaliste, crédible, immersive, innovante, interactive et qui favorise l'apprentissage actif.

Les boucles de *quiz* et de rétroactions furent également appréciées des participants (9/27, 33 %) qui ont eu l'opportunité de recevoir un retour immédiat suite à leurs réponses.

Finalement, l'interaction et les échanges entre l'infirmière et le patient virtuels ont été identifiés par six participantes (22 %) comme un élément appréciable de leur expérience basée sur la simulation.

Tableau 3. Thèmes, sous-thèmes et extraits de verbatim appuyant les éléments les plus appréciés de la simulation

Thèmes (n=nombre de participantes)	**Sous-thèmes (n=nombre de participantes)**	**Extraits de verbatim (numéro du participant)**
Contenu théorique de la simulation appliqué à une situation crédible (n=12)	Entretien motivationnel (n=6)	Revoir la formation sur l'entretien motivationnel. (P5) Les parties « évocation » et « planification. » (P25)
	Application de la théorie à la pratique (n=3)	Les liens entre les appuis scientifiques de Miller et Rollnick et la réalité lors de l'entrevue avec le patient. (P24)
	Pièges liés à la communication (n=3)	Les pièges à éviter afin que le patient nous donne sa confiance. (P20) Les pièges de communication dans lesquels nous pouvons malheureusement tomber comme clinicien. (P26)
Caractéristiques de la simulation (n=9)	Interactive, innovante, versatile, immersive et favorisant l'apprentissage actif (n=6)	La caractéristique innovante de la simulation virtuelle. (P16) On se sent actif dans notre apprentissage. (P14)
	Réaliste et crédible (n=3)	Le patient était très réel de ce que l'on rencontre dans nos bureaux. (P3)
Boucles de quiz et de rétroactions (n=9)	(aucun sous-thème)	J'ai aimé répondre au quiz (même si un peu stressant de se tromper) et de voir la réponse la plus appropriée selon le contexte. (P6)

		La rétroaction et l'information facilement accessible. (P12)
Interactions avec le patient (n=6)	(aucun sous-thème)	La possibilité d'interagir avec le patient. (P10) J'ai aussi adoré de pouvoir découvrir au cours de la formation l'ouverture du patient lorsque la communication utilisée judicieusement. On aurait pu avoir des préjugés sur sa situation. (P26)

8.1.10.4.2 Éléments les moins appréciés dans la simulation

Les participantes ont indiqué que les éléments les moins appréciés sont liés majoritairement aux aspects techniques de la simulation et dans une moindre mesure, à son contenu, à son inaccessibilité sur le lieu de travail et à sa durée.

Quatorze des 27 participantes (52 %) ont commenté les aspects techniques de la simulation en précisant qu'elles avaient été confrontées à la lenteur et à la lourdeur du système causant ainsi un manque de fluidité dans les échanges entre l'infirmière et le patient, à une navigation parfois difficile et à une présentation audiovisuelle non optimale. Pour deux participantes (7 %), il leur était impossible d'accéder à la simulation à partir de leur lieu de travail, faute notamment de l'absence d'une autorisation nécessaire pour l'installation du système. Trois participantes (11 %) ont commenté les éléments de contenu qu'elles ont les moins appréciés, comme la longueur des rétroactions et les questions ouvertes contenues dans les quiz. Finalement, la durée de la simulation était jugée comme étant trop courte par deux participantes (7 %), ce qui représente un élément positif.

Tableau 4. Thèmes, sous-thèmes et extraits de verbatim appuyant les éléments les moins appréciables de la simulation

Thèmes (n=nombre de participantes)	**Sous-thèmes (n=nombre de participantes[a])**	**Extraits de verbatim (numéro du participant)**
Aspects techniques et audiovisuels de la simulation (n=14)	Lenteur et lourdeur du système causant un manque de fluidité dans les échanges (n=9)	La lourdeur de la plateforme numérique, ma batterie de portable Mac est vite tombée à plat et mon Mac avait de la difficulté à la supporter. (P9)

		Il y avait toujours un temps d'attente avant et entre les répliques du patient et de l'infirmière. Les échanges n'étaient pas fluides (P19).
	Navigation difficile (=3)	Plusieurs menus. Manque de liens automatiques qui pourraient avancer automatiquement lorsqu'une étape est complète. (P10) La navigation n'était pas très claire, manque de fluidité. (p.24)
	Présentation audiovisuelle non optimale (n=7)	La taille d'écriture parfois petite. (P7) Au point de vue graphique, mes jeunes auraient été morts de rire. (P13)
Inaccessibilité de la simulation sur le lieu de travail (n=2)	(Aucun)	Dans le réseau bien souvent nous n'avons pas les droits d'installer d'applications. (P14)
Aspects relatifs au contenu (n=3)	(Aucun)	Je l'aurais questionné davantage sur les effets secondaires de son nouveau traitement. (P1) Les questions ouvertes (P17).
Durée trop courte de la formation (n=2)	(Aucun)	Je me répète... Trop courte! J'ai bien aimé la formation et j'aurais aimé qu'elle soit plus longue ! (P6)

[a] Une même participante a identifié plus d'un élément.

8.1.10.4.3 Recommandations pour améliorer la simulation

Tout d'abord, 12 participantes sur 27 (44 %) n'avaient aucune recommandation à proposer. Ensuite, le tiers des participantes (8/27) suggèrent des pistes pour améliorer les aspects techniques de la simulation. Par exemple, il est proposé de faciliter la navigation avant et arrière (P7), d'automatiser les enchaînements lorsqu'une étape de l'EM est complétée (P9), de voir l'infirmière virtuelle à l'écran (P10), de recourir à un infirmier virtuel (P19) et de rendre accessible la simulation sur tous types d'appareil, comme le cellulaire (P9, P23). Finalement, les participantes (6/27, 22 %) proposent de développer d'autres situations et scénarios cliniques simulés auprès de diverses clientèles, en lien ou non avec la pratique de l'EM.

9 Chapitre 9. Critères de qualité de la recherche qualitative, quantitative et mixte

Ce chapitre vise à décrire les critères utilisés pour assurer la *qualité* des approches de recherche utilisées dans le cadre de ce projet de thèse. La notion de *qualité* est souvent associée à celle de *rigueur* (Sandelowski, 1993; Tobin et Begley, 2004) et de *risques de biais* (Pollock et al., 2020). Dans l'ensemble du projet de thèse, nous avons évalué deux dimensions de la qualité, soit la *qualité méthodologique* et la qualité du « *reporting*[16] *».* L'appréciation critique de la qualité méthodologique peut prendre forme au niveau des études primaires, mais aussi au niveau de plusieurs types de synthèses des connaissances, comme les revues systématiques de revues systématiques (Hong et Pluye, 2018; Pollock et al., 2020; Whiting et al., 2016). La qualité méthodologique porte sur la manière dont une étude ou autres types d'approches sont menées (Hong et Pluye, 2018) tandis que la qualité du « *reporting* » consiste en un compte-rendu précis, transparent et clair de ce qui a été fait et trouvé dans la recherche (Simera et al., 2010). Ces deux dimensions de la qualité visent à minimiser les risques de biais qui pourraient s'être introduits au niveau du devis, de la conduite de la recherche, de l'analyse des données et de la présentation d'informations qui sont susceptibles d'affecter notamment la validité, la crédibilité, la fiabilité et/ou la confiance dans les résultats (Nieswiadomy, 2008; Pollock et al., 2020; Simera et al., 2010).

Il existe plusieurs critères pour juger de la qualité méthodologique d'une étude et d'une revue systématique de revues systématiques. Ces critères sont nombreux et sont formulés dans un langage qui tient compte des fondements philosophiques épistémologiques, ontologiques et axiologiques sous-jacents aux diverses approches de recherche (ex : quantitatives, qualitatives, mixtes, synthèses de connaissances) (Tobin et Begley, 2004). À titre d'exemples, les termes « validité interne et externe » de même que les « risques de biais » raisonnent avec les approches quantitatives, alors que d'autres appellations sont préconisées pour les approches qualitatives, comme la crédibilité, la confirmabilité et la transférabilité (Lincoln et Guba, 1985; Sandelowski, 1986).

Dans les articles 1 et 2, nous avons utilisé différents outils : AMSTAR (Shea et al., 2009), AMSTAR 2 (Shea et al., 2017) et le ROBIS (Whiting et al., 2016), lesquels comportent des critères distinctifs

[16] Nous préconisons dans ce cas-ci l'usage d'un anglicisme puisque ce terme est connu de la communauté scientifique et qu'il est difficilement traduisible.

permettant d'évaluer la qualité méthodologique et le risque de biais au niveau des revues systématiques incluses dans les revues de revues. Dans l'article 3 (Rouleau, Richard, et al., 2019), nous avons utilisé l'outil COREQ (Tong et al., 2007) pour rapporter les éléments liés à la conduite d'une recherche qualitative. Nous avons énoncé brièvement les critères méthodologiques utilisés, comme la crédibilité, la confirmabilité et la transférabilité, lesquels seront approfondis dans cette section. Dans l'article 5 (Rouleau et al., sous révision), nous avons fait usage de plusieurs outils pour assurer la qualité du « *reporting* » : le COREQ (Tong et al., 2007), le GRAMMS (O'Cathain et al., 2008) pour l'approche mixte, une version adaptée du CONSORT-EHEALTH (Eysenbach et CONSORT-EHEALTH Group, 2011) pour le devis préexpérimental et le CHERRIES (Eysenbach, 2004) pour détailler le développement du questionnaire en ligne post-intervention. Nous décrivons dans cette section les critères de qualité méthodologique que nous avons employés, en commençant par l'approche qualitative, suivie de l'approche quantitative, pour conclure avec l'approche mixte.

9.1 Critères de qualité méthodologique pour l'approche qualitative

Les critères de qualité qui sont élaborés dans cette section s'appliquent autant à l'approche qualitative relative au premier but de l'étude (*cf.* article 3) que celle intégrée dans l'approche mixte qui se rapporte au deuxième but de la recherche (*cf.* article 5).

Un premier critère pour assurer la qualité de la recherche qualitative porte sur la confirmabilité (Lincoln et Guba, 1985). Le potentiel confirmatif réside dans la confiance que les interprétations des résultats proviennent bien des données issues du terrain de la recherche (du matériel empirique) et donc, directement des participantes. Nous avons fait de multiples lectures des transcriptions et nous avons vérifié que les données retranscrites étaient conformes aux enregistrements. Pour reconnaître la singularité, l'unicité, la différence et l'authenticité des personnes et de leurs situations à travers les multiples voix entendues (Lincoln, 1995; Whittemore et al., 2001), nous avons pris soin de présenter certaines caractéristiques des participantes (ex. : le genre, le titre d'emploi) pour appuyer les extraits de verbatim. Chacun des thèmes a été appuyé par plusieurs extraits de verbatim pour soutenir nos interprétations.

La crédibilité réfère à la correspondance entre l'expérience des participants et la représentation qu'en fait le chercheur (Lincoln et Guba, 1985). Les résultats sont crédibles lorsque les expériences et leurs

significations sont reconnues par les participants à l'étude et par les chercheurs ou lecteurs (Sandelowski, 1986). Nous avons ainsi mis en place des stratégies pour assurer la crédibilité, au niveau de la collecte et de l'analyse des données.

Premièrement, l'équipe d'encadrement de la thèse a supervisé le déroulement de la collecte de données de l'étudiante-chercheuse, ce qui a permis de réfléchir aux stratégies d'échantillonnage et de recrutement, et d'ajuster, au besoin, les outils de collecte de données. Deuxièmement, une combinaison de stratégies d'échantillonnage, soit de convenance, à choix raisonné et par boule de neige (Creswell et Creswell, 2018; Patton, 2015a), a permis de diversifier le profil des participantes, leurs expériences et leurs perspectives, contribuant ainsi à la richesse des résultats. Troisièmement, une analyse consciencieuse et systématique des données a été réalisée (Patton, 2015a). L'implication et l'accompagnement des membres du comité d'encadrement de la thèse dans le processus d'analyse des données ont favorisé la création d'espaces de dialogues pour échanger sur l'interprétation de nos résultats. Quatrièmement, une attitude d'ouverture a été adoptée tout au long du processus d'analyse, et ce, pour rester à l'affut de nouveaux thèmes et pour voir et interpréter ce qui semblait indivisible dans les données (Patton, 2015a). Cinquièmement, l'étudiante-chercheuse était engagée dans le PNMVH depuis quelques années et connaissait toutes les participantes (des infirmières membres-expertes du PNMVH) qui ont pris part au groupe de discussion (*cf.* article 3). L'étudiante-chercheuse avait ainsi une bonne compréhension du contexte de travail de ces infirmières et des dynamiques relationnelles qui opéraient au sein de ce groupe de professionnelles. Cet engagement prolongé (Patton, 2015a) fut facilitant autant pour la collecte que pour l'analyse des données. Sixièmement, un journal de bord et des mémos ont été utilisés pour prendre en note les pistes d'analyse à approfondir et les interprétations qui émergeaient. Septièmement, les résultats préliminaires de l'étude qualitative exploratoire (*cf.* article 3) ont été discutés devant un public composé d'infirmières travaillant pour la majorité auprès des PVVIH. Ceci nous a permis de constater que les infirmières se reconnaissaient dans les résultats qualitatifs. Huitièmement, puisque l'étudiante-chercheuse (Cypress, 2017) était elle-même un « outil » de collecte de données (Jack, 2008) et qu'elle pouvait donc influencer en quelque sorte la collecte et l'analyse, ayant ses propres référents et préconceptions, plusieurs auteurs suggèrent d'user de réflexivité (Finlay, 2002; Hewitt, 2007; Jack, 2008). La réflexivité est une conscience de soi réfléchie. L'analyse réflexive en recherche comprend une évaluation continue des réponses subjectives, des dynamiques intersubjectives et du processus de recherche en lui-même (Finlay, 2002). L'étudiante-chercheuse a clarifié son rôle auprès des participantes et les a invitées à

révéler leur expérience le plus spontanément possible. Considérant que l'étudiante-chercheuse avait développé la simulation numérique et qu'elle était la personne ayant animé le groupe de discussion (*cf.* article 5), elle a invité les participantes à exprimer librement leurs perceptions sur l'intervention. Les commentaires à connotation « plus négative » portant sur des éléments non appréciés étaient encouragés, car ils seraient profitables pour améliorer la simulation. L'étudiante-chercheuse a discuté de cette limite possible relative aux liens qu'elle entretenait avec les participantes à la recherche avec le comité d'encadrement de la thèse.

Finalement, le critère de transférabilité (Lincoln et Guba, 1985) consiste en l'applicabilité des résultats dans d'autres milieux auprès de participants similaires. Le jugement du potentiel de transférabilité des résultats ne revient pas au chercheur ayant mené l'étude, mais à des personnes « extérieures » au projet. Le rôle du chercheur consiste davantage à fournir des informations nécessaires aux lecteurs afin qu'ils puissent considérer l'utilisation, le potentiel et la signification des résultats des études à d'autres situations. Nous avons donc pris soin de détailler l'ensemble des considérations méthodologiques dans la thèse et dans les articles, de même que les caractéristiques des participantes.

9.2 Critères de qualité méthodologique pour l'approche quantitative

La validité d'une étude (quantitative) est une mesure de vérité et de précision des résultats obtenus d'une étude (Grove et al., 2015). Il s'agit de porter un jugement sur les menaces à la validité ou les problèmes possibles, et d'expliciter la manière dont ils ont pu affecter les résultats d'une étude.

La *validité interne* correspond à la mesure dans laquelle les effets d'une intervention sont le reflet de la réalité plutôt que le résultat de variables externes. Notre étude avait une visée descriptive et exploratoire et n'aspirait pas à établir un lien de causalité entre l'efficacité de la simulation (variable indépendante) et l'adoption d'habiletés relationnelles chez les infirmières (variable dépendante). Un devis préexpérimental est circonscrit à produire une description, un portrait d'un phénomène à un moment précis dans le temps (Nieswiadomy, 2008). Il n'y a donc aucun contrôle ni manipulation qui ont été effectués sur la répartition des participantes, sur l'accès à l'intervention ni sur le temps lié à la mesure post-intervention. Le type de devis, soit un groupe unique avec une seule mesure post-intervention, fait en sorte qu'aucune comparaison ni changement n'ont pu être observés à partir de

mesures recueillies avant l'intervention (Nieswiadomy, 2008). Un biais de sélection est une menace possible aux résultats de notre étude. Dans la conception de l'étude, les participantes devaient être exposées à la simulation pour pouvoir se prononcer sur l'acceptabilité, ce qui était cohérent avec le devis dans lequel une seule mesure post-intervention était utilisée. En conséquence, les 27 participantes qui ont complété l'étude (sur un total de 49), par rapport aux 22 qui ne l'ont pas terminée, étaient potentiellement des personnes avec un haut niveau de motivation et d'engagement. Ceci a probablement influencé les résultats, considérant que les participantes qui ont complété l'étude ont évalué favorablement l'acceptabilité de la simulation numérique.

La *validité de construit* est centrée sur l'harmonisation entre les définitions opérationnelles et conceptuelles des variables et la mesure de ce qui doit être évaluée avec l'instrument. Une limite de notre étude est d'avoir utilisé un questionnaire non validé. Nous avons néanmoins utilisé la version française (Fontaine et al., 2016) du *Technology Acceptance Model* (Cheng, 2012) pour mesurer la qualité globale du système et l'acceptation de la technologie. Les propriétés psychométriques de l'instrument original ont démontré une bonne fiabilité avec des alphas de Cronbach se situant entre 0.75 et 0.96 pour les huit construits. Les résultats de notre instrument adapté en langue française ont démontré une cohérence interne légèrement plus basse que celle de Cheng et coll. (2012), variant entre 0.68 et 1.00.

La *validité externe* porte sur la généralisation des résultats, laquelle est jugée dans les méthodologies expérimentales. La généralisation ne s'applique pas au devis préexpérimental, considérant les sources de biais possibles. Or, nous jugeons approprié d'employer le critère de transférabilité. L'effet Rosenthal est un risque de biais qui peut survenir lorsque les caractéristiques et les attentes du chercheur peuvent influencer les réponses des participants (Grove et al., 2015; Nieswiadomy, 2008). Il est vrai que l'étudiante-chercheuse figure dans la vidéo de prébriefing de la simulation, qu'elle a recruté directement certaines participantes qu'elle connaissait et qu'elle a collecté elle-même les données qualitatives. Une certaine forme de désirabilité sociale aurait pu se manifester. En contrepartie, nous pourrions aussi croire que cette relation entre l'étudiante-chercheuse et les participantes ait pu encourager la participation et l'engagement, et ainsi, avoir une influence probable sur la rétention des infirmières dans l'étude et sur les résultats. Le fait que les infirmières travaillaient ou non dans le domaine du VIH, qu'elles occupaient différents titres et pratiquaient dans des milieux cliniques et d'enseignement sont

des indicateurs intéressants de la portée d'utilisation de la simulation numérique et de ses retombées préliminaires.

9.3 Fondements philosophiques de l'approche mixte pour éclairer les critères de qualité

Alors qu'une description des critères de qualité a été réalisée pour chaque approche qualitative et quantitative en tenant compte de leurs postures épistémologiques et méthodologiques respectives, nous abordons maintenant les critères pour l'approche mixte. Bien que les forces de chaque composante qualitative et quantitative se potentialisent dans une approche mixte, leurs faiblesses s'additionnent également (Chicoine, 2018; Johnson et Onwuegbuzie, 2004). Nous commençons en présentant certaines notions de Morgan (2007) pour situer les postures méthodologiques et épistémologiques du pragmatisme, telles que la relation entre le chercheur et les participants. Nous poursuivons ensuite en décrivant les critères proposés dans l'outil d'évaluation de la qualité méthodologique des études qualitatives, quantitatives et mixtes, connu sous le nom de *Mixed Methods Appraisal Tool* (Hong et al., 2018; Pluye et al., 2009).

9.3.1 Abductivité, intersubjectivité et transférabilité liées au pragmatisme pour répondre aux questions méthodologiques

Morgan (2007) considère l'approche du pragmatisme comme une troisième option pour répondre aux questions méthodologiques en sciences sociales, laquelle vient s'ajouter aux approches quantitatives et qualitatives. Morgan introduit les notions d'*abductivité*, d'i*ntersubjectivité* et de *transférabilité* non pas comme des « critères de qualité méthodologique », mais plutôt comme une manière de rendre compte des relations qui existent entre les postures épistémologiques et méthodologiques qui sont cohérentes avec le pragmatisme. Ces notions peuvent aider à mieux comprendre les fondements sur lesquels s'appuie la recherche mixte, et par extension, pourraient éclairer la notion de « qualité ».

Morgan (2007) considère que la connexion entre la théorie et les données se fait de manière *abductive*, c'est-à-dire dans un mode de raisonnement itératif entre la déduction (ex. : tester des hypothèses) et l'induction (ex. : découvrir des thèmes) (Johnson et Onwuegbuzie, 2004; Morgan, 2007). Dans le cadre de notre étude mixte, nous nous sommes immergées tout d'abord dans les données quantitatives et ensuite, dans les données qualitatives. Nous avons procédé à l'analyse de chaque composante,

quantitative et qualitative, de manière séparée. L'analyse quantitative descriptive portait sur la mesure d'énoncés prédéterminés (raisonnement déductif) alors que l'analyse qualitative procédait de manière inductive. Grâce à une approche narrative inspirée de Fetters et coll. (2013; 2015), nous avons intégré les résultats des deux composantes sous forme de constats mixtes interprétatifs (raisonnement abductif). Pour y parvenir, nous avons juxtaposé les données, catégories et thèmes de chaque composante (quantitative et qualitative) dans un tableau (Johnson et al., 2019), pour faciliter leur intégration et la comparaison de leurs similarités et différences. Nous pourrions ainsi convenir qu'une force de l'étude était de trianguler des méthodes de recherche (Patton, 2015a, p. 663) pour obtenir une compréhension complémentaire et enrichie de l'acceptabilité.

La relation entre le chercheur et le processus de recherche est qualifiée comme étant *intersubjective* et représente en soi une réponse du pragmatisme au problème d'incommensurabilité. L'intersubjectivité est un élément du cercle social, qui s'inscrit dans la création de connaissances à travers des lignes d'action qui peuvent prendre forme dans des projets communs accomplis par plusieurs personnes. Le discours est ainsi plus large et va au-delà de la reconnaissance d'une réalité objective ou subjective. L'intersubjectivité s'inscrit dans un processus de communication, de dialogue, de significations partagées non seulement entre le chercheur et les participants de la recherche, mais auprès des collègues qui lisent et révisent la recherche (Morgan, 2007). Tel que soulevé dans les critères de qualité pour l'approche qualitative, l'étudiante-chercheuse a usé de réflexivité pour prendre conscience de sa relation avec les participantes et de l'impact possible sur la recherche. Elle a pesé les avantages et les inconvénients de conduire elle-même la collecte de données et s'est montrée transparente quant à son rôle, en plus d'encourager la spontanéité des échanges.

Finalement, Morgan (2007) utilise la notion de transférabilité, empruntée de Lincoln et Guba (1985), pour désigner l'inférence qui est faite par rapport aux connaissances générées à partir des données. Plutôt que de mettre l'accent sur la généralisation des connaissances, la *transférabilité* permet de se questionner à savoir si les apprentissages que nous pouvons faire avec un type de méthode dans un milieu spécifique peuvent être appliqués et utilisés de manière appropriée dans d'autres circonstances.

9.3.2 Critères de qualité méthodologique pour l'approche mixte

Cinq critères sont proposés pour évaluer la qualité méthodologique des études mixtes (Hong et al., 2018; Pluye et al., 2009) : 1) La justification adéquate de l'utilisation des méthodes mixtes pour répondre aux buts et aux objectifs de recherche ; 2) L'intégration appropriée des diverses composantes de l'étude effectuée de manière à répondre aux buts et aux objectifs de la recherche ; 3) L'interprétation adéquate de la résultante (« *outputs* ») de l'intégration des composantes quantitative et qualitative ; 4) L'adéquation dans la manière dont les divergences et les contradictions entre les résultats quantitatifs et qualitatifs est abordée ; 5) « L'adhésion » des différentes composantes de l'étude aux critères de qualité des traditions méthodologiques concernées.

Pour répondre au premier critère, nous avons pris soin de justifier en quoi une méthode mixte nous permettait d'évaluer l'acceptabilité de la simulation (but général évaluatif). De plus amples informations présentées dans le GRAMMS (O'Cathain et al., 2008) justifient le recours à l'étude mixte en lien avec le phénomène d'intérêt (*cf.* article 5). Par la formulation d'objectifs clairs et spécifiques pour la composante quantitative (mesurer des perceptions), qualitative (comprendre l'expérience d'apprentissage) et mixte (explorer comment la simulation contribue au renforcement des habiletés relationnelles, à la progression des apprentissages et à leur transfert en pratique), nous considérons ainsi avoir bien répondu au deuxième critère de qualité. D'ailleurs, le but et les objectifs de l'étude mixte ont été retravaillés maintes et maintes fois, avec le soutien de l'équipe d'encadrement de la thèse et des coauteurs de l'article 5. Pour le troisième critère d'interprétation et d'intégration des composantes quantitative et qualitative, nous l'avons abordé précédemment en lien avec l'abductivité et avons fourni un tableau présentant une représentation visuelle des résultats quantitatifs, qualitatifs et mixtes (*cf*. article 5). Considérant la nature très consensuelle des résultats en faveur de la simulation, nous n'avons pas relevé de divergences ou de contradictions telles que suggérées dans le quatrième critère. Les divergences au sein des résultats quantitatifs et qualitatifs sont l'une des limites potentielles du devis mixte convergent (Creswell et Creswell, 2018). Ces divergences ont plus de « risque » de survenir lorsque l'échantillon de chacune des composantes quantitative et qualitative diffère. L'interdépendance de notre échantillon, soit les mêmes personnes qui ont participé à la composante quantitative et qualitative a pu atténuer cette limite potentielle de divergences. Pour conclure avec le cinquième critère, nous avons détaillé individuellement les critères de qualité pour chacune des composantes quantitative et qualitative.

10 Chapitre 10. Discussion générale

Dans cette discussion générale, nous faisons un rappel des buts, des objectifs et de la cohérence du projet de thèse avec l'approche du pragmatisme. Nous présentons également les diverses contributions du projet de thèse, pour ensuite énoncer ses forces et ses limites. Nous concluons ce chapitre avec les recommandations pour la recherche et la formation.

10.1 Rappel des buts, objectifs et cohérence du projet de thèse avec l'approche du pragmatisme

Notre projet de thèse visait deux buts généraux : 1) Développer la simulation numérique ; 2) Évaluer l'acceptabilité de la simulation auprès des infirmières en contexte de formation continue.

Pour répondre au premier but, nous avons poursuivi ces deux objectifs : 1.1.) Explorer la pratique infirmière d'accompagnement des PVVIH dans la prise de leur TAR, les défis rencontrés dans cette pratique et les ressources mobilisées par les infirmières (*cf.* article 3) ; 1.2) Décrire la méthode de développement de la simulation numérique, les éléments qui composent l'intervention et son contenu, et les leçons apprises (*cf.* article 4). L'évaluation quantitative et qualitative de l'acceptabilité de la simulation comme deuxième but poursuivi se déclinait en trois objectifs spécifiques de recherche : 2.1) Mesurer les perceptions des infirmières relatives aux éléments composant la simulation, au rôle de la simulation pour soutenir la pratique, à la qualité globale du système et à l'acceptation de la technologie de même qu'à l'atteinte des objectifs d'apprentissage ; 2.2) Explorer l'expérience d'apprentissage des infirmières basée sur la simulation; 2.3) Comprendre comment la simulation a contribué à la progression des apprentissages des infirmières, dont ceux liés aux habiletés relationnelles, et à leur transfert en pratique.

Nous avons eu recours à diverses méthodes de recherche pour constituer l'ensemble de la thèse : revues systématiques de revues systématiques (approches déductives, guidées par des cadres théoriques), étude qualitative (approche inductive), méthode collaborative de codéveloppement de la simulation et étude mixte (approche abductive). En cohérence avec l'esprit du pragmatisme, le projet de thèse est tissé par une pluralité de points de connexion, de questions de recherche et de méthodes qui rallient chacune de ses parties (Morgan, 2007).

10.2 Principaux résultats : contributions empiriques situées dans l'état des connaissances

Nous décrivons les principaux résultats générés à partir des différentes parties de la thèse et donc, des cinq articles, en les situant dans l'état des connaissances. Étant donné qu'une discussion des résultats a été présentée de manière plus approfondie dans chaque article, et pour ainsi éviter la redondance, nous apportons dans cette section quelques éléments que nous jugeons pertinents et complémentaires.

10.2.1 Effets positifs et négatifs des TIC et de la formation numérique sur les soins infirmiers

Les deux revues systématiques de revues systématiques (articles 1 & 2, Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson et Dubois, 2017; Rouleau, Gagnon, et al., 2019) nous ont permis de mieux connaître et d'étudier un certain objet de recherche (Risjord, 2010). Les résultats ont appuyé la gamme d'effets positifs et négatifs des TIC et de la formation numérique sur les soins infirmiers démontrant que des modalités technologiques peuvent être des approches alternatives à considérer comme outils de prestation des soins et d'apprentissage.

La synthèse de 22 revues systématiques a permis d'identifier 19 indicateurs de soins infirmiers qui sont influencés par l'usage des TIC : temps passé sur les soins du patient ; gestion du temps ; temps de documentation ; qualité et accès à l'information ; qualité de la documentation ; mise à jour et utilisation des connaissances ; autonomie des infirmières ; collaboration intra et interprofessionnelle; habiletés et compétences des infirmières ; relation infirmière-patient ; planification et évaluation des soins ; enseignement aux patients à leur famille ; communication et coordination des soins ; perspectives de la qualité des soins prodigués ; satisfaction des infirmières et des patients avec les TIC ; confort du patient et qualité de vie reliés aux soins ; autonomisation et statut fonctionnel du patient.

Par ailleurs, 22 autres revues systématiques ont fait l'objet d'une synthèse sur le recours à la formation numérique par les infirmières. Les résultats ont soulevé les retombées de la formation numérique sur les connaissances, les réactions des infirmières par rapport à cette modalité de formation, leurs habiletés, leurs attitudes, leur efficacité personnelle et les coûts.

Nos résultats sur les effets des TIC partagent certaines similarités avec le cadre de résultat de technologie infirmière numérique (*Digital nursing technology outcome framework*) de Krick et al. (2020), tout en se démarquant. Ce cadre a été développé suite à une revue de portée regroupant 123 études (Krick et al., 2019) pour identifier les effets (les résultats) d'une variété de technologies infirmières numériques incluant entre autres les outils d'aide à la décision, la robotique et la formation numérique. L'efficacité de ces technologies a été rapportée en 47 résultats se situant au niveau des infirmières, des patients, des proches aidants et des organisations de soins de santé. La contribution de notre revue de revues se concentre sur les effets des TIC, précisément sur les ressources infirmières et les processus infirmiers, tout en permettant de relier un indicateur (ex. : temps passé aux soins des patients) avec un type spécifique de technologie (ex. : dossier de santé électronique). Le cadre de Krick et al. (2020) ne permet pas d'associer un résultat avec un type de technologie. Or, nous pourrions croire que les spécificités d'une technologie, par exemple, la robotique et la formation numérique, concourent en des résultats différents sur les soins infirmiers.

Les résultats de notre revue de revues sur les effets de la formation numérique sont comparables à ceux d'une revue méthodologique (n=242 études) réalisée par Bajpai et collaborateurs (2019). Cette revue visait à identifier et à évaluer l'utilisation des théories d'apprentissage dans la conception et l'implantation des interventions portant sur la formation numérique des professionnels de la santé. Les résultats d'apprentissage les plus documentés sont : les connaissances (n=118 études), les habiletés (n=62), la performance (n=59), l'attitude (n=15), la satisfaction (n=14) et l'efficacité personnelle (n=9). La valeur ajoutée de notre revue systématique de revues systématiques par rapport aux connaissances existantes porte sur la population et le contexte : la formation numérique est une thématique qui demeure surreprésentée auprès des étudiants de premier cycle (étudiantes infirmières) et sous-représentée auprès des infirmières. Une revue de revues a été réalisée par de Caro et al. (2014; 2016) et visait la formation numérique dans un contexte de formation académique auprès des étudiantes infirmières. Ainsi, nous avons offert un portrait synthétisé assez large et détaillé de notre méthode et des résultats, en quantifiant la fréquence des résultats (le nombre de fois qu'un résultat est rapporté, le nombre de revues dans lesquelles un résultat est rapporté), en qualifiant les effets de la formation numérique (positifs, pas d'effet, négatifs) de même que la teneur du résultat (ex : habiletés - préparation et administration de médicaments).

10.2.2 Compréhension de la pratique infirmière et de ses défis comme étape préalable pour informer la simulation numérique

La pratique infirmière (*cf.* article 3) déployée auprès des PVVIH est d'abord qualifiée comme étant relationnelle. Les résultats qualitatifs soulignent que la relation thérapeutique est considérée comme le fondement des soins infirmiers. Les activités infirmières pour soutenir les PVVIH dans la prise du TAR consistent à : évaluer les dimensions biomédicales et psychosociales reliées à la santé et les représentations symboliques du VIH et du TAR ; faire de l'enseignement sur le traitement et le VIH ; coordonner les soins et référer les PVVIH aux ressources adaptées à leurs besoins. Ces activités infirmières sont également décrites dans les lignes directrices nationales et internationales concernant les soins infirmiers prodigués aux PVVIH (CANAC, 2013a; Dumitru et al., 2017; Relf et al., 2011). De plus, ces activités d'enseignement, d'évaluation et de coordination correspondent à celles qui s'inscrivent plus largement dans le champ de pratique des infirmières, indépendamment de la clientèle cible (D'Amour et al., 2012; Déry et al., 2015). Une contribution importante de cette étude qualitative a été de mettre en évidence les défis et les barrières auxquels sont confrontées les infirmières dans leur pratique. Ces défis sont fréquemment discutés selon la perspective des patients qui prennent un traitement et non au niveau des professionnels et de leur pratique. Les infirmières doivent composer avec des déterminants sociopolitiques qui affectent l'accès aux services et aux soins des PVVIH. Certaines perçoivent que l'autonomie du rôle infirmier, à l'interface d'une dimension biomédicale et sociale, n'est pas déployée à son plein potentiel. Les infirmières ne se sentent pas toujours bien outillées pour agir sur la dimension sociale de la santé et des soins. Finalement, le désalignement des objectifs des infirmières (l'adhésion au traitement) avec ceux des patients a été le « défi clé » et marquant qui a précisé la situation clinique du scénario de la simulation numérique. Devant un patient qui « ne semble pas motivé » à prendre son traitement, les infirmières se sentent démunies, impuissantes et vivent un sentiment d'échec. C'est ainsi que les habiletés relationnelles sont mises au service de cette consultation simulée avec le patient virtuel pour qui la prise du traitement est difficile. Finalement, les infirmières mobilisent des ressources, c'est-à-dire des savoirs expérientiels, théoriques et empiriques, la pratique réflexive, leurs réseaux, et ce, pour assurer leur développement professionnel, pour surmonter certains défis inhérents à leur pratique et pour pouvoir ainsi mieux soutenir leur clientèle.

10.2.3 Méthode de développement de la simulation numérique et nouvelle intervention éducative : objets de connaissances

Les résultats de l'étude qualitative sont l'une des sources de connaissances qui ont contribué au développement de la simulation numérique. Nous estimons que le projet de thèse a généré deux contributions distinctes et complémentaires en lien avec le quatrième article. La première contribution est d'avoir rendu intelligible et accessible la méthode de développement de la simulation numérique et la description de son contenu détaillé dans une publication, en plus d'avoir explicité les défis rencontrés et les solutions utilisées. O'Cathain et coll. (2019) ont présenté un modèle logique pour développer des interventions complexes. Ce modèle englobe les principes, les actions clés, les livrables (*outputs)* de même que les effets à court (ex. : faisabilité, acceptabilité) et à long terme (ex. : changement de pratique, amélioration de la pratique). Les auteurs décrivent les livrables en termes de publication du processus de développement de l'intervention (*cf.* article 4) de même qu'un manuel qui la décrit. La deuxième contribution est le « produit » lui-même, et donc, la simulation numérique qui a le potentiel de devenir une offre additionnelle de formation continue et de formation initiale des étudiants en santé. La simulation numérique en tant que « produit » est issue d'un croisement de savoirs empiriques, expérientiels et théoriques. Durant le parcours doctoral, cette simulation a également été traduite en anglais dans un objectif futur d'élargir son accessibilité et ses possibilités d'évaluation.

Nous avons proposé dans l'article 4 des repères « pratiques » visant notamment à opérationnaliser et à transposer des habiletés relationnelles découlant de l'EM dans des schèmes de communication préprogrammés entre une infirmière et un patient. La plupart des modèles ou des cadres existants sur le développement des interventions offrent des repères généraux ou spécifiques (Colquhoun et al., 2017; O'Cathain et al., 2019) à des interventions qui sont différentes d'une simulation numérique animée par un patient virtuel. Nous rappelons que nous qualifions notre simulation comme étant un type spécifique d'intervention éducative, considérant : 1) La modalité d'apprentissage utilisée – une simulation numérique avec un patient virtuel dans un environnement d'apprentissage en deux dimensions - ; 2) Le comportement visé - l'adoption d'habiletés relationnelles -; 3) L'approche théorique de l'EM qui y est mobilisée; 4) Les professionnels à qui s'adresse la simulation - les infirmières - ; 5) Le groupe cible à qui s'adresse le comportement - les patients -. Bien qu'elle soit « spécifique », la simulation pourrait à notre avis être applicable à un large auditoire de professionnels et d'étudiants. La diffusion de ce processus de développement est une manière de partager nos savoir-faire et les leçons

apprises, lesquels pourraient potentiellement être sources de connaissances pour d'autres chercheurs, développeurs, professionnels de la santé, professeurs, équipe de simulation, etc. De plus, nombre d'auteurs (Cheng et al., 2016; Eysenbach et CONSORT-EHEALTH Group, 2011; Hoffmann et al., 2014) soutiennent l'importance de fournir les informations détaillées à propos des interventions, incluant la simulation : informations qui demeurent essentielles pour apprécier les retombées de ces interventions et leur potentiel de réplication et de transférabilité.

Considérant la spécificité de notre simulation numérique, l'état des connaissances avec la comparaison d'une littérature similaire est parcellaire. Dans une étude qualitative exploratoire, Peddle et coll. (2019) ont décrit les éléments clés de la simulation numérique avec un patient virtuel. Dans ce cas-ci, un acteur jouait le rôle d'un patient et était représenté dans des vidéos. L'approche narrative et la fonctionnalité de cette simulation partageaient des caractéristiques similaires à la nôtre au travers desquelles les choix de l'apprenant avaient une influence sur le déroulement du scénario. La communication était l'une des habiletés non techniques abordées dans la simulation avec une approche théorique différente de l'EM. Récemment, Park et coll. (2019) ont décrit le développement d'une séquence conversationnelle basée sur *l'EM bref,* dispensée via une application de message texte basée sur le Web (« *chatbot »*), pour favoriser la gestion du stress des étudiants gradués. Cet article est intéressant pour comprendre comment les composantes relationnelles et techniques ont été intégrées dans ce *chatbot*. Par contre, cette intervention est bien différente de la nôtre puisque notre simulation reflète et représente la nature de la relation entre une infirmière et un patient, alors que le *chatbot* n'est pas incarné par un professionnel : il représente un assistant virtuel non personnifié. Nous pourrions penser que l'infirmière virtuelle de notre simulation puisse représenter une forme de modèle de rôle, bien que ceci n'ait pas été soutenu dans nos résultats. Finalement, Lamont et Brunero (2013) offrent une présentation détaillée d'un programme de formation en simulation numérique pour les infirmières en santé mentale, en trois scénarios, présentés grâce à des vidéos. Les auteurs décrivent le développement de leur programme basé sur les attributs de la simulation, tels que rapportés dans une analyse de concepts de Bland, Topping et Wood (2011) auprès des étudiantes infirmières. Lamont et Brunero (2013) font des liens entre ces attributs de la simulation - création d'une opportunité hypothétique, la représentation authentique, la participation active, l'intégration, la répétition et la réflexion - et des principes issus de théories d'apprentissage.

Les quelques exemples illustrés ci-dessus dénotent que la littérature offre des repères pour guider le développement de certains types de simulation qui mobilisent des approches théoriques et conceptuelles distinctes. À notre connaissance, nous n'avons pas identifié de simulation numérique avec un patient virtuel dans laquelle un enchaînement d'interactions préprogrammées guidées par l'EM illustre une consultation complète entre une infirmière et un patient, comme modalité de formation continue pour les infirmières.

10.2.4 Acceptabilité de la simulation numérique

Une autre contribution de notre projet de thèse a été d'évaluer l'acceptabilité de la simulation numérique selon la perspective des infirmières. Cette évaluation était une première initiative de mise à l'essai d'une simulation numérique auprès d'un petit groupe de participantes ayant des profils variés au sein d'une même profession, et ainsi, de porter un jugement préliminaire sur l'acceptabilité d'une intervention nouvellement développée. Dans l'ensemble, les résultats quantitatifs ont indiqué un haut niveau d'acceptabilité de la simulation numérique sur le plan des éléments qui la composent, de la qualité globale du système et de l'acceptation de la technologie, du rôle de la simulation pour soutenir la pratique et de l'atteinte des objectifs d'apprentissage. Les résultats quantitatifs sont très favorables à la simulation et sont consensuels entre les participantes. L'expérience d'apprentissage recueillie auprès des infirmières s'est reflétée dans les thèmes et les sous-thèmes suivants : 1) Motivations à s'engager dans la recherche basée sur la simulation; 2) L'apprentissage dans un environnement réaliste, immersif et de non-jugement ; 3) Utilité perçue de la simulation pour : 3a) apprendre de manière réflexive et transférer ses apprentissages en pratique, 3b) se remémorer l'importance d'être présentes et revisiter ses habiletés relationnelles, 3c) acquérir des connaissances sur l'entretien motivationnel, savoir comment l'appliquer et renforcer son sentiment de confiance en soi; 4) Difficultés perçues à s'engager dans la recherche basée sur la simulation. L'intégration des résultats quantitatifs et qualitatifs a généré des constats mixtes interprétatifs : 1) La fidélité de la simulation influence le sentiment d'immersion dans l'expérience d'apprentissage et celui d'avoir vécu une pratique réelle; 2) La flexibilité de la simulation, le contrôle sur l'apprentissage et son efficacité perçue contribuent positivement à l'expérience d'apprentissage; 3) Une prise de conscience du soi et la réflexion sur la pratique relationnelle; 4) L'acquisition de nouvelles connaissances et le développement de sa confiance en soi.

Les résultats de l'étude mixte indiquent que la simulation numérique est utile pour réfléchir à sa pratique, pour revisiter ses habiletés relationnelles et pour se rappeler l'importance d'être présent et à l'écoute des patients. La simulation permet de relier les assises théoriques issues de l'EM à la pratique. De plus, les caractéristiques et les éléments composant la simulation, comme le niveau de réalisme, le contrôle et la flexibilité dans l'apprentissage, ont généré une expérience d'apprentissage positive, immersive et de non-jugement. Nos résultats corroborent ceux de deux études qualitatives exploratoires (Lamont et Brunero, 2014; Peddle et al., 2019). D'une part, Peddle et coll. (2019) décrivent une simulation numérique avec patient virtuel qui a été mise à l'essai auprès des étudiants infirmiers au baccalauréat (n=71) pour développer leurs habiletés non techniques comme la communication. Nos résultats corroborent ceux de cette étude dans laquelle l'importance du rôle de la communication pour les soins des patients et de l'écoute des patients est ressortie. Nos résultats partagent également des similarités avec ceux de Lamont et de Brunero (2014) reflétant que les infirmières ont apprécié le degré d'authenticité des scénarios de la simulation, le réalisme avec la pratique réelle de même que l'immersion dans les scénarios. La simulation a fait en sorte que les infirmières se sont replongées dans des expériences cliniques antérieures, interpellant ainsi une réflexion sur la pratique.

Un résultat inattendu qui a émergé de la composante qualitative de notre étude est cette prise de conscience des infirmières sur leur manière de communiquer avec leur clientèle, l'importance d'être à l'écoute et de réaliser que leur style d'intervention peut influencer directement les patients. Nous avons bâti la simulation pour créer ce type de réflexion sur la pratique, qui est aussi cohérente avec la manière d'opérer de l'EM. Nous aurions pu penser que les habiletés relationnelles sont « prises pour acquises », surtout pour les infirmières expérimentées. Dans les résultats de la revue intégrative de Peddle et coll. (2016), les étudiantes infirmières considéraient justement la communication comme étant « acquise ». Les participantes de notre étude ont été réceptives à revisiter leurs habiletés relationnelles et ont même indiqué qu'elles les mettraient en pratique. Elles ont mentionné que dorénavant, elles seraient plus vigilantes, par exemple, pour manifester davantage d'ouverture et poser des questions afin que les solutions viennent du patient, et non des infirmières. Cette prise de conscience du soi et des autres et comment cela affecte la communication s'alignent avec ce que des auteurs surnomment « les habiletés perceptuelles » (Bennett-Levy, 2006; Denniston et al., 2017). En sciences infirmières, il est question du *savoir personnel* (Carper, 1978). Bennett-Levy (2006) met en lumière les habiletés perceptuelles interpersonnelles, lesquelles sont fondamentales pour une pratique

thérapeutique efficace, incluant l'empathie, la pleine conscience et la réflexion dans l'action. Le savoir personnel est centré sur la relation avec le soi (ici, l'infirmière), sur la manière dont le soi est formé dans l'interaction avec l'autre (ici, le patient). La connaissance de soi serait fondamentale comme source de savoir puisque les relations intersubjectives y sont dérivées (Carper, 1978; Phenix, 1964). Le savoir personnel s'incarne et se vit dans une relation authentique, de réciprocité, à travers laquelle la liberté et l'unicité d'autrui sont reconnues et acceptées.

Une revue intégrative (Peddle et al., 2016) comprenant 28 articles a été menée pour décrire et synthétiser la littérature concernant le recours au patient virtuel pour soutenir les habiletés non techniques de futurs professionnels de la santé dans un contexte de formation initiale. Bien que la majorité des étudiants se trouvait dans des programmes de médecine, huit des articles recensés incluaient des étudiants infirmiers. Aucune des études identifiées provenaient du Canada. Nos résultats sont comparables à ceux de cette revue intégrative qui sont plutôt favorables pour soutenir la valeur ajoutée du patient virtuel à renforcer et à enseigner de nouvelles habiletés de communication, à offrir une occasion de pouvoir pratiquer ces habiletés, à bâtir sa confiance en ses aptitudes à communiquer et à développer des habiletés spécifiques de communication verbale et non verbale.

10.3 Contributions du projet de thèse

10.3.1 Production de savoirs actionnables

Dans le cadre de ce projet de thèse, nous avons produit des « savoirs actionnables », définis par Argyris (1995, p. 237) comme étant « valables et pouvant être mis en action dans la vie quotidienne. » Des savoirs « valables » sont ceux qui résultent d'un travail réflexif et d'une conceptualisation rigoureuse, soit le travail épistémique (Avenier et Schmitt, 2007). L'ensemble des résultats du projet de thèse a fourni des repères pour soutenir et pour susciter le questionnement, la réflexion et l'action créative. Notre recherche effectuée dans une perspective d'actionnabilité poursuivait un double objectif (Avenier et Schmitt, 2007) : d'une part, contribuer au développement de savoirs en sciences infirmières, et d'autre part, rendre ces savoirs utiles à la réflexion et à l'action des infirmières. Une parcelle des connaissances générées par la compréhension de la pratique des infirmières auprès des PVVIH et des défis rencontrés (*cf.* article 3) a été transformée en une occasion d'apprentissage « pratique » grâce à la simulation afin de pouvoir agir concrètement sur une difficulté exprimée par les infirmières. En soi, puisque tous les défis issus de l'expérience des infirmières n'ont pu être transformés

en occasions d'apprentissage, ces derniers pourraient inspirer le développement d'éventuelles interventions en soutien au développement professionnel. L'action créative et la collaboration ont été mises à profit pour développer la simulation numérique, découlant en partie d'un travail épistémique préalable (la recherche qualitative), d'approches théoriques (ASFF et EM) et de la littérature. La simulation s'est révélée en une modalité intéressante pour recréer une histoire d'un patient virtuel qui se rapproche de la réalité, en liant des fondements théoriques à la pratique, ce qui est cohérent avec l'approche du pragmatisme. Par ailleurs, la simulation numérique est porteuse de savoirs actionnables qui pourraient potentiellement être utiles aux infirmières, les outillant dans l'adoption d'habiletés relationnelles pour optimiser l'engagement relationnel avec leur clientèle. Nous pourrions ainsi prétendre que les infirmières, qui ont participé à la simulation, ont renforcé un *savoir personnel* entourant cette relation thérapeutique avec le patient, en plus d'avoir acquis et consolidé un *savoir théorique* issu des notions de l'EM, notions qu'elles perçoivent applicables à leur pratique.

10.3.2 Contribution sur le plan de la formation

La contribution sur le plan de la formation repose sur la simulation numérique pour soutenir l'apprentissage des infirmières dans un contexte de formation continue. Ce contexte a été ciblé, considérant que la simulation numérique est davantage documentée au niveau de la formation initiale des étudiants en sciences infirmières. Les infirmières qui ont participé à la recherche ont pu obtenir trois heures de formation accréditées sur les sept heures qui sont exigées annuellement (Ordre des infirmières et infirmiers du Québec, 2011). Nous considérons toutefois que cette simulation a le potentiel de rejoindre un auditoire plus vaste, autant les étudiants en santé que les professionnels de la santé et des services sociaux, notamment les médecins, les travailleurs sociaux et les intervenants communautaires, sans s'y limiter. La modalité de cette approche est facilement accessible : elle peut être consultée à partir du lieu et du temps déterminés par l'apprenant. Elle ne requiert aucune ressource humaine additionnelle, puisque la simulation numérique est « autonome » en elle-même, c'est-à-dire que le processus d'apprentissage est autodirigé. La vidéo de prébriefing a été pensée pour offrir un contenu théorique de base sur l'EM pour que tous les apprenants partent avec des connaissances élémentaires de cette approche avant de s'engager dans la simulation. De plus, le cœur de la simulation porte sur les habiletés relationnelles, lesquelles sont déployées par tous les étudiants et professionnels de la santé et des services sociaux. Ces habiletés sont donc transversales

à leurs pratiques et à leurs interventions. Le potentiel d'applicabilité est ainsi très grand, d'autant plus que la simulation est maintenant disponible en anglais.

10.3.3 Contribution sur le plan clinique

Ultimement, l'intérêt d'avoir développé cette simulation numérique est d'améliorer les habiletés relationnelles des infirmières et ainsi, apporter des changements dans la pratique professionnelle pour améliorer la santé et la condition des patients (Moore et al., 2018). Bien que le but de la recherche portait sur l'évaluation de l'acceptabilité, et non sur l'évaluation de l'efficacité de la simulation sur la pratique, les infirmières, même celles expérimentées, ont identifié des retombées positives. Pour elles, la simulation est une occasion de pratiquer avec un patient virtuel et de pouvoir transposer leur acquis dans la *vraie* pratique. Certaines participantes de notre étude occupaient un rôle de gestionnaire. Elles se sont engagées volontairement dans la recherche par intérêt pour la simulation numérique. En soi, elles ne côtoient pas directement de patients, leur clientèle étant « les infirmières ». Ainsi, la simulation demeure une occasion unique de consolider leur pratique, ce qui est non négligeable. Considérant que la simulation numérique permet de relier la théorie à la pratique et que la visée est d'engendrer un transfert des acquis dans la pratique, nous pensons que cette étude est un point de départ qui pourrait mener éventuellement à des changements au niveau de la pratique. Dans la composante qualitative, les participantes ont rapporté de quelle manière elles pensaient que les apprentissages faits avec la simulation numérique allaient se répercuter dans leur pratique.

10.3.4 Contribution conceptuelle et théorique

Une première contribution du projet de thèse est d'avoir utilisé le Cadre de performance des soins infirmiers (Dubois et al., 2013) dans un nouveau domaine en lien avec l'usage des TIC par les infirmières. Ce cadre a fourni un éclairage systémique sur les effets des TIC sur les soins infirmiers, tant sur le plan des ressources, des processus (actions ou interventions infirmières) qu'au sujet des patients. Nous avons ainsi proposé une version adaptée du Cadre de performance des soins infirmiers avec le « nouveau domaine » étudié (Rouleau, Gagnon, Côté, Payne-Gagnon, Hudson et Dubois, 2017).

Notre expérience à réaliser deux revues systématiques de revues systématiques a servi de levier pour poursuivre les réflexions concernant ce type de synthèse de connaissances et pour écrire un article de type discussion méthodologique visant à répondre aux deux problèmes identifiés: 1) le manque de

typologie et de terminologie pour désigner une revue systématique de revues systématiques incluant à la fois des revues systématiques qualitatives, quantitatives et mixtes ; 2) le manque de repères pour évaluer la qualité méthodologique des revues systématiques qualitatives et mixtes comparativement à celles de nature quantitative. En réponse aux problèmes identifiés, nous avons d'abord suggéré une terminologie reliée à trois types de revues de revues : 1) Revue systématique de revue systématique qualitative, 2) Revue systématique de revues systématiques quantitatives, 3) Revue systématique de revues systématiques qualitatives, quantitatives et mixtes. Nos deux revues de revues se situent dans la troisième typologie, peu décrite dans la littérature. Nous avons ensuite identifié et comparé les critères dérivant des trois outils permettant d'évaluer la qualité méthodologique de revues quantitatives et mixtes, et avons suggéré des pistes pour adapter ces critères aux revues qualitatives et mixtes (Rouleau et al., Accepté). Même si cet article ne fait pas partie intégrante du projet de thèse, ce sont les deux revues de revues réalisées à titre de recension des écrits qui ont contribué à poursuivre les réflexions dans un domaine mettant en relief un type de synthèse des connaissances en pleine effervescence. Il s'agit d'une deuxième contribution de notre démarche ayant influencé des travaux futurs.

Une troisième contribution a été d'opérationnaliser les assises théoriques sous-jacentes à l'EM dans une séquence conversationnelle reproduisant des interactions préprogrammées entre une infirmière et un patient virtuels. L'esprit de la simulation, basé sur une conception des soins infirmiers (ASFF), représente une toile de fond formant l'arrière-scène (avec ses valeurs), alors que les habiletés relationnelles issues de l'EM soutiennent la méthode de communication utilisée par l'infirmière virtuelle pour explorer la situation avec le patient virtuel. Bien que de nombreuses formations sur l'EM existent, intégrer les savoir-faire essentiels pour assurer une pratique efficace de l'EM dans un environnement d'apprentissage automatisé en deux dimensions avec un patient virtuel n'était pas documenté. Comme nous avons mentionné à maintes reprises que la simulation offre un moyen de faciliter l'intégration de la théorie à la pratique (Bland et al., 2011), il nous fallait rendre ces savoirs théoriques « digestes » et actionnables. Puisque l'EM demeure une approche largement utilisée en formation et comme outil d'intervention clinique, nous pensons que notre démarche pourrait inspirer les travaux d'autres professionnels, chercheurs, professeurs et/ou équipes de simulation.

10.4 Forces et limites du projet de thèse

Les forces et les limites inhérentes aux considérations méthodologiques du projet de thèse sont énoncées dans cette section, en complémentarité aux critères de qualité présentés au Chapitre 9.

10.4.1 État des connaissances sur les effets des TIC et de la formation numérique

Les deux revues systématiques de revues systématiques avaient une visée exploratoire et ont permis de tracer un portrait de la quantité et du type d'évidences disponibles (Lunny et al., 2018) sur les effets des TIC et de la formation numérique sur les soins infirmiers. Considérant que les objets et questions de recherche se sont précisés et transformés avec l'avancement du projet de thèse, la simulation numérique avec patient virtuel n'était pas incluse initialement comme type d'intervention dans les revues de revues. Nous n'avons donc pas réalisé une démarche systématique et analysé le contenu des écrits qui nous aurait permis, de prime abord, d'extraire les composantes plus actives des simulations numériques et d'autres types d'intervention susceptibles d'influencer les pratiques professionnelles. Les deux revues de revues, de nature plus informative, ont l'avantage d'avoir fait connaître une parcelle de la littérature, mais n'ont pas été « prescriptives » pour orienter l'ensemble de la démarche de recherche.

10.4.2 Développement de la simulation

10.4.2.1 Comprendre la pratique infirmière et ses défis avec une étude qualitative exploratoire

Les infirmières qui avaient de l'expérience dans la prestation des soins aux PVVIH ont constitué notre population d'intérêt. Nous n'avons pas considéré la perspective des receveurs de soins, les patients. Il aurait été intéressant de comparer et de contraster les perspectives de ces deux acteurs. En ce qui concerne la pratique des infirmières, celle-ci s'exerçait principalement en milieux urbains. Il est possible de croire qu'une pratique se déroulant dans un contexte rural et en régions éloignées pourrait présenter des différences et ainsi, concourir en des défis et des ressources propres à ces environnements de pratique, en comparaison à ceux issus du groupe à l'étude. Néanmoins, le recours à diverses stratégies d'échantillonnage, c'est-à-dire à variation maximale, à choix raisonné et de convenance (Creswell et Creswell, 2018; Patton, 2015a), a permis de teinter les résultats à partir de plusieurs perspectives

d'infirmières qui avaient un nombre variable d'années d'expérience, qui occupaient des rôles diversifiés, et qui suivaient diverses clientèles atteintes du VIH.

Nous ne sommes pas retournées aux participantes pour valider la justesse et la précision des interprétations de l'étudiante-chercheuse, une stratégie connue sous le nom de « validation par les pairs. » Cette stratégie est utilisée pour assurer la crédibilité des résultats (Birt et al., 2016). Par contre, le processus d'analyse a été réalisé de manière rigoureuse et consciencieuse, en commençant avec un codage ligne par ligne et en validant l'interprétation des résultats avec l'équipe d'encadrement de la thèse et les coauteurs. Considérant que l'étudiante-chercheuse était l'outil de collecte de données, et était elle-même en processus d'apprentissage, il est possible qu'une personne plus expérimentée ait animé le groupe de discussion et les entrevues différemment. En contrepartie, il est aussi possible de penser que la relation de confiance déjà établie avec l'ensemble des participantes ait eu une influence positive sur le déroulement de la collecte de données et sur l'engagement dans cette recherche.

10.4.2.2 Décrire les étapes de développement de la simulation numérique, les éléments qui composent l'intervention, les défis et les leçons apprises

Les forces, les limites et les défis concernent à la fois le processus de développement de la simulation de même que l'intervention en elle-même.

Tel que discuté dans l'article 4, le fait de ou l'action de concevoir le scénario de la consultation infirmière-patient de sorte qu'il s'harmonise avec les fonctionnalités de la plateforme de simulation numérique a constitué un défi important. Ce défi résidait également dans la transposition de la dimension relationnelle des soins infirmiers et des habiletés sous-jacentes à l'EM dans une séquence de communication préprogrammée, sans avoir de repères opérationnels pour y parvenir. La limite de cette approche inductive a eu pour effet de prolonger le développement de la simulation, lequel s'est échelonné sur une période de 16 mois puisque nous avons dû procéder par « essais-erreurs », et que l'orientation s'est précisée au fil du temps. L'approche inductive et émergente de codéveloppement liée à la phase de création de contenu, phase initialement insécurisante, a donné lieu à une expérience créative, constructive et riche en apprentissages. Durant l'écriture dyadique du scénario, c'est-à-dire une démarche itérative entre les deux coéquipiers, des opportunités d'échange et de transfert de connaissances ont pris forme. Pour la version anglaise de la simulation, l'ensemble de la traduction a

été révisée par un infirmier, détenteur d'un doctorat en sciences infirmières et expert-formateur en EM. L'expérience des formateurs constitue un élément positif pour assurer l'intégrité et la qualité d'une intervention fondée sur l'EM (Lavoie et al., 2014).

Dans le développement de l'intervention éducative et dans l'évaluation de celle-ci, nous avons catégorisé le glossaire, le dossier électronique du patient, les quiz, les rétroactions, les étiquettes, de même que le réalisme comme des *éléments composant la simulation.* Or, nous reconnaissons des limites à cette catégorisation puisque nous attribuons à ces éléments des fonctionnalités distinctes. Le glossaire est une ressource d'information « statique » qui est complémentaire à la consultation infirmière-patient. Les quiz, les rétroactions et les étiquettes seraient, selon la perspective de Jeffries (2005), des pratiques éducatives alors que pour Bland et collaborateurs (2011), ils constitueraient des attributs de la simulation. Pour Moore et coll. (2018), ces éléments font partie d'une conception pédagogique (*instructional design*). Pour Chiniara (2013), les rétroactions sont l'une des caractéristiques de la présentation d'une simulation, tout comme le réalisme. C'est ainsi que nous avons intégré les quiz, les rétroactions et les étiquettes dans la simulation pour optimiser l'apprentissage actif des infirmières, pour favoriser la mise à l'épreuve de leur savoir expérientiel, en le comparant à des notions théoriques, et ainsi, leur permettre d'apprendre de leurs erreurs. Ces quelques exemples nous indiquent qu'il ne semble pas y avoir de consensus sur la sémantique entourant les divers éléments et caractéristiques rattachés à la simulation elle-même (à l'intervention) et à ses modes d'apprentissage. La ligne peut être floue entre ce qui qualifie une simulation et ce qui constitue ses mécanismes d'apprentissage. Dans la perspective d'un développement éventuel d'une intervention éducative, il serait recommandé de se référer à une ou à plusieurs conceptions théoriques de l'apprentissage chez l'adulte; ces théories pouvant être de nature descriptive et prescriptive. Elles peuvent notamment permettre de comprendre comment les personnes apprennent et les raisons qui font qu'une simulation (ou autre intervention) a bien fonctionné ou comment mieux articuler l'alignement des mécanismes d'apprentissage avec la pratique clinique (Nestel et Bearman, 2015). Ceci étant, nous avons identifié, dans le quatrième article, des principes de l'apprentissage expérientiel (Kolb, 2014) et par transformation (Duchesne, 2010; Mezirow, 2000), sans toutefois en approfondir la portée.

La simulation en elle-même comporte ses propres limites. Premièrement, le fait qu'elle soit automatisée, basée sur un apprentissage autodirigé, exempte de contacts humains, peut être

contraignant pour ceux et celles qui aiment apprendre notamment de manière « collective » et en présentiel. Autrement dit, la simulation numérique convient à certains profils de personnes ayant des styles d'apprentissages qui conviennent bien à ce type d'approche. Aussi, il est possible de croire qu'une exposition d'une durée limitée à un patient virtuel ne puisse influencer que certaines facettes des habiletés relationnelles en lien avec l'EM. Comme le soulignent Miller et Rose (2009), les apprenants ont besoin de plus d'une formation pour améliorer leurs habiletés relatives à la méthode complexe qu'est l'EM. La simulation numérique a été développée à partir d'un défi précis (parmi tant d'autres) vécu par les infirmières dans un contexte de pratique particulier. Nous reconnaissons la complexité de cette pratique infirmière auprès des PVVIH et sommes tenues d'admettre que la simulation numérique n'a pu répondre qu'à une parcelle de cette pratique. Par contre, même en participant à la simulation dont la durée approximative est de 45 minutes, les infirmières ont pu en apprécier les retombées sur le plan relationnel. En effet, la simulation leur a permis de se remémorer des éléments de leur pratique antérieure, de se rappeler l'importance d'être présentes et à l'écoute du patient et de se conscientiser sur l'impact de leur style de communication sur la relation avec le patient. Une limite potentielle de la simulation numérique est l'absence d'une séance de débriefing, considérée comme une composante centrale de la simulation et comme une norme de bonne pratique pour favoriser l'intégration de la théorie; pour maximiser et consolider l'apprentissage; et pour améliorer la performance future des apprenants (Hall et Tori, 2017; INACSL, 2016).

À la lumière de nos résultats, nous croyons que notre simulation est un espace d'apprentissage qui peut servir de déclencheur, de prise de conscience, de réflexion sur la pratique, avec le potentiel de modifier certains aspects relatifs aux habiletés relationnelles. La simulation numérique pourrait ainsi s'inscrire comme l'une des composantes d'une approche multifacette plus large, qui nécessiterait d'autres interventions pouvant agir sur d'autres cibles et aspects d'une pratique professionnelle.

10.4.3 Évaluation de l'acceptabilité de la simulation numérique

Chaque composante quantitative et qualitative a ses propres forces et limites. Le devis préexpérimental a permis de mesurer un bon nombre d'énoncés en lien avec plusieurs facettes de la simulation. Cela a contribué à la description d'un large portrait pour situer l'acceptabilité de la simulation à partir des perspectives d'un petit nombre d'infirmières. Toutefois, ces résultats à eux seuls, illustrés par des variables continues et catégorielles, n'indiquent pas en quoi ces infirmières trouvent utile la simulation, ni de quelle manière elle a pu contribuer à leurs apprentissages. La valeur ajoutée de la composante

qualitative a permis de nuancer, d'apporter une compréhension de cette expérience de simulation notamment en termes d'utilité pour la pratique et de progression des apprentissages. La complémentarité de ces deux approches contribue à la richesse des résultats. Cependant, chacune des composantes comporte ses propres limites et forces, de même que la modalité de la recherche en ligne, lesquelles sont résumées ici-bas.

La recherche a été réalisée entièrement en ligne, passant par l'obtention du consentement, la complétion du questionnaire sociodémographique, la consultation de la simulation numérique, la complétion du questionnaire post-intervention et la participation au groupe de discussion. De plus, des courriels personnalisés agissaient comme stratégies de rappels pour favoriser l'engagement dans l'étude. Nous avons utilisé les technologies autant comme outils de collecte de données que comme modalité d'intervention, avec les avantages et les inconvénients que ces technologies comportent. Les participantes (n=49) ont majoritairement auto-rapporté se sentir confiantes ou pleinement confiantes en leur capacité de réaliser une recherche en ligne. Il est fort possible que les participantes qui ne se sentaient pas habilitées avec les technologies n'aient pas voulu y participer : c'est ce qu'on nomme « le biais de sélection »; un risque connu des études en ligne (Greenacre, 2016). Par ailleurs, nous avons interrogé uniquement les infirmières qui ont complété la simulation numérique pour prendre en compte leurs perceptions et leurs expériences puisque l'objectif était d'évaluer l'acceptabilité « vécue. » Les résultats quantitatifs et qualitatifs sont très favorables à la simulation numérique, ce qui pourrait en partie être expliqué par la motivation et l'engagement intensifs des participantes à mener à terme le projet. Il est possible de croire que les stratégies mises en place pour encourager la participation et la complétion de l'étude (trois heures de formation accréditée, tirage de chèques-cadeaux) aient eu un effet positif. Nous avons peu d'information sur les participantes qui n'ont pas complété l'étude. Cette information aurait pu générer des connaissances utiles sur les barrières et les difficultés à l'engagement des infirmières dans une recherche évaluative impliquant la simulation numérique comme modalité d'intervention. Par ailleurs, la seule caractéristique sociodémographique dont la fréquence est différente entre les deux groupes est reliée au statut de travail. Huit des 27 participantes (29.63%) qui ont complété la recherche ont indiqué travailler à temps partiel, alors que ce nombre est réduit à une personne sur les 22 (4.55%) dans le groupe qui n'a pas complété l'étude.

Dans la composante quantitative, un questionnaire a été développé pour collecter les données quantitatives. Nous nous sommes inspirées d'outils existants et nous avons légèrement adapté un

instrument de mesure déjà développé et validé, le *Technology Acceptance Model* (Cheng, 2012), pour mesurer la qualité globale du système et l'acceptation de la technologie. N'ayant pas entrepris de démarche méthodologique basée sur les meilleures pratiques pour développer et valider des instruments de mesure (Boateng et al., 2018), nous admettons que cette lacune représente une limite importante à notre étude. Il s'agit d'une menace à la validité de contenu (Grove et al., 2015; Nieswiadomy, 2008; Polit et al., 2007) et de construit (cette dernière ayant été énoncée précédemment, *cf*. Chapitre 9). La validité de contenu est définie par Polit, Beck et Owen (2007) comme le degré dans lequel un instrument de mesure contient un ensemble d'énoncés appropriés et pertinents pour représenter le domaine d'intérêt. Généralement, des experts sont invités à évaluer la pertinence des énoncés, de même que la population cible visée par le domaine d'intérêt (Boateng et al., 2018). Pour assurer la validité du contenu, il importe au préalable d'avoir proposé une définition conceptuelle préliminaire du domaine d'intérêt. Dans notre étude, nous avons eu recours à deux termes, soit « habiletés relationnelles » et « pratique professionnelle **»**, sans en avoir précisé les contours. Nous reconnaissons ainsi un manque de clarté conceptuelle et opérationnelle notamment en ce qui concerne leur usage. Nous explicitons cette limite avec l'un des outils que nous avons développés pour évaluer les retombées de la simulation, soit, le Rôle de la simulation pour soutenir la pratique professionnelle (*cf*. Article 5, *Role of simulation in supporting nurses' professional practice*). Nous avons conçu la simulation numérique dans une visée d'améliorer les « habiletés relationnelles ». Considérant la portée exploratoire et descriptive de notre recherche, nous souhaitions sonder plus largement les retombées de la simulation sur la « pratique professionnelle » des infirmières (laquelle incluait les habiletés relationnelles). Notre prémisse était alors que la simulation pouvait avoir des retombées se situant au-delà des habiletés relationnelles, d'où l'ajout d'énoncés à l'outil qui nous permettraient de décrire diverses retombées anticipées (sur les apprentissages, sur la pratique, la mise en action des habiletés relationnelles) et vécues de la simulation, en plus de la confiance des infirmières à réaliser des changements dans leur pratique. En contrepartie, même si nous ne pouvons compter sur la fiabilité et la validité du questionnaire utilisé, cette première étude mixte a permis d'évaluer l'acceptabilité d'une simulation numérique nouvellement développée. Nous croyons que les résultats de notre étude pourraient alimenter des développements méthodologiques futurs.

Nous avons tout de même eu recours à la version française (Fontaine, 2016) du *Technology Acceptance Model* (Cheng, 2012) que nous avons légèrement adaptée. Deux construits de notre instrument adapté avaient un alpha de Cronbach sous le seuil du 0.70 recommandé (Nunnally et

Bernstein, 1994). Il s'agit de la qualité de l'interface utilisateur (0.68) et de la perception de la facilité d'utilisation (0.69). Concernant la qualité de l'interface utilisateur, Cheng et coll. (2012) avaient calculé un alpha de 0.75, alors que pour la facilité d'utilisation, il se situait à 0.92. Considérant la nature exploratoire de notre approche de recherche, la cohérence interne de ces deux construits pourrait être acceptable (Robinson et al., 1991). Par ailleurs, notons une force à notre démarche d'évaluation quantitative, celle d'avoir réalisé deux rondes de prétests avec des utilisateurs potentiels. La première ronde portait sur le questionnaire papier et électronique, et la deuxième, sur le questionnaire accessible via LimeSurvey. L'avantage d'utiliser une plateforme comme LimeSurvey est de pouvoir contrôler et éviter les réponses manquantes en programmant les réponses comme étant « obligatoires. » Si les participantes ne répondent pas à l'une des questions obligatoires, elles ne peuvent pas soumettre le questionnaire. En conséquence, il n'y a eu que très peu de données manquantes dans le questionnaire post-intervention.

Dans la composante qualitative, c'est l'étudiante-chercheuse qui a animé le groupe de discussion. Nous rappelons que c'est elle qui a mené l'étude et qui a participé activement au développement de la simulation. L'étudiante-chercheuse connaissait la majorité des infirmières. Ceci peut représenter une limite, mais en même temps une force. D'un côté, il y a un risque potentiel de désirabilité sociale : les participantes pourraient ne pas révéler ce qu'elles pensent, pour « faire plaisir » à l'étudiante-chercheuse. Celle-ci pourrait « influencer » l'orientation de la collecte de données pour amener les participantes vers des résultats souhaités. D'un autre côté, l'étudiante-chercheuse est la mieux positionnée pour comprendre l'expérience d'apprentissage, étant donné son niveau d'engagement dans le projet. Le fait que la relation de confiance soit établie a pu faciliter les échanges. Les participantes avaient reçu l'information au préalable dans le formulaire d'information et de consentement, pour préciser le rôle de l'étudiante-chercheuse dans la recherche en général, mais aussi, dans l'animation du groupe de discussion. Le guide d'entrevue a été envoyé aux participantes avant la tenue de ce groupe, incluant le temps approximatif alloué à chaque thématique. Ceci a permis aux participantes de se préparer et de se familiariser avec les questions, en plus de bien utiliser le temps dont nous disposions, ce qui représente à notre avis une autre force de l'étude. Une limite de l'échantillonnage de convenance pour la composante qualitative est d'avoir ciblé les participantes disponibles et intéressées. Nous aurions pu, par exemple, sélectionner les participantes à partir de leurs réponses dans le questionnaire (par exemple, choisir les participantes à partir de leurs réponses « contradictoires »). Par ailleurs, une limite du devis mixte est de jongler avec une quantité de données

variables entre les deux composantes. D'une part, les données descriptives étaient issues de 80 énoncés et les transcriptions des données qualitatives brutes s'étalaient sur 17 pages de texte. De plus, nous reconnaissons la taille d'échantillon inégale entre les deux composantes.

En résumé, les résultats de l'étude mixte doivent ainsi être interprétés avec prudence si l'on tient compte qu'ils ont été extraits de la perspective d'infirmières fortement mobilisées dans la démarche et de la limite liée aux résultats des infirmières qui n'ont pas terminé leur participation laissant ainsi difficile la compréhension de ce qui a pu freiner leur engagement initial. Il est possible de croire que les résultats de l'étude auraient pu être différents avec des infirmières ayant un niveau variable d'engagement dans la simulation. Néanmoins, nos résultats décrivent un éventail de perceptions et d'expériences généralement positives de ces infirmières qui ont participé à la simulation numérique jusqu'à la fin, lesquelles affirment l'utilité d'une telle intervention pour leur pratique.

10.5 Recommandations

10.5.1 Sur le plan conceptuel, méthodologique et théorique

Nous recommandons qu'une étude méthodologique puisse faire l'objet de travaux futurs pour développer et valider un nouvel instrument de mesure ou faire l'adaptation d'un outil existant qui servirait à évaluer l'efficacité de la simulation numérique pour améliorer les habiletés relationnelles.

Nous avons évoqué à de multiples reprises que la simulation numérique a été développée pour améliorer les habiletés relationnelles. Or, bien que les résultats de notre étude mixte nous aient offert quelques pistes intéressantes sur les éléments qui ont contribué à l'apprentissage des infirmières de même que les retombées potentielles de la simulation sur les habiletés relationnelles, plusieurs angles supplémentaires mériteraient d'être explorés. Tout d'abord, nous avons une connaissance parcellaire sur le comment et le pourquoi cette simulation fonctionne ou non pour induire un changement dans les habiletés relationnelles des infirmières. Dans une perspective d'obtenir une perspective plus exhaustive des mécanismes d'action qui sous-tendent une intervention, des auteurs suggèrent d'articuler une théorie de programme (Pawson et Tilley, 1997), également appelée modèle logique (Nilsen et Hasson, 2020). Ce type de théorie permet notamment de poser les grands principes et postulats d'une intervention, de dégager les circonstances, les ressources et les conditions optimales pour prodiguer l'intervention et/ou celles susceptibles de l'influencer, et d'identifier les mécanismes d'action susceptibles d'induire un changement, soit les résultats escomptés (Nilsen et Hasson, 2020;

Pawson et Tilley, 1997). Bien que l'élaboration d'une telle théorie doive généralement précéder le choix des questions évaluatives (Champagne et al., 2011), les résultats de notre étude d'acceptabilité pourraient constituer l'une des sources de connaissances pour alimenter la construction future de ce type de théorie, et ainsi, guider de futurs questionnements évaluatifs.

10.5.2 Sur le plan de la recherche

Puisque nous considérons que la simulation puisse être applicable à l'ensemble des étudiants en santé, des professionnels de la santé et des services sociaux, incluant les intervenants communautaires, nous suggérons de reconduire une étude d'acceptabilité en incluant différentes populations. Dans une telle étude, il serait utile d'explorer les barrières à l'engagement des participantes dans une recherche basée sur la simulation, en tenant en compte de l'état de connaissances sur des sujets similaires qui ont porté largement sur des interventions de santé numérique (O'Connor et al., 2016; Perski et al., 2017; Short et al., 2018). Les résultats d'une telle étude pourraient venir confirmer ou réfuter les conceptions existantes sur la notion d'engagement. Une meilleure connaissance de ces facteurs d'engagement serait utile pour ensuite identifier des stratégies spécifiques pour agir sur ces facteurs, et ainsi, optimiser l'utilisation de la simulation. Par ailleurs, il serait judicieux de comparer en quoi la notion d'engagement dans des études en ligne visant le changement de comportement ou de pratique diffère ou partage des similarités entre professionnels de la santé et patients.

Les participantes de l'étude mixte sont des infirmières francophones recrutées à travers le Québec qui ont non seulement un profil sociodémographique varié, mais qui proviennent de différents contextes et milieux de travail (ex. : milieux hospitaliers, spécialisés et non spécialisés en VIH, milieux académiques). Le contexte, qui est un élément « extérieur » à la simulation, peut influencer la mise à l'essai, l'évaluation et l'implantation d'une intervention (Squires et al., 2019). Certaines infirmières ont mentionné des raisons d'avoir cessé leur participation au projet, par exemple : le manque d'effectifs infirmiers et le manque de temps. Nous recommandons ainsi, comme piste de recherches futures, d'explorer comment les attributs du contexte en milieux francophones et anglophones (ex. : la culture organisationnelle, la structure du travail, les ressources) et les déterminants relatifs aux professionnels de la santé (ex. : leur rôle, leurs priorités) viennent influencer l'utilisation de la simulation numérique.

Considérant que la simulation vise à améliorer les habiletés relationnelles des infirmières, il serait d'un grand intérêt de réaliser une étude de plus grande envergure pour examiner dans quelle mesure les habiletés concourent en des changements dans la pratique, et ultimement, d'évaluer les retombées auprès des patients. Nous pourrions envisager différents indicateurs auprès des patients, comme la qualité perçue de la relation thérapeutique, la qualité des soins, l'autonomisation, l'adoption des comportements de santé (comme l'adhésion à la médication). Les questions de recherche suivantes seraient donc d'intérêt : Auprès de qui cette simulation est-elle avantageuse et peu avantageuse ? Quels sont les éléments contextuels qui peuvent influencer la manière dont fonctionne l'intervention ? Comment et par quels mécanismes agit-elle ? Quels sont les résultats générés ? Pourquoi et comment fonctionne ou non ce type d'intervention ? Quelle est l'efficacité de ce type d'intervention ? À ce sujet, plusieurs approches évaluatives seraient appropriées pour répondre à différentes questions, comme par exemple, une évaluation réaliste (Pawson et Tilley, 1997) servirait à analyser comment le contexte et les mécanismes génèrent les résultats souhaités, un essai clinique randomisé permettrait d'évaluer l'efficacité de l'intervention et une évaluation de processus pourrait expliquer pourquoi et comment l'intervention fonctionne (Moore et al., 2015).

10.5.3 Sur le plan de la formation : offre de formation et ajout du débriefing

Les résultats du projet de thèse ont permis de développer des connaissances utiles sur l'acceptabilité d'une nouvelle intervention éducative. Ces connaissances pourraient permettre d'améliorer la simulation, particulièrement grâce aux commentaires des participantes sur les éléments les plus appréciés, les moins appréciés et leurs recommandations.

Il serait ainsi judicieux d'envisager le développement d'une composante de débriefing innovante qui pourrait être dispensée virtuellement (Verkuyl et al., 2018; Verkuyl et al., 2017) pour s'harmoniser à l'esprit de la simulation numérique.

Notre souhait serait que la simulation puisse devenir éventuellement une offre de formation continue accréditée aux professionnels de la santé et des services sociaux et qu'elle soit en plus intégrée aux programmes de formation académique, comme une ressource éducative additionnelle et complémentaire aux programmes existants.

Conclusion

Le projet de thèse a fait état d'une démarche de recherche exhaustive, émergente et pragmatique, avec une préoccupation entourant l'usage des technologies comme outils de prestation des soins infirmiers et de formation. Les résultats des deux revues systématiques de revues systématiques ont mis en lumière l'éventail des effets qui découlent de l'usage des TIC et de la formation numérique sur les soins infirmiers. Les impacts « négatifs » méritent d'être connus puisqu'ils peuvent alimenter la mise sur pied de stratégies nécessaires à une intégration positive des TIC au service de la pratique professionnelle et de la santé de la population. Dans cette ère d'avancées technologiques, de nouveaux outils peuvent constituer une avenue prometteuse, pour autant qu'ils puissent soutenir, voir même potentialiser ce que font les infirmières, et non les contraindre.

Par ailleurs, plusieurs objets, questions de recherche, méthodes, approches conceptuelles et théoriques ont contribué à la génération de savoirs actionnables, pratiques, personnels et empiriques. Pour développer la simulation numérique, nous avons d'abord puisé dans les expériences des infirmières œuvrant auprès des PVVIH, pour comprendre ce qu'elles faisaient, pour cerner leurs difficultés et ainsi, mieux cibler l'objet de la formation. L'apport de la lentille qualitative s'est avéré tout à fait approprié pour saisir la complexité de cette pratique infirmière, de ses défis et des ressources mobilisées pour soutenir le développement professionnel. À notre avis, les défis rencontrés par ces infirmières qui accompagnent les PVVIH dans la prise du traitement ont été particulièrement révélateurs puisqu'ils sont peu documentés. Dans la littérature, les défis répertoriés sont plutôt identifiés à partir de la perspective des PVVIH, comme des déterminants de l'adhésion et des barrières. Pourtant, les infirmières ont un rôle prépondérant pour accompagner les personnes dans l'atteinte de leurs objectifs de vie et d'un état de santé optimale. Les infirmières ont pour rôles de soutenir le développement des forces de la personne/famille, d'identifier et de mobiliser ces forces pour qu'elles puissent faire face aux défis rencontrés. Or, nos résultats qualitatifs ont suggéré que les infirmières vivent un sentiment d'échec lorsqu'elles se heurtent à des situations dans lesquelles les PVVIH ne prennent pas le traitement tel que prescrit. Le désalignement entre les objectifs d'adhésion de l'infirmière et le patient a été le point culminant de l'idéation de créer une simulation numérique en soutien au développement professionnel infirmier.

La simulation numérique est une contribution indéniable du projet de thèse. Elle est un véhicule de savoirs relationnel/personnel, théorique et expérientiel. Bien qu'une simulation numérique ne puisse

représenter qu'imparfaitement et partiellement la nature relationnelle des soins, l'interactivité de la formation offre une opportunité de pratiquer les habiletés de communication avec un patient virtuel, sans conséquence réelle sur les *vrais* patients. La logique de cette simulation, soutenue par les assises théoriques de l'EM, est de former les infirmières pour les conscientiser sur les impacts de leurs styles de communication sur l'engagement relationnel avec les patients. Ainsi, une infirmière dont les interventions sont centrées sur les « déficits », sur le problème d'adhésion à la médication, et ce, sans avoir exploré ouvertement la situation avec la personne, risque, malgré ses intentions bienveillantes, de susciter un discours-maintien chez le patient (en faveur du statu quo). Conséquemment, le patient risque de se désengager de la relation soignante (Miller et Rollnick, 2013b).

La réalisation d'une étude mixte pour évaluer l'acceptabilité de la simulation a permis de dégager « une première impression » de cette intervention éducative auprès d'infirmières travaillant auprès des PVVIH et d'autres clientèles. Les infirmières de plusieurs régions du Québec ont pu bénéficier d'une offre de formation dont les retombées ont été perçues et vécues favorablement. En effet, les infirmières ont acquis des connaissances sur l'EM, elles se sont senties plus confiantes en leurs habiletés, elles ont souligné avoir revisité leurs habiletés relationnelles, elles ont saisi l'opportunité de réfléchir sur leur pratique et elles ont anticipé des changements positifs futurs dans leur pratique. En soi, les résultats hautement favorables appuyant l'acceptabilité de la simulation numérique offrent une indication intéressante pour encourager la poursuite de projets futurs. Les infirmières ont qualifié la simulation comme étant innovante, interactive, immersive et réaliste. Les éléments les moins appréciés et les difficultés rencontrées reposent sur les aspects techniques liés à la technologie. La lenteur et la lourdeur du système ont causé un manque de fluidité, notamment sur le plan des interactions entre l'infirmière et le patient virtuels. Le fait qu'il était impossible pour certaines infirmières de consulter la simulation à partir du lieu de travail était contraignant.

La qualité de la relation thérapeutique est un élément de grande importance dans la prestation des soins infirmiers à tous types de clientèles. Les sciences infirmières sont considérées comme une discipline professionnelle, dirigée vers des finalités « pratiques » (Donaldson et Crowley, 1978). La simulation numérique est une modalité prometteuse pour recréer un contexte de pratique avec un patient virtuel. Si la simulation permet aux infirmières de prendre conscience de leurs propres styles de communication et de certains pièges qui les guettent, en plus de réfléchir aux impacts de leurs

interventions, nous croyons que cette réflexivité peut être porteuse de changements ultérieurs, aux bénéfices des personnes réceptrices de soins, mais aussi de celles qui prodiguent ces soins.

Annexe A. Lettre d'information pour inviter les infirmières membres-expertes du PNMVH à participer au groupe de discussion

Objet : Invitation à participer à une discussion en groupe sur l'accompagnement à la prise des antirétroviraux auprès de la clientèle VIH lors de la rencontre des infirmières expertes du PNMVS[17] le 10 juin 2016.

Bonjour à vous toutes et tous,

Dans le cadre de mon doctorat, je vise à développer et à évaluer l'implantation d'une formation en ligne destinée aux infirmières et infirmiers pour les soutenir dans leur pratique d'accompagnement à la prise des antirétroviraux auprès de leur clientèle VIH.

Je suis donc intéressée à vous entendre sur les éléments de votre pratique infirmière qui pourraient être améliorés et/ou transposés dans une formation en ligne. Je suis également intéressée à adapter des connaissances issues d'une intervention infirmière qui a été évaluée en présentiel (Pilar Ramirez-Garcia & José Côté) et en modalité virtuelle (VIH-TAVIE, José Côté et son équipe). Il serait intéressant de voir comment on peut modeler ces connaissances pour les appliquer et les rendre accessibles aux infirmières et infirmiers[18].

Votre expérience d'infirmière et d'infirmier est une source riche de connaissances. Ainsi, dans le cadre de la prochaine rencontre des infirmières expertes qui se tiendra le 10 juin prochain, une portion de l'avant-midi (environ 60 minutes) sera allouée à un échange portant sur vos expériences, connaissances et recommandations en lien avec l'accompagnement des PVVIH qui prennent un traitement. Au préalable, je répondrai à vos questions sur la nature de ce projet de recherche et de votre participation. Je prendrai quelques minutes pour vous faire remplir un court questionnaire sociodémographique (7 courtes questions). J'animerai ensuite le groupe de discussion dont le contenu des échanges sera enregistré sur bande audio, avec votre consentement, puisque le fruit de ces discussions fait partie intégrante de mon projet de recherche. Je joins donc à ce présent courriel le formulaire d'information et de consentement puisque des données seront collectées et que, par conséquent, mon projet a dû être approuvé par le comité d'éthique du CHUM.

Votre participation est bien entendu volontaire et confidentielle.

N'hésitez pas à communiquer avec moi si vous avez des questions.

[17] Programme national de mentorat sur le VIH/sida. Ce dernier a ensuite changé de nom pour « Programme national de mentorat sur le VIH et les hépatites, PNMVH. »

[18] En 2016, nous avions l'intention d'utiliser l'intervention infirmière virtuelle VIH-TAVIE (Côté et al., 2008, 2011, 2015a, b) destinée aux PVVIH, et ainsi, l'adapter comme modalité de formation pour les infirmières. L'idée de la formation numérique a été conservée, mais l'intervention éducative en elle-même a changé.

Votre collaboration est précieuse pour la réalisation de cette recherche et je vous remercie à l'avance de votre participation.

À bientôt,

Geneviève Rouleau, inf., Ph. D.(c)
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José Côté, inf., Ph. D., chercheuse régulière au centre de recherche du CHUM
CRCHUM, pavillon St-Antoine, 850 rue St-Denis, bureau S03-424
Montréal (Québec), H2X 0A9

Annexe B. Formulaire d'information et de consentement pour la participation des infirmières à l'étude qualitative exploratoire

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

Titre du projet :	Développement et implantation d'une formation en ligne destinée aux infirmières qui accompagnent les personnes vivant avec le VIH dans la prise des antirétroviraux
Chercheuse responsable au CHUM :	José Côté, inf., Ph. D., titulaire de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers, professeure titulaire, Université de Montréal, chercheuse régulière au Centre de recherche du CHUM (CRCHUM)
Étudiante-chercheuse :	Geneviève Rouleau, inf., Ph. D.(c), candidate au doctorat, Université Laval
Directrice de recherche :	Marie-Pierre Gagnon, Ph. D., professeure titulaire, Université Laval
Cochercheurs :	Damien Contandriopoulos, Ph.D, professeur titulaire, titulaire de la Chaire de recherche - Politiques, connaissances et santé, Université de Montréal. Yann-Gaël Guéhéneuc, Ph.D, titulaire de la Chaire du Canada sur les patrons de logiciels, École polytechnique Sylvie Dubois, inf., Ph. D., directrice nationale des soins infirmiers et autres professionnels au ministère de la Santé et des Services sociaux du Québec (MSSS) Kenneth Monteith, directeur de la Coalition des organismes communautaires québécois de lutte contre le VIH/sida (COCQ-sida) Rock Lévesque, infirmier-chef au département de prévention de santé toxicomanie du CHUM Rachel Therrien, pharmacienne à l'Unité hospitalière de recherche, d'enseignement et de soins sur le sida (UHRESS) du CHUM Valérie Martel-Laferrière, microbiologiste-infectiologue au CHUM, chercheuse CRCHUM

Collaborateur :	Jean Manassé Théagène, président de 360Medlink
Organisme subventionnaire :	Instituts de recherche en santé du Canada (IRSC)
No. projet CHUM :	15.345

PRÉAMBULE

Nous sollicitons votre participation à un projet de recherche parce que vous êtes une infirmière ou un infirmier qui travaillez directement ou indirectement auprès des personnes vivant avec le VIH. Cependant, avant d'accepter de participer à ce projet et de signer ce formulaire d'information et de consentement, veuillez prendre le temps de lire, de comprendre et de considérer attentivement les renseignements qui suivent.

Ce formulaire peut contenir des mots que vous ne comprenez pas. Nous vous invitons à poser toutes les questions que vous jugerez utiles à la chercheuse responsable du projet, à l'étudiante-chercheuse ou aux autres membres du personnel affecté au projet de recherche et à leur demander de vous expliquer tout mot ou renseignement qui n'est pas clair.

NATURE ET OBJECTIFS DU PROJET

Les infirmières représentent la main-d'œuvre la plus populeuse du système de la santé. Elles sont présentes dans plusieurs milieux et contextes de soins, elles ont des contacts étroits et privilégiés avec la clientèle, ce qui les positionne favorablement dans la prestation et dans la coordination de plusieurs types de soins, notamment ceux relatifs à l'adhésion aux médicaments en collaboration avec les autres professionnels de la santé. Une intervention infirmière (VIH-TAVIE) a été développée et évaluée pour optimiser l'adhésion aux antirétroviraux auprès des personnes vivant avec le VIH (PVVIH), en favorisant le développement de leurs habiletés d'autogestion. L'état actuel des connaissances dénote que les interventions reliées à l'adhésion des antirétroviraux ciblent quasi exclusivement les patients. À notre connaissance, très peu d'études se sont penchées sur des stratégies éducatives qui s'adressent directement aux infirmières ou infirmiers pour soutenir leur pratique de soutien à l'adhésion auprès des PVVIH.

Le présent projet de recherche a pour but de développer et d'implanter une formation en ligne destinée aux infirmières qui accompagnent les personnes vivant avec le VIH. Dans un premier temps, nous jugeons essentiel de vous consulter en tant qu'infirmières et infirmiers pour développer et valider le contenu de la formation en ligne pour qu'il réponde davantage à vos besoins. Pour ce faire, il vous sera demandé d'identifier des éléments de votre pratique qui pourraient être améliorés lorsque vous accompagnez vos patients dans la prise de leurs médicaments antirétroviraux. Par ailleurs, il est prévu d'adapter une variété de connaissances sur la prise des antirétroviraux à votre pratique d'infirmière. Ces connaissances sont issues notamment d'une intervention infirmière qui a été évaluée en présentiel par une infirmière et en modalité virtuelle (projet VIH-TAVIE). Dans un deuxième temps, le processus d'implantation de cette formation en ligne sera évalué de manière qualitative, et ce, dans deux milieux cliniques de la région de Montréal.

Le présent formulaire ne concerne que le premier volet de l'étude, soit le développement du contenu clinique de la formation en ligne et sa validation.

NOMBRE DE PARTICIPANT(E)S ET DURÉE DE LA PARTICIPATION

Le nombre total d'infirmières et d'infirmiers visés à participer se situe entre 15 et 25, dont minimalement cinq de ces participants proviendront du CHUM. L'important est d'obtenir une certaine représentativité des infirmières et infirmiers qui œuvrent dans divers milieux de pratique au Québec à travers le programme national mentorat sur le VIH/sida (PNMVS).

La durée prévue pour votre participation est variable et dépendra de vos disponibilités et de votre niveau d'engagement au projet. Si vous souhaitez contribuer au développement et à la validation du contenu, la durée de votre participation pourrait varier de deux (2) à vingt (20) heures sur une période de six mois. Une période de deux heures et demie serait allouée pour une infirmière/infirmier qui accepte de partager (via un groupe de discussion et deux entrevues individuelles) des éléments de sa pratique qu'elle souhaite améliorer par une formation en ligne. Une durée de 20 heures serait allouée pour une autre infirmière/infirmier qui voudrait participer à un comité de travail consultatif dans lequel le contenu serait développé, peaufiné, validé et transposé dans une plateforme Web.

NATURE DE LA PARTICIPATION DEMANDÉE ET DÉROULEMENT DU PROJET

Si vous acceptez de participer à ce projet de recherche et après avoir signé le présent formulaire d'information et de consentement, votre participation sera convenue entre vous et l'étudiante- chercheuse en fonction de votre lieu de pratique, de vos disponibilités et de vos préférences.

Vous serez invité(e) à :

- Remplir un court questionnaire sociodémographique (durée de complétion d'environ 3 minutes) comprenant des questions telles que votre niveau de formation, votre statut d'emploi, vos années d'expérience auprès de la clientèle VIH, etc.
- Faire partie d'un comité de travail consultatif qui portera sur le sujet de recherche, soit le développement et la validation du contenu d'une formation en ligne. Vous serez ainsi invité(e) à commenter et à discuter de manière ponctuelle de l'évolution du développement du contenu clinique de la formation en ligne, et ce, soit par écrit, et/ou lors de rencontres informelles (en présentiel, via skype ou par téléphone). Vous serez également invité(e) à tester et à commenter la version Web.

Si vous assistez à la réunion des infirmières expertes du PNMVS (juin 2016), vous serez invité(e) à :

- rencontrer l'étudiante-chercheuse lors d'un groupe de discussion d'une heure qui se tiendra lors de la réunion (prévue le 10 juin 2016) pour discuter des éléments de votre pratique d'accompagnement à l'adhésion des antirétroviraux qui pourraient être améliorés par une formation en ligne ;
- participer à deux entrevues individuelles d'une durée prévue variant de 30 à 45 minutes en présentiel, par Skype ou par téléphone. La première entrevue visera deux objectifs : 1) approfondir les éléments de votre pratique d'accompagnement aux antirétroviraux pouvant être améliorés par une formation en ligne ; 2) dégager les connaissances qui doivent être adaptées, issues de l'intervention infirmière (comme VIH-TAVIE). La deuxième entrevue visera à clarifier et à valider le contenu de la première entrevue.

Si vous n'avez pas assisté à la réunion des infirmières expertes du PNMVS (juin 2016), vous serez invité(e) à :

- participer à deux entrevues individuelles en présentiel, par Skype ou par téléphone. La première entrevue visera à dégager les éléments de votre pratique d'accompagnement aux antirétroviraux qui pourraient être améliorés par la formation en ligne et à dégager les connaissances qui doivent être adaptées, issues de l'intervention infirmière (comme VIH-TAVIE). La deuxième entrevue visera à approfondir, à clarifier et à valider le contenu de la première entrevue.

Pour faciliter la collecte et l'analyse de données lors des rencontres, des entrevues et/ou des groupes de discussion et avec votre consentement, toutes les conversations seront enregistrées sur support audionumérique et l'étudiante-chercheuse prendra des notes dans un journal de bord. L'enregistreuse pourra être arrêtée à tout moment. L'étudiante-chercheuse prendra alors les réponses en notes. Vous n'êtes pas tenu(e) de répondre à toutes les questions.

Des exemples de questions qui pourraient vous être posées sont : Est-ce qu'il y a des connaissances ou des outils que vous souhaiteriez avoir via cette formation en ligne ? Y-a-t-il des situations dans lesquelles vous avez éprouvé des difficultés à soutenir vos patients dans la prise de leurs médicaments? Qu'est-ce qui est facilitant dans votre pratique quand vous aidez vos patients à prendre ses médicaments ? Au tout début de votre pratique auprès de la clientèle VIH, qu'est-ce qui vous a aidé(e) ou qu'est-ce qui aurait pu vous aider à vous sentir confiant(e) dans votre capacité à soutenir la clientèle dans la prise des médicaments ?

RISQUES ET INCONVÉNIENTS

Il n'y a aucun risque connu à participer à cette étude. Par contre, votre participation à cette recherche pourrait vous occasionner certains inconvénients liés aux émotions suscitées par la description de votre expérience. Advenant le cas où vous auriez besoin de soutien, nous pourrons vous orienter vers une ressource capable de vous aider. De plus, le temps nécessaire pour répondre aux questions (durant les entrevues et/ou le groupe de discussion) peut représenter un inconvénient pour certain(e)s participant(e)s et susciter un questionnement ou un stress. Vous pouvez cesser les entrevues à tout moment. L'étudiante-chercheuse vous offrira de poursuivre l'entrevue à un autre moment si vous le désirez.

AVANTAGES

Il se peut que vous retiriez un bénéfice personnel de votre participation à ce projet de recherche, mais on ne peut vous l'assurer. À tout le moins, les résultats obtenus contribueront à l'avancement des connaissances dans ce domaine.

CONFIDENTIALITÉ

Durant votre participation à ce projet, l'étudiante-chercheuse recueillera et consignera dans un dossier de recherche les renseignements vous concernant. Seuls les renseignements nécessaires pour répondre aux objectifs scientifiques de ce projet seront recueillis.

Ces renseignements peuvent comprendre les informations concernant votre lieu de pratique, vos rôles comme infirmière et infirmier qui accompagnent les personnes vivant avec le VIH dans la prise de leurs médicaments. D'autres renseignements tels que votre nom, votre sexe de même que le nombre d'années de pratique dans le domaine du VIH vous seront demandés.

Tous les renseignements recueillis demeureront strictement confidentiels dans les limites prévues par la loi. Afin de préserver votre identité et la confidentialité des renseignements, vous ne serez identifié(e) que par un numéro de code. La clé du code reliant votre nom à votre dossier de recherche sera conservée par la chercheuse responsable et l'étudiante-chercheuse.

L'étudiante-chercheuse fera parvenir à l'organisme subventionnaire ou à ses représentants les données vous concernant. Ces données n'incluent pas votre nom ni votre adresse. L'organisme subventionnaire utilisera les données à des fins de recherche dans le but de répondre aux objectifs scientifiques du projet décrits dans le formulaire d'information et de consentement.

Les données en elles-mêmes ou combinées aux données provenant d'autres projets pourront être partagées avec les organismes réglementaires canadiens ou d'autres pays ou avec les partenaires commerciaux de l'organisme subventionnaire. Ce transfert d'information implique que vos données pourraient être transmises dans d'autres pays que le Canada. Cependant, l'organisme subventionnaire respectera les règles de confidentialité en vigueur au Québec et au Canada, et ce, dans tous les pays. Ces données seront conservées pendant sept ans après la fin de l'étude par la chercheuse responsable, l'étudiante-chercheuse et l'organisme subventionnaire.

Les données pourraient aussi servir pour d'autres analyses de données reliées au projet ou pour l'élaboration de projets de recherches futurs.

Les données pourront être publiées dans des revues spécialisées ou faire l'objet de discussions scientifiques, mais il ne sera pas possible de vous identifier.

À des fins de surveillance et de contrôle, votre dossier de recherche ainsi que vos dossiers médicaux pourront être consultés par une personne mandatée par le comité d'éthique de la recherche du CHUM ou par l'établissement, par une personne mandatée par des organismes publics autorisés ainsi que par des représentants de l'organisme subventionnaire. Toutes ces personnes et ces organismes adhèrent à une politique de confidentialité.

À des fins de protection, notamment afin de pouvoir communiquer avec vous rapidement, vos noms et prénoms, vos coordonnées et la date de début et de fin de votre participation au projet seront conservés pendant un an après la fin du projet dans un répertoire à part, maintenu par la chercheuse responsable et l'étudiante-chercheuse.

Vous avez le droit de consulter votre dossier de recherche pour vérifier les renseignements recueillis et les faire rectifier au besoin, et ce, aussi longtemps que la chercheuse responsable du projet, l'étudiante-chercheuse ou l'établissement détiennent ces informations. Cependant, afin de préserver l'intégrité scientifique du projet, vous pourriez n'avoir accès à certaines de ces informations qu'une fois votre participation terminée.

COMMUNICATION DES RÉSULTATS GÉNÉRAUX

Vous connaîtrez les résultats généraux de cette première phase de développement du contenu de la formation en ligne via un courriel. Les résultats de cette première phase de développement pourraient également être communiqués dans un article scientifique et dans des présentations scientifiques et/ou professionnelles. Les résultats pourront être mis à votre disposition sur demande. La demande devra être faite par écrit auprès de la chercheuse responsable ou de l'étudiante-chercheuse.

FINANCEMENT DU PROJET

L'étudiante-chercheuse et l'établissement ont reçu un financement des Instituts de recherche en santé du Canada (IRSC) pour mener à bien ce projet de recherche.

COMPENSATION

Vous ne recevrez aucune compensation monétaire pour votre participation à ce projet de recherche.

INDEMNISATION EN CAS DE PRÉJUDICE ET DROITS DU(DE LA) PARTICIPANT(E) À LA RECHERCHE

Si vous deviez subir quelque préjudice que ce soit par suite de toute procédure reliée à l'étude, vous recevrez tous les soins et services requis par votre état de santé, sans frais de votre part.

En acceptant de participer à ce projet, vous ne renoncez à aucun de vos droits ni ne libérez les chercheuses, l'organisme subventionnaire ou l'établissement de leur responsabilité civile et professionnelle.

PARTICIPATION VOLONTAIRE ET POSSIBILITÉS DE RETRAIT

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision à la chercheuse responsable du projet ou à l'étudiante-chercheuse.

Votre décision de ne pas participer à ce projet de recherche ou de vous en retirer n'aura aucune conséquence sur vos relations avec vos supérieurs ni sur votre employabilité ou sur vos relations avec les chercheuses et les autres intervenants.

La chercheuse responsable du projet de recherche, l'étudiante-chercheuse, le comité d'éthique de la recherche du CHUM ou l'organisme subventionnaire peuvent mettre fin à votre participation, sans votre consentement, si de nouvelles découvertes ou informations indiquent que votre participation au projet n'est plus dans votre intérêt, si vous ne respectez pas les consignes du projet de recherche ou s'il existe des raisons administratives d'abandonner le projet.

Si vous vous retirez ou êtes retiré(e) du projet, l'information déjà obtenue dans le cadre de ce projet (via les enregistrements et les notes prises par l'étudiante-chercheuse) sera conservée aussi longtemps que nécessaire pour rencontrer les exigences réglementaires.

Toute nouvelle connaissance acquise durant le déroulement du projet qui pourrait affecter votre décision de continuer d'y participer vous sera communiquée sans délai verbalement et par écrit.

PERSONNES-RESSOURCES

Si vous avez des questions concernant le projet de recherche ou si vous éprouvez un problème que vous croyez reliés à votre participation au projet de recherche, vous pouvez communiquer avec madame José Côté, chercheuse responsable du projet, ou avec l'étudiante-chercheuse aux coordonnées suivantes :

- José Côté, 514-890-8000 poste 15536, jose.cote@umontreal.ca
- Geneviève Rouleau, 514-890-8000 poste 12744, genevieve.rouleau.chum@ssss.gouv.qc.ca (entre 8h00 et 16h00 du lundi au vendredi)

Pour toute question concernant vos droits en tant que participant(e) à ce projet de recherche ou si vous avez des plaintes ou des commentaires à formuler vous pouvez communiquer avec le commissaire local aux plaintes et à la qualité des services de l'Hôpital St-Luc du CHUM au numéro 514- 890-8000, poste 36366.

SURVEILLANCE DES ASPECTS ÉTHIQUES

Le comité d'éthique de la recherche du CHUM a approuvé ce projet de recherche et en assure le suivi. De plus, il approuvera au préalable toute révision et toute modification apportée au formulaire d'information et de consentement et au protocole de recherche.

CONSENTEMENT

Avant de signer et dater le présent formulaire de consentement, j'ai reçu des explications complètes sur les méthodes et les moyens qui seront utilisés dans ce projet de recherche ainsi que sur les désagréments et les risques qui pourraient y être associés.

J'ai lu et j'ai eu suffisamment de temps pour comprendre pleinement les renseignements présentés ci-dessus concernant cette étude. J'ai eu l'occasion de poser toutes mes questions et on y a répondu à ma satisfaction. Je suis libre de poser d'autres questions à n'importe quel moment. J'accepte de plein gré de signer ce formulaire de consentement. Je recevrai un exemplaire de ce formulaire après l'avoir signé et daté.

En apposant ma signature sur ce formulaire, je ne renonce cependant à aucun de mes droits légaux ni ne libère les chercheuses, l'hôpital et l'organisme subventionnaire de leur responsabilité civile et professionnelle.

Nom et signature du(de la) participant(e) à la recherche Date

Je consens à ce que la chercheuse responsable du projet et/ou l'étudiante-chercheuse me contacte pour me donner des informations sur ma participation potentielle au comité de travail, qui portera exclusivement sur l'objet de la recherche, soit le développement et la validation du contenu de la formation en ligne.

Non/Oui

Signature de la personne qui a obtenu le consentement, si différente de la chercheuse responsable.

Je, soussignée, ai expliqué de façon complète les détails de cette étude au/à la participant(e) dont le nom apparaît ci-dessus et j'ai répondu aux questions qu'il/elle m'a posées.

Nom et signature de la personne qui obtient le consentement Date

Engagement de la chercheuse

Je certifie qu'on a expliqué au(à la) participant(e) à la recherche les termes du présent formulaire d'information et de consentement, que l'on a répondu aux questions que le(la) participant(e) à la recherche avait à cet égard et qu'on lui a clairement indiqué qu'il(elle) demeure libre de mettre un terme à sa participation.

Je m'engage, avec l'équipe de recherche, à respecter ce qui a été convenu au formulaire d'information et de consentement et à en remettre une copie signée et datée au(à la) participant(e) à la recherche.

Nom et signature de la chercheuse responsable du projet de recherche Date

Annexe C. Lettre d'information pour inviter les infirmières du CHUM à participer aux entrevues de l'étude qualitative exploratoire.

Objet : Invitation infirmières et infirmiers du CHUM à participer au projet de recherche « Développement et implantation d'une formation en ligne aux infirmières qui accompagnent les personnes vivant avec le VIH dans la prise des antirétroviraux »

Bonjour chères infirmières et chers infirmiers du CHUM,

Vous qui travaillez de près ou de loin avec les personnes vivant (PVVIH) avec le VIH.

Je me nomme Geneviève Rouleau, je suis infirmière coordonnatrice de recherche au centre de recherche du CHUM et je travaille en recherche en sciences infirmières depuis neuf ans auprès des PVVIH. Je suis actuellement candidate au doctorat en sciences infirmières à l'Université Laval sous la direction de Marie-Pierre Gagnon et de José Côté. Le but de mon projet de recherche, qui a reçu le financement des Instituts de recherche en santé du Canada (IRSC, #354828), est de développer et d'évaluer l'implantation d'une formation en ligne destinée aux infirmières et infirmiers pour les soutenir dans leur pratique d'accompagnement à la prise des antirétroviraux auprès de leur clientèle. Je suis intéressée à vous entendre sur les éléments de votre pratique infirmière qui pourraient être améliorés et/ou transposés dans une formation en ligne. Je suis également intéressée à adapter des connaissances issues d'une intervention infirmière qui a été évaluée en présentiel (Pilar Ramirez-Garcia & José Côté) et en modalité virtuelle (VIH-TAVIE, José Côté et son équipe). Il serait intéressant de voir comment on peut modeler ces connaissances pour les appliquer et les rendre accessibles aux infirmières et infirmiers.

Votre expérience d'infirmière et d'infirmier est une source riche de connaissances. Ainsi, j'aimerais beaucoup avoir l'occasion de m'entretenir avec vous, par l'entremise de deux entrevues individuelles[19] (en face à face, sur skype ou par téléphone) d'une durée moyenne de 30 à 45 minutes. Le contenu de ces échanges sera enregistré sur bande audio, avec votre consentement. Votre participation est bien entendu volontaire et confidentielle.

Je suis convaincue que cette formation en ligne aurait avantage à être basée sur les meilleures connaissances qui existent : des connaissances scientifiques, théoriques, mais aussi, expérientielles. Je crois que l'une des clés pour faciliter le succès de l'intégration et de l'implantation de nouvelles idées et de nouveaux projets de recherche dans les milieux cliniques est de renforcer la collaboration et de créer des espaces de discussion entre nous toutes et tous qui avons le même objectif : offrir des soins de qualité à nos patient(e)s.

[19] Le plan initial était de conduire deux entrevues : la deuxième aurait servi principalement à approfondir et à valider le contenu de la première. Finalement, pour des raisons de temps et de recrutement, nous nous sommes concentrées sur une seule entrevue.

N’hésitez pas à communiquer avec moi si vous avez des questions/commentaires et si vous souhaitez prendre part au développement de cette formation en ligne. **Je me permettrais de vous écrire un courriel de relance après sept jours ouvrables si je n’ai pas eu de retour de votre part suite à la première invitation.**

Votre collaboration est précieuse pour la réalisation de cette recherche et je vous remercie à l’avance votre participation.

Je vous prie d’accepter mes cordiales salutations.

Geneviève Rouleau, inf., Ph. D.(c)
Étudiante-chercheuse, Centre de recherche du Centre hospitalier de l’Université de Montréal (CRCHUM)
Candidate au doctorat, Faculté des sciences infirmières, Université Laval
Téléphone : 514-890-8000 poste 12744
Adresse électronique : genevieve.rouleau.chum@ssss.gouv.qc.ca

José Côté, inf., Ph. D., chercheuse régulière au centre de recherche du CHUM
CRCHUM, pavillon St-Antoine, 850 rue St-Denis
Montréal (Québec), H2X 0A9
Adresse électronique : jose.cote@umontreal.ca

Annexe D. Questionnaire sociodémographique dispensé aux infirmières de l'étude qualitative exploratoire

1. À quel groupe d'âge appartenez-vous ?

- ☐ Moins de 25 ans
- ☐ 25 à 34 ans
- ☐ 35 à 44 ans
- ☐ 45 à 54 ans
- ☐ 55 à 64 ans
- ☐ 65 ans et plus
- ☐ Je préfère ne pas répondre

2. Vous êtes…

- ☐ Une femme
- ☐ Un homme
- ☐ Je préfère ne pas répondre

3. Quel est votre niveau de formation complété ?

- ☐ Diplôme d'études collégiales en soins infirmiers
- ☐ Diplôme d'études collégiales autre que soins infirmiers et précisez : _____
- ☐ Baccalauréat en sciences infirmières
- ☐ Baccalauréat dans une autre discipline/domaine et précisez : _____
- ☐ Maîtrise en sciences infirmières
- ☐ Maîtrise dans une autre discipline/domaine et précisez : _____
- ☐ Doctorat en sciences infirmières
- ☐ Doctorat dans une autre discipline/domaine et précisez : _____

4. Quel est votre statut d'emploi ?

- ☐ Travail à plein temps
- ☐ Travail à temps partiel
- ☐ Études à plein temps, précisez votre domaine d'études : _____
- ☐ Études à temps partiel, précisez votre domaine d'études : _____

5. Quel est votre titre d'emploi ?

- ☐ Infirmier/infirmière-chef
- ☐ Assistant(e) infirmier/infirmière-chef
- ☐ Infirmier/Infirmière clinicien(ne)
- ☐ Infirmier/infirmière de recherche
- ☐ Autre : Précisez

6. Combien d'années d'expérience avez-vous auprès des personnes vivant avec le VIH ?

_____

7. Depuis combien de temps exercez-vous la profession d'infirmière ?

_____

Annexe E. Courriel d'information envoyé aux membres du PNMVH pour les inviter à participer à l'étude mixte

Objet. Formation en ligne accréditée : Renforcer vos habiletés de communication avec le patient virtuel

À vous, infirmières et infirmiers du Québec,

Vous êtes à la recherche d'opportunités de formation continue ? Participez à cette recherche et **obtenez trois heures de formation accréditée** !

Il s'agit d'une **simulation numérique gratuite** dans laquelle vous pourrez appliquer vos habiletés de communication auprès de monsieur Desbiens, un homme vivant avec le VIH qui éprouve des difficultés avec la prise de son traitement antirétroviral.

Pour participer, vous devez satisfaire ces critères :

- Être infirmière ou infirmier âgé(e) de 18 ans et plus détenant un permis de pratique valide de l'OIIQ ;
- Être intéressé(e) par cette pratique d'accompagnement des personnes qui prennent un traitement antirétroviral.

Pour participer au projet, consultez ce lien :

- Hyperlien

Pour plus d'informations :

- Consulter le lien suivant : [hyperlien de l'étude]
- Communiquer par courriel ou par téléphone avec l'étudiante-chercheuse.

Je vous encourage également à relayer l'information à vos collègues.

Je vous remercie de votre attention.

Geneviève Rouleau, inf., MSc, Ph. D(c), étudiante-chercheuse
Faculté des sciences infirmières, Université Laval
Courriel : genevieve.rouleau.chum@ssss.gouv.qc.ca
Téléphone : 438-392-1857 ou 514-890-8000 poste 12744

Annexe F. Bannière Web diffusée aux infirmières membres de l'OIIQ

Annexe G. Informations sur l'étude mixte diffusées sur le site Web de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers

Description

Qu'est-ce que la simulation numérique ?

Il s'agit d'une formation en ligne qui permet de reproduire une consultation entre une infirmière et un patient. La simulation permet donc de communiquer avec le patient virtuel à l'aide d'une sélection de dialogues, tout en observant ses réactions. La simulation est un environnement sécuritaire pour apprendre de ses erreurs et maximiser ses bons coups. Le contenu de cette simulation est basé sur **l'entretien motivationnel**.

Quelle est la situation clinique adressée dans la simulation numérique ?

La simulation numérique adresse spécifiquement l'histoire de monsieur Desbiens, un homme vivant avec le VIH, qui éprouve des difficultés à prendre son traitement antirétroviral.

Pourquoi adresser une situation de non-adhésion au traitement ?

Les infirmières rencontrent fréquemment ces situations dans leur pratique. Accompagner un patient qui ne prend pas ses médicaments tels que prescrits est source d'inconfort pour certaines infirmières. Certaines se sentent impuissantes devant une telle situation : elles se demandent ce qu'elles peuvent faire pour motiver le patient. Elles iront même jusqu'à remettre en question leurs propres interventions.

Cette simulation vise à renforcer les habiletés de communication des infirmières pour mieux intervenir.

Dois-je être expert(e) du VIH et des traitements antirétroviraux pour participer à la simulation numérique ?

Non, pas du tout. Cette simulation ne vise pas à tester vos connaissances sur le VIH et les traitements antirétroviraux. La situation clinique interpelle les habiletés de communication et contient des pièges relationnels qui nous guettent, comme infirmières, lorsque nous intervenons auprès de la clientèle.

Comment fonctionne la simulation numérique ?

Vous, infirmières et infirmiers, aurez à choisir les interventions (via des quiz) qui favorisent une ouverture sur la communication avec monsieur Desbiens. Des « pièges » ont été glissés tout au long de la consultation, lesquels ont tendance à fermer le dialogue avec le patient, ce qui peut affecter la relation thérapeutique. Chacune des bonnes et des mauvaises réponses est accompagnée d'une rétroaction constructive, dans l'objectif d'améliorer et/ou de renforcer ses interventions infirmières.

Vous êtes intéressé(e)s à essayer ce nouveau mode de formation et à obtenir des heures de formation accréditée ? Consultez la section Projet de recherche.

Équipe

Cette simulation numérique est le fruit du projet doctoral de Geneviève Rouleau, infirmière, candidate au doctorat à la Faculté des sciences infirmières (FSI) de l'Université Laval. Elle est dirigée par Marie-Pierre Gagnon, professeure titulaire à la FSI de l'Université Laval et titulaire de la Chaire de recherche du Canada en technologies et pratiques en santé, et codirigée par José Côté, professeure titulaire à la FSI de l'Université de Montréal et titulaire de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers.

Dans cette courte vidéo, Geneviève Rouleau discute des différentes étapes de la création du simulateur numérique. https://youtu.be/KBWuXD7h1VQ

Équipe du projet

- Conceptrice principale du contenu clinique : Rouleau G.
- Coconcepteur principal du contenu clinique : Pelletier J.
- Concepteur graphique et informatique : SimForHealth
- Cochercheuses : Gagnon M.-P., Côté J., Richard L.
- Collaborateurs : Lévesque R., Martel-Laferrière V., Monteith K., Morin H., de Kiewit A.
- Organismes partenaires : Programme National de Mentorat sur le VIH et les Hépatites (PNMVH), Coalition des organismes communautaires québécois de lutte contre le sida (COCQ-SIDA)

Projet de recherche

Votre participation impliquera environ trois heures de votre temps, en échange de trois heures de formation accréditée !

Pour ce faire, vous aurez à :

- Confirmer si vous êtes éligible à participer : (*Lien du questionnaire en ligne via la plateforme LimeSurvey*)
- Lire le formulaire d'information et de consentement, et consentir à participer
- Remplir un court questionnaire sociodémographique
- Consulter la simulation numérique
- Remplir un questionnaire en ligne
- Participer à un groupe de discussion entre infirmières (facultatif)

Organismes subventionnaires (bourses doctorales et financements de recherche)

- Réseau de recherche en interventions en sciences infirmières du Québec (RRISIQ)
- Fonds de recherche du Québec-santé/Unité de Soutien-SRAP du Québec
- Instituts de recherche en santé du Canada (IRSC)
- Ministère de l'Éducation et de l'Enseignement supérieur

Annexe H. Dépliants d'information utilisés pour le recrutement des infirmières dans l'étude mixte

Une recherche visant à recueillir vos perceptions et commentaires suite à votre participation au **simulateur numérique *COMMENCERA BIENTÔT !***

Votre participation vous donnera **3 heures de formation accréditée** par la Faculté des sciences infirmières de l'Université de Montréal.

QUI PEUT PARTICIPER À CETTE RECHERCHE ?

Tout(e) infirmier(ère) ...

- Intéressé(e) à la pratique infirmière d'accompagnement à la prise des antirétroviraux.
- Âgé(e) de 18 ans et plus.
- Capable de lire et de comprendre le français.
- Confortable à naviguer sur le Web.

QU'EST-CE QUE LA PARTICIPATION À CETTE RECHERCHE IMPLIQUE ?

- Compléter 2 questionnaires en ligne (25 minutes).
- Consulter le simulateur en ligne et interagir avec M.Desbiens, le patient virtuel (entre 60-120 minutes).
- Participer, sur une base volontaire, à un groupe de discussion en ligne (60-75 minutes).

La participation à l'étude est confidentielle.

Passez le mot à vos collègues infirmiers(ères) !

POUR PLUS D'INFORMATIONS :

Communiquez avec **Geneviève Rouleau**
514-890-8000, poste 12744
genevieve.rouleau.chum@ssss.gouv.qc.ca

Annexe I. Critère d'éligibilité présenté dans LimeSurvey

Bonjour et bienvenue !

Si vous êtes arrivé(e) sur cette page, c'est que vous avez obtenu l'information sur le projet de recherche visant à évaluer une simulation numérique. Cette simulation s'adresse aux infirmières qui s'intéressent à la pratique d'accompagnement des personnes vivant avec le VIH qui prennent un traitement antirétroviral.

Comme nous visons à recruter exclusivement des infirmières, nous vous demandons de bien vouloir répondre à une seule question, en cliquant sur le bouton "Suivant".

Cette question vise à établir votre éligibilité à participer à ce projet de recherche.

Partie A: Etre infirmière et avoir un permis de pratique

Détenez-vous un permis de pratique valide de l'OIIQ ?

Merci d'avoir répondu à cette question. Cependant, comme vous ne possédez pas de permis de pratique de l'OIIQ, vous ne pourrez pas participer à cette étude. Veuillez svp fermer cet onglet de votre navigateur web.

Si toutefois vous avez un intérêt pour connaître les résultats de cette étude et les prochaines étapes de cette recherche, veuillez contacter Geneviève Rouleau, infirmière, étudiante-chercheuse à l'adresse courriel suivante: genevieve.rouleau.chum@ssss.gouv.qc.ca

A1.

Oui ☐

Non ☐

Partie B: Vous êtes éligible !

Veuillez svp cliquer sur le lien ci-dessous pour prendre connaissance du formulaire d'information et de consentement (FIC) et pour accéder au questionnaire sociodémographique.

Merci!

Lien vers le FIC et le questionnaire

! Merci de NE PAS CLIQUER sur le bouton "Envoyer".

Merci beaucoup!

Annexe J. Formulaire d'information et de consentement - composante quantitative de l'étude mixte

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

Titre du projet :	Développement et évaluation d'une simulation numérique destinée aux infirmières qui accompagnent les personnes vivant avec le VIH dans la prise des antirétroviraux
Chercheuse responsable au CHUM (codirectrice):	José Côté, inf., Ph. D., titulaire de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers, professeure titulaire, Université de Montréal, chercheuse régulière au Centre de recherche du CHUM (CRCHUM)
Étudiante-chercheuse :	Geneviève Rouleau, inf., Ph. D.(c), candidate au doctorat, Université Laval
Chercheuse responsable à l'Université Laval (directrice) :	Marie-Pierre Gagnon, professeure titulaire à l'Université Laval, chercheuse régulière au centre de recherche du CHU de Québec
Chercheuse membre du comité d'encadrement de la thèse :	Lauralie Richard, chercheuse, Département de Pratique Générale et Santé Rurale, École de médecine de Dunedin; Nouvelle-Zélande; professeure associée, FSI, Université de Montréal
Collaborateurs :	Jérôme Pelletier, étudiant au doctorat, FSI, Université Laval; Professeur, Université du Québec à Rimouski Sylvie Dubois, inf., Ph. D., directrice nationale des soins infirmiers et autres professionnels au ministère de la Santé et des Services sociaux du Québec (MSSS) Renée Descôteaux, directrice des soins infirmiers et des regroupements clientèles, CHUM Rock Lévesque, infirmier-chef au département de prévention de santé toxicomanie du CHUM Kenneth Monteith, directeur de la Coalition des organismes communautaires québécois de lutte contre le VIH/sida (COCQ-sida)

	Valérie Martel-Laferrière, microbiologiste-infectiologue au CHUM, chercheuse CRCHUM
	Hélène Morin, infirmière à l'Unité hospitalière de recherche, d'enseignement et de soins sur le sida (UHRESS) du CHUM
	Alexandra de Kiewit, patiente-partenaire, Organisme Stella
	Programme national de mentorat sur le VIH et les hépatites, CHUM
Compagnie partenaire :	Interaction Healthcare (SimForHealth Canada)
Organisme subventionnaire :	Instituts de recherche en santé du Canada (IRSC), Réseau de recherche en interventions en sciences infirmières du Québec (RRISIQ)
Identifiant multicentrique :	MP-02-2017-6452
No de projet au CHUM :	18.243

PRÉAMBULE

Nous sollicitons votre participation à un projet de recherche parce que vous êtes une infirmière (*le mot féminin sera utilisé pour alléger le texte*) qui avez un intérêt pour la pratique infirmière d'accompagnement des personnes vivant avec le VIH (PVVIH) dans la prise du traitement antirétroviral (TAR).

Cependant, avant d'accepter de participer à ce projet et de signer ce formulaire d'information et de consentement, veuillez prendre le temps de lire, de comprendre et de considérer attentivement les renseignements qui suivent.

Ce formulaire peut contenir des mots que vous ne comprenez pas. Nous vous invitons à poser toutes les questions que vous jugerez utiles à la chercheuse responsable du projet ou à l'étudiante-chercheuse et à leur demander de vous expliquer tout mot ou renseignement qui n'est pas clair.

NATURE ET OBJECTIFS DU PROJET

Les infirmières sont des acteurs clés dans le domaine des soins et services destinés aux PVVIH. L'une des compétences centrales de ces infirmières vise à initier, évaluer et assurer le suivi du traitement antirétroviral (TAR). Il est démontré que les interventions (ex. : *counseling* individuel ou de groupe) menées par les infirmières ont des effets significatifs pour améliorer l'adhésion des PVVIH au TAR. Malgré l'efficacité documentée de ce rôle infirmier, peu de connaissances ciblent les interventions éducatives destinées directement aux infirmières pour soutenir leurs compétences dans la pratique d'accompagnement de soutien à l'adhésion, dans une perspective de développement professionnel. La grande majorité des études visent plutôt à outiller les patients et non les infirmières. Ce projet poursuit comme but principal de développer et d'évaluer une simulation numérique destinée aux infirmières dans un contexte d'adhésion au TAR.

Trois objectifs découlent de ce but : 1) décrire cette pratique infirmière d'accompagnement à la prise du TAR et comprendre les défis qui l'entourent; 2) développer la simulation numérique; et 3) l'évaluer auprès des infirmières. Votre participation est sollicitée pour répondre au troisième objectif, soit, évaluer la simulation numérique. Les deux premiers objectifs ont déjà été réalisés (et ont reçu préalablement l'approbation éthique).

Nous jugeons essentiel d'obtenir votre point de vue pour documenter dans quelle mesure la simulation numérique vous paraît acceptable, et ce, à plusieurs niveaux : la qualité du contenu, l'utilité perçue, la modalité, les caractéristiques de la simulation (ex : à quel point la situation clinique reflète la réalité ou non), etc.

NOMBRE DE PARTICIPANT(E)S ET DURÉE DE LA PARTICIPATION

Le nombre total d'infirmières et d'infirmiers visé se situe autour de 30. Nous souhaitons recruter entre 5 à 10 participants au CHUM. Puisque l'information sur l'étude sera diffusée à travers le Québec, il n'est pas possible d'estimer le nombre total de participants par milieu de travail.

La durée prévue pour votre participation est variable et dépendra de vos disponibilités et de votre niveau d'engagement au projet. La durée de votre participation pourrait varier de 2 à 3 heures.

Un ou une participante qui participe à la simulation numérique et à la phase quantitative, c'est-à-dire la complétion du questionnaire en ligne post-simulation, verra sa participation se situer autour de 2 heures. À ceci peut s'ajouter une heure supplémentaire pour la participation à la phase qualitative de l'étude (donc trois heures au total) pour participer à un groupe de discussion (sur une base volontaire) pour échanger avec d'autres infirmières sur leur participation à la simulation. La durée totale prévue de l'étude est d'un an.

La participation à cette étude sur vos heures de travail devrait être approuvée par votre supérieur immédiat, faute de quoi votre participation aurait à se faire sur vos heures personnelles hors travail.

NATURE DE LA PARTICIPATION DEMANDÉE ET DÉROULEMENT DU PROJET

Vous trouverez un tableau à même ce formulaire qui décrit plus en détail la nature de votre participation de même que le temps estimé pour chaque étape.

Si vous acceptez de participer à cette phase quantitative de ce projet de recherche et après avoir approuvé le présent formulaire d'information et de consentement en format électronique, vous serez appelé(e) à participer aux activités de recherche suivantes :

- Remplir un court questionnaire sociodémographique en ligne (durée de complétion d'environ 5 minutes) comprenant des questions telles que votre niveau de formation, votre statut d'emploi, vos années d'expérience auprès de la clientèle VIH, etc.

- Consulter la simulation numérique (d'une durée variant entre 60 et 120 minutes), laquelle comprend : des vidéos d'introduction sur la nature du projet et ses objectifs et une situation clinique en quatre étapes qui reproduit la consultation infirmière-patient dans un contexte de prise du TAR. Vous pourrez également consulter des ressources complémentaires (par exemple, le glossaire, le dossier patient).

En fonction de votre progression dans la simulation numérique, vous recevrez trois rappels par courriel pour vous encourager à la compléter.

- Durant la consultation de la simulation numérique, vous agirez à titre d'observateur aux échanges de l'infirmière et du patient de même qu'à titre de participant actif. Vous serez invité(e) à répondre à des *quiz* (lesquels visent, entre autres, à choisir l'intervention à privilégier avec le patient). En fonction de vos réponses aux *quiz*, vous recevrez des rétroactions au fur et à mesure de votre participation et à la toute fin de la simulation numérique.

- La simulation numérique est accessible via un hyperlien qui vous mènera directement à la plateforme sécurisée et confidentielle nommée MedicActiv. Un code vous sera communiqué à la suite de la complétion du questionnaire sociodémographique pour accéder à la simulation numérique et ainsi, pour pouvoir créer votre compte. Les informations requises pour la création de votre compte sont les suivantes : civilité, nom, prénom, courriel, établissement, ville, pays, langue, statut professionnel.

    - Les données (ex : liées à la création de votre compte sur MedicActiv, vos réponses au quiz, les données sur le progrès des utilisateurs) seront hébergées sur les serveurs professionnels de Google Compute Platform à Saint-Ghislain en Belgique (l'un des centres de données de Google en Europe). https://www.google.com/about/datacenters/inside/locations/st-ghislain/

    - Les serveurs sur lesquels sont hébergées les données sont soumis régulièrement à des contrôles indépendants de sécurité, de confidentialité, de conformité pour l'obtention des certifications répondant aux normes internationales appropriées. Ainsi, la protection des données personnelles est l'une des cibles couvertes par ces normes et réglementations. Pour plus d'informations, visitez le : https://cloud.google.com/security/compliance/

- Il vous sera possible de compléter la simulation numérique autant de fois que vous le désirez pendant la durée de l'étude. Sachez toutefois que toutes vos réponses et votre progression seront effacées de la base de données au moment de recommencer la simulation numérique.

- Remplir un questionnaire « post-simulation » en ligne d'une durée prévue de 25 minutes pour recueillir votre perspective sur l'acceptabilité d'une telle approche. Une fois la simulation numérique complétée, un courriel vous sera envoyé par l'étudiante-chercheuse, vous invitant à remplir le questionnaire en ligne via l'hyperlien qui vous mènera à la plateforme LimeSurvey. Au besoin, trois rappels par courriel vous seront envoyés pour vous encourager à compléter la simulation.

    - Les données des questionnaires sociodémographiques et d'acceptabilité/de satisfaction seront hébergées de manière sécuritaire sur des serveurs localisés au Canada. Les

réponses ne seront pas anonymisées, de sorte que nous puissions garder trace de votre participation en vue de l'obtention des heures de formation accréditées.

  - Selon la politique de confidentialité de LimeSurvey, en aucun cas vos données ne seront recueillies dans le but de tirer des conclusions sur vous personnellement. Pour plus d'informations, visitez le : https://www.limesurvey.org/fr/politiques/politique-de-confidentialite.

- Participer au groupe de discussion, sur une base volontaire, sur votre expérience d'apprentissage d'avoir participé à la simulation numérique. Le contenu audio sera d'abord enregistré, ensuite retranscrit, afin de permettre l'analyse qualitative.

Tableau 1. Résumé de la nature de la participation au projet

Quoi et où ?	Activités et actions	Durée estimée	Exemples de données recueillies	Quand ?		
				Pré-étude	Jour 0 et +	Après la complé-tion de la simula-tion numé-rique
0) Critère d'éligibilité pour participer à l'étude	Répondre à une seule question en ligne pour déterminer l'éligibilité à participer au projet de recherche. (Hyperlien LimeSurvey)				Mars 2019 à…	
1) Formulaire d'information et de consentement et collecte de données sociodémographiques via la plateforme LimeSurvey						
1a) À l'endroit de votre choix, sur l'appareil de votre choix (tablette, ordinateur, téléphone intelligent)	1a1) Consentir à l'étude 1a2) Remplir un questionnaire sociodémographique en ligne avec des informations permettant de décrire un portrait global.	10 min.	**Données sociodémographiques :** Titre d'emploi, genre, groupe d'âge, milieu de travail, expérience en VIH et comme infirmière, formation reçue sur l'entretien motivationnel, niveau d'aisance avec la technologie		Mars 2019 à …	
2) Participation à la simulation numérique via la plateforme MedicActiv					X	

2a) À l'endroit de votre choix (ex : de votre milieu de travail, de votre domicile, lieu public, accessible sur Internet à partir d'un ordinateur ou d'une tablette). Note : Si les pares-feux de votre établissement bloquent l'accès au simulateur numérique, contactez Geneviève Rouleau par courriel : genevieve.rouleau.chum@ssss.gouv.qc.ca Un maximum de 3 courriels seront envoyés pour encourager votre participation à la simulation numérique.	2a1) Accéder à la plateforme MedicActiv en consultant d'abord l'hyperlien par Internet et **en créant votre compte :** (*hyperlien*) 2a2) Choisissez l'une des deux manières de consulter le simulateur : 1) Lancer la version en ligne (moins bonne qualité d'image) ; 2) Télécharger l'application à partir d'un ordinateur ou d'une tablette (meilleure qualité d'image). *N.B. L'Internet demeure requis même après l'installation de l'application.* 2a3) Consulter la simulation numérique • Écouter les vidéos d'introduction • Consulter les ressources d'information complémentaires et additionnelles (dossier patient, glossaire) • Consulter les 4 étapes de la simulation numérique	De 60 à 120 minutes	**Informations requises lors de la création du compte :** Civilité (ex. : Monsieur, Madame), nom, prénom, courriel, établissement, ville, pays, langue, statut professionnel **Base de données administrateur de MedicActiv (accessible par l'étudiante-chercheuse) :** Courriel, nombre de personnes ayant terminé la simulation et celles n'ayant pas commencé; moyenne de temps total passé par apprenant pour consulter la simulation.	Consultation illimitée pendant la durée de l'étude (à partir du Jour 0 jusqu'à la complétion du questionnaire post-simulation du dernier participant à l'étude)

3) Évaluation post-simulation via un questionnaire en ligne accessible sur LimeSurvey						X
3a) À l'endroit de votre choix (domicile, travail, centre de recherche), sur l'appareil de votre choix (tablette, ordinateur, téléphone intelligent). Un maximum de 4 courriels seront envoyés pour encourager la complétion du questionnaire.	3a1) Remplir le questionnaire en ligne pour évaluer l'acceptabilité de la simulation numérique.	25 min.	- Qualité : de la simulation numérique, de l'information, des objectifs, du soutien, de l'interface ; - L'intention d'utilisation ; - Plaisir de naviguer ; - Réalisme			
4) Participation à un groupe de discussion en ligne (optionnel) via la plateforme de vidéoconférence Zoom		75 min.				X
4a) À l'endroit de votre choix (domicile, travail, centre de recherche), sur l'appareil de votre choix (tablette, ordinateur, téléphone intelligent ou téléphone). Un maximum de 4 courriels seront envoyés pour encourager la participation au groupe de discussion.	4a1) Remplir le formulaire d'information et de consentement en ligne. 4a2) Rejoindre la réunion de Zoom en cliquant sur l'hyperlien suivant : _____		- Perceptions, expérience de la simulation numérique, éléments aidants			

RISQUES ET INCONVÉNIENTS

En dépit des mesures prises pour assurer la confidentialité, l'intégrité et la sécurité des données transmises en ligne, l'utilisation d'Internet comporte certains risques d'intrusion par des tiers, de manipulations, de pertes de données et d'identification. Veuillez éviter l'utilisation d'une connexion sans fil pour transmettre des données sensibles.

Votre participation à cette recherche pourrait vous occasionner certains inconvénients liés aux émotions possibles suscitées par la consultation de la simulation numérique. Advenant le cas où vous auriez besoin de soutien, nous pourrons vous orienter vers une ressource capable de vous aider. De plus, le temps nécessaire pour participer à l'ensemble de l'étude de même que les manipulations liées à l'usage de la technologie (participer à des questionnaires en ligne, consultation de la simulation numérique) peut susciter un questionnement ou un stress et représenter un inconvénient pour certains participants.

AVANTAGES

Il se peut que vous retiriez un bénéfice personnel de votre participation à ce projet de recherche, mais on ne peut vous l'assurer. À tout le moins, les résultats obtenus contribueront à l'avancement des connaissances dans ce domaine.

CONFIDENTIALITÉ

Durant votre participation à ce projet, l'étudiante-chercheuse recueillera et consignera dans un dossier de recherche les renseignements vous concernant. Seuls les renseignements nécessaires pour répondre aux objectifs scientifiques de ce projet seront recueillis.

Ces renseignements peuvent comprendre les informations concernant votre lieu de pratique, vos rôles comme infirmière et infirmier qui accompagnent les personnes vivant avec le VIH dans la prise de leurs médicaments. D'autres renseignements tels que votre nom, votre sexe de même que le nombre d'années de pratique dans le domaine du VIH vous seront demandés.

Tous les renseignements recueillis demeureront strictement confidentiels dans les limites prévues par la loi. Afin de préserver votre identité et la confidentialité des renseignements, vous ne serez identifié(e) que par un numéro de code (seulement dans la base de données de recherche de l'étudiante-chercheuse, et non durant votre participation à l'étude puisque pour avoir les heures de formation accréditées, la « liste de présences » et donc, votre identité, est requise.) La clé du code reliant votre nom à votre dossier de recherche sera conservée par la chercheuse responsable et l'étudiante-chercheuse.

L'étudiante-chercheuse fera parvenir à l'organisme subventionnaire ou à ses représentants, les données codées vous concernant. Ces données n'incluent pas votre nom ni votre adresse. L'organisme subventionnaire utilisera les données à des fins de recherche dans le but de répondre aux objectifs scientifiques du projet décrits dans le formulaire d'information et de consentement.

Les données en elles-mêmes ou combinées aux données provenant d'autres projets, pourront être partagées avec les organismes réglementaires canadiens ou d'autres pays ou avec les partenaires commerciaux de

l'organisme subventionnaire. Ce transfert d'information implique que vos données pourraient être transmises dans d'autres pays que le Canada. Cependant, l'organisme subventionnaire respectera les règles de confidentialité en vigueur au Québec et au Canada, et ce, dans tous les pays. Ces données seront conservées pendant dix ans après la fin de l'étude par la chercheuse responsable, l'étudiante-chercheuse et l'organisme subventionnaire.

Les données codées pourraient aussi servir pour d'autres analyses de données reliées au projet ou pour l'élaboration de projets de recherches futurs.

Les données pourront être publiées dans des revues spécialisées ou faire l'objet de discussions scientifiques, mais il ne sera pas possible de vous identifier.

À des fins de surveillance et de contrôle, votre dossier de recherche pourra être consulté par une personne mandatée par le comité d'éthique de la recherche du CHUM ou par l'établissement, par une personne mandatée par des organismes publics autorisés ainsi que par des représentants de l'organisme subventionnaire. Toutes ces personnes et ces organismes adhèrent à une politique de confidentialité.

Vous avez le droit de consulter votre dossier de recherche pour vérifier les renseignements recueillis et les faire rectifier au besoin, et ce, aussi longtemps que la chercheuse responsable du projet, l'étudiante-chercheuse ou l'établissement détiennent ces informations. Cependant, afin de préserver l'intégrité scientifique du projet, vous pourriez n'avoir accès à certaines de ces informations qu'une fois votre participation terminée.

COMMUNICATION DES RÉSULTATS GÉNÉRAUX

Les résultats de cette étude seront communiqués dans un article scientifique et dans des présentations scientifiques et/ou professionnelles. Les résultats pourront être mis à votre disposition sur demande. La demande devra être faite par écrit auprès de la chercheuse responsable ou de l'étudiante-chercheuse.

FINANCEMENT DU PROJET

L'étudiante-chercheuse a reçu un financement des IRSC et du RRISIQ pour mener à bien ce projet de recherche.

COMPENSATION

Chaque personne qui aura complété la simulation et le questionnaire post-simulation sera inscrite au tirage au sort et va courir la chance de gagner l'une des trois cartes-cadeaux prépayées d'une valeur de 100$. Vous aurez accès gratuitement à la simulation numérique de même qu'à trois heures de formation accréditée (HFA) par la Faculté des sciences infirmières de l'Université de Montréal. Voici les conditions qui vous permettront d'obtenir vos HFA :

- Avoir complété la simulation numérique à 100 % (et donc, avoir visionné la vidéo d'introduction, avoir passé à travers des 4 étapes de la consultation et avoir lu le glossaire) ;

- Avoir rempli le questionnaire en ligne ;

- Avoir accepté que votre nom et votre signature figurent sur la liste de présences qui sera envoyée à la Faculté des sciences infirmières de l'Université de Montréal pour produire le certificat des HFA.

EN CAS DE PRÉJUDICE

En acceptant de participer à ce projet, vous ne renoncez à aucun de vos droits ni ne libérez les chercheuses, l'organisme subventionnaire ou l'établissement de leur responsabilité civile et professionnelle.

PARTICIPATION VOLONTAIRE ET POSSIBILITÉS DE RETRAIT

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision à la chercheuse responsable du projet ou à l'étudiante-chercheuse.

Votre décision de ne pas participer à ce projet de recherche ou de vous en retirer n'aura aucune conséquence sur vos relations avec vos supérieurs ni sur votre employabilité ou sur vos relations avec les chercheuses et les autres intervenants.

La chercheuse responsable du projet de recherche, l'étudiante-chercheuse, le comité d'éthique de la recherche du CHUM ou l'organisme subventionnaire peuvent mettre fin à votre participation, sans votre consentement, si de nouvelles découvertes ou informations indiquent que votre participation au projet n'est plus dans votre intérêt, si vous ne respectez pas les consignes du projet de recherche ou s'il existe des raisons administratives d'abandonner le projet.

Si vous vous retirez ou êtes retiré(e) du projet, l'information déjà obtenue dans le cadre de ce projet (via les enregistrements et les notes prises par l'étudiante-chercheuse) sera néanmoins conservée, analysée ou utilisée pour assurer l'intégrité du projet.

Toute nouvelle connaissance acquise durant le déroulement du projet qui pourrait avoir un impact sur votre décision de continuer à participer à ce projet vous sera communiquée rapidement.

PERSONNES-RESSOURCES

Si vous avez des questions ou éprouvez des problèmes en lien avec le projet de recherche, ou si vous souhaitez vous en retirer, vous pouvez communiquer avec madame José Côté, chercheuse responsable du projet, ou avec l'étudiante-chercheuse aux coordonnées suivantes :

- José Côté, 514-890-8000 poste 15536, jose.cote@umontreal.ca
- Geneviève Rouleau, 514-890-8000 poste 12744, genevieve.rouleau.chum@ssss.gouv.qc.ca (entre 8h00 et 16h00 du lundi au vendredi).

Pour toute question concernant vos droits en tant que participant(e) à ce projet de recherche ou si vous avez des plaintes ou des commentaires à formuler vous pouvez communiquer avec le commissaire local aux plaintes et à la qualité des services du CHUM au numéro 514-890-8484.

SURVEILLANCE DES ASPECTS ÉTHIQUES

Le comité d'éthique de la recherche du CHUM a approuvé le projet et assurera le suivi du projet pour les établissements du réseau de la santé et des services sociaux du Québec participant.

CONSENTEMENT

J'ai pris connaissance du formulaire d'information et de consentement. On m'a expliqué le projet de recherche et le présent formulaire d'information et de consentement. On a répondu à mes questions et on m'a laissé le temps voulu pour prendre une décision. Après réflexion, je consens à participer à ce projet de recherche aux conditions qui y sont énoncées.

En cliquant sur le bouton « accepter », je ne renonce cependant à aucun de mes droits légaux ni ne libère les chercheuses, l'établissement et l'organisme subventionnaire de leur responsabilité civile et professionnelle.

<u>En cliquant sur le bouton « J'accepte », j'atteste :</u>

- Avoir pris connaissance du formulaire d'information et de consentement ;

- Consentir volontairement et librement à participer à cette phase de ce projet de recherche (remplir les 2 questionnaires en ligne et participer à la simulation numérique) ;

- Consentir à être recontacté(e) par un membre de l'équipe de recherche pour participer à la phase qualitative de ce projet (échanger sur votre expérience d'apprentissage de la simulation numérique avec d'autres infirmières).

[BOUTON J'ACCEPTE]
[BOUTON JE REFUSE]

Désirez-vous une copie électronique du formulaire d'information et de consentement ? [BOUTON OUI] [BOUTON NON] – (*Note : En cliquant sur « Oui », une copie PDF s'ouvre dans Google Docs.)*

En cliquant sur le bouton « J'accepte d'être recontacté(e)», j'atteste :

Consentir à être recontacté(e) par un membre de l'équipe de recherche pour participer à la phase qualitative de ce projet (échanger sur votre expérience d'apprentissage de la simulation numérique avec d'autres infirmières).

[BOUTON J'ACCEPTE D'ÊTRE RECONTACTÉ(E)]
[BOUTON JE REFUSE D'ÊTRE RECONTACTÉ(E)]

Annexe K. Questionnaire sociodémographique dispensé aux infirmières participant à l'étude mixte

1. À quel groupe d'âge appartenez-vous ?

   ☐ Moins de 25 ans
   ☐ 25 à 34 ans
   ☐ 35 à 44 ans
   ☐ 45 à 54 ans
   ☐ 55 à 64 ans
   ☐ 65 ans et plus
   ☐ Je préfère ne pas répondre

2. Vous êtes…

   ☐ Une femme
   ☐ Un homme
   ☐ Je préfère ne pas répondre

3. Quel est votre niveau de formation complété ?

   ☐ Diplôme d'études collégiales en soins infirmiers
   ☐ Diplôme d'études collégiales autre que soins infirmiers et précisez : _____

   ☐ Baccalauréat en sciences infirmières
   ☐ Baccalauréat dans une autre discipline/domaine et précisez : _____

   ☐ Maîtrise en sciences infirmières
   ☐ Maîtrise dans une autre discipline/domaine et précisez : _____

   ☐ Doctorat en sciences infirmières
   ☐ Doctorat dans une autre discipline/domaine et précisez : _____

4. Quel est votre statut d'emploi ?

   ☐ Travail à plein temps
   ☐ Travail à temps partiel
   ☐ Études à plein temps, précisez votre domaine d'études : _____
   ☐ Études à temps partiel, précisez votre domaine d'études : _____

5. Quel est votre ou vos titres d'emploi ?

   ☐ Infirmier/infirmière-chef
   ☐ Assistant(e) infirmier/infirmière-chef
   ☐ Infirmier/Infirmière clinicien(ne)
   ☐ Infirmier/infirmière de recherche
   ☐ Professeur(e)
   ☐ Agent(e) de recherche/assistant(e)/coordonnateur(trice)
   ☐ Chercheur/chercheuse

☐ Autre : Précisez _____

6. Avez-vous participé, en 2016, au premier volet de ce projet, c'est-à-dire de faire partie d'un groupe de discussion lors d'une rencontre entre infirmières du programme de mentorat, ou bien à une entrevue?

☐ Non
☐ Oui
☐ Je ne sais pas

7. Dans quelle région travaillez-vous présentement :

☐ Bas-Saint-Laurent
☐ Saguenay-Lac-Saint-Jean
☐ Québec
☐ Mauricie
☐ Estrie
☐ Montréal
☐ Outaouais
☐ Abitibi-Témiscamingue
☐ Côte-Nord
☐ Nord-du-Québec
☐ Gaspésie-Îles-de-la-Madeleine
☐ Chaudière-Appalaches
☐ Laval
☐ Lanaudière
☐ Laurentides
☐ Montérégie
☐ Centre-du-Québec

8. Depuis combien de temps exercez-vous la profession d'infirmière ?

_____

9. Combien d'années d'expérience avez-vous auprès des personnes vivant avec le VIH ?

_____

Je n'ai pas d'expérience auprès de cette clientèle. ☐ *Passez à la question 10*

10. Si vous ne travaillez pas actuellement avec les PVVIH, quel est votre secteur de pratique et auprès de quel type de clientèle travaillez-vous ?

_____
_____

11. Avez-vous déjà participé à une formation sur l'entretien motivationnel ?

☐ Non, je n'ai pas suivi de formation
☐ Non, je n'ai pas suivi de formation, mais je me suis formé(e) moi-même (autodidacte)
☐ Oui *(Allez à la question 12)*
☐ Je ne sais pas

12. Quelle était cette formation (ou ces formations ?) Veuillez, dans la mesure du possible, fournir les renseignements en lien avec la ou les formations obtenues (nom de l'organisme/personne qui a offert la formation, durée de la formation, nom de la formation)

_____
_____

13. Avez-vous déjà essayé une forme de simulation numérique ? (que ce soit la réalité virtuelle, avec des lunettes/casque ou bien sur votre ordinateur)

- ☐ Non
- ☐ Oui
- ☐ Je ne sais pas

14. Sachant que vous participerez à une recherche qui se déroulera entièrement en ligne (c.-à-d., compléter des questionnaires en ligne, participer à la simulation numérique), à quel point vous sentez-vous confiant d'y arriver ?

- ☐ Je n'ai pas confiance du tout en mes capacités
- ☐ J'ai peu confiance en mes capacités
- ☐ Je suis neutre
- ☐ J'ai confiance en mes capacités
- ☐ J'ai pleinement confiance en mes capacités

15. Sachant que vous participerez à une recherche qui se déroulera entièrement en ligne (c.-à-d., compléter des questionnaires en ligne, participer à la simulation numérique), cochez la réponse qui se rapporte le plus à votre perception de la technologie. « Pour moi, participer à cette recherche qui utilise les technologies est stressant. »

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ Ni en désaccord ni en accord
- ☐ En accord
- ☐ Fortement en accord

Annexe L. Questionnaire post-intervention en ligne administré aux infirmières ayant participé à la composante quantitative de l'étude mixte

Bonjour à vous, infirmières et infirmiers.

Nous vous remercions de prendre le temps de compléter ce questionnaire en ligne, d'une durée prévue entre 15 et 30 minutes.

Les questions suivantes se rapportent aux composantes de la simulation, soit, le contexte du projet, le glossaire, le dossier patient, les quiz, les rétroactions, les étiquettes de même que le niveau de fidélité.

Vous avez à évaluer votre degré de désaccord/d'accord en lien avec chacun des énoncés.

Vos réponses sont essentielles pour nous permettre de comprendre vos impressions et perceptions liées à l'utilisation du simulateur numérique.

Une fois ce questionnaire complété, vous aurez accès à vos trois heures de formation accréditées.

Identification

*En tout temps, vous pouvez « finir plus tard » le questionnaire en appuyant sur « finir plus tard » en haut à droite du questionnaire. Il vous sera demandé de choisir un pseudonyme et un mot de passe.

Identification du participant

Vos prénom et nom de famille sont nécessaires **pour obtenir vos heures de formation accréditées** par la Faculté des sciences infirmières de l'Université de Montréal

Votre courriel (personnel ou professionnel) est aussi requis pour communiquer avec vous et assurer le suivi de votre participation.

Veuillez répondre selon le format suivant :

Nom, Prénom, courriel.

Par exemple : Tremblay, Lucie, lucie.tremblay@email.com

Partie B: 1. Contexte du projet

Le contexte de la simulation numérique a été présenté sous deux formes : l'introduction vidéo (d'une durée de 12 minutes), animée par l'étudiante-chercheuse, de même que l'introduction textuelle, laquelle comprend le texte écrit de la vidéo. La vidéo et le texte portent sur le contexte de la simulation numérique, c'est-à-dire : les origines du projet ; la définition de la simulation numérique ; ses objectifs et son fonctionnement ; les limites d'une telle approche ; et des informations générales sur l'entretien motivationnel.

Les questions qui suivent se rapportent uniquement à ces introductions vidéo et textuelle (lesquelles portent sur le même contenu, mais avec une modalité différente).

B1. L'introduction vidéo animée par l'étudiante-chercheuse était essentielle pour bien comprendre le contexte de la simulation numérique.

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord
- ☐ Non applicable/Je ne l'ai pas consultée ou visionnée

B2. L'introduction textuelle (qui reprend le même contenu que l'introduction vidéo) était essentielle pour bien comprendre le contexte de la simulation numérique.

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord
- ☐ Non applicable/Je ne l'ai pas consultée ou visionnée

B3. Je crois important d'avoir accès aux deux modalités d'informations (texte et vidéo) pour situer le contexte de la simulation numérique.

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord

B4. **Si vous avez des commentaires à ajouter sur le contexte du projet, vous pouvez les inscrire ici.**

B5. **Laquelle des deux est la plus importante pour situer le contexte de la simulation numérique ? Cochez une seule réponse.**

- ☐ Introduction vidéo
- ☐ Introduction textuelle

C1. **Le glossaire a été utile pour soutenir mon apprentissage.**

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord
- ☐ Non applicable/Je ne l'ai pas consulté ou visionné

C2. **Si vous avez des commentaires à ajouter sur le glossaire, vous pouvez les inscrire ici.**

C3. Le glossaire est une ressource essentielle pour fournir des informations complémentaires sur l'ensemble de la consultation infirmière-patient (incluant les quiz et les rétroactions).

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord

C4. Vous avez indiqué ne pas avoir consulté le glossaire. Qu'est-ce qui vous aurait incité à le consulter ? Cochez la ou les réponses :

- ☐ Que la consigne du départ soit plus visible
- ☐ Qu'il y ait des rappels fréquents
- ☐ Qu'une version électronique du glossaire soit envoyée par courriel
- ☐ Qu'il y ait un hyperlien à chaque quiz pour consulter le glossaire
- ☐ Autre

Autre

C5. Le glossaire contenait des termes techniques qui m'étaient difficiles à comprendre.

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord

C6. **J'ai l'intention de consulter le glossaire comme document de référence à l'avenir.**

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord

Partie D: 3. Le dossier patient

Le dossier patient comprend les rubriques suivantes : profil du patient, histoire psychosociale et facteurs de vulnérabilité, habitudes de vie, histoire du VIH, histoire médicamenteuse, notes cliniques, motif de la consultation.

D1. **J'ai reçu suffisamment d'information dans toutes les différentes rubriques du « Dossier patient » pour avoir un portrait de l'ensemble de la situation du patient.**

- ☐ Fortement en désaccord
- ☐ En désaccord
- ☐ En accord
- ☐ Fortement en accord
- ☐ Non applicable/Je n'ai pas consulté le dossier patient

D2. **Quelle est ou quelles sont les rubriques dont les informations contenues étaient insuffisantes ? Cochez toutes les réponses qui s'appliquent et indiquez les informations manquantes :**

- ☐ Profil du patient

Commentaire

- ☐ Histoire psychosociale et facteurs de vulnérabilité

Commentaire

Habitudes de vie ☐

Commentaire

Histoire du VIH ☐

Commentaire

Histoire médicamenteuse ☐

Commentaire

Notes cliniques ☐

Commentaire

Motif de consultation ☐

Commentaire

D3. Vous avez indiqué ne pas avoir consulté le dossier patient. Qu'est-ce qui vous aurait incité à le consulter ? Cochez la ou les réponses :

Que la consigne du départ soit plus visible ☐

Que les rappels soient plus fréquents ☐

Que la consultation du dossier patient soit obligatoire avant de cliquer sur les étapes de la consultation ☐

Autre ☐

D4. **Si vous avez des commentaires à ajouter sur le dossier patient, vous pouvez les inscrire ici.**

Partie E: 4. Quiz, rétroactions et étiquettes

Tout au long de l'entretien avec le patient virtuel, vous avez participé à des quiz (questions). Ensuite, des rétroactions écrites (feedback) vous ont été offertes en fonction de vos réponses. À certains moments, des « étiquettes » étaient présentes. Ces "étiquettes" étaient des encadrés verts ou rouges, comportant des mots clés illustrant la nature des interventions de l'infirmière ou du patient.

Les questions qui suivent réfèrent à l'usage des quiz, des rétroactions et des étiquettes.

E1.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
Les quiz demandaient un certain temps de réflexion avant de choisir une ou des réponses	☐	☐	☐	☐
Je me suis reconnu(e) dans certains choix de réponses contenus dans les quiz	☐	☐	☐	☐
Les quiz ont suscité une réflexion sur ma pratique infirmière	☐	☐	☐	☐
Le nombre de quiz était suffisant	☐	☐	☐	☐
Les rétroactions (feedback) m'ont permis de faire des liens entre la situation simulée et les éléments théoriques de l'entretien motivationnel	☐	☐	☐	☐
Les rétroactions (feedback) ont été offertes en temps opportun (au fur et à mesure de l'avancement de l'entretien)	☐	☐	☐	☐
Les rétroactions (feedback) accessibles immédiatement suite au quiz ont perturbé mon apprentissage	☐	☐	☐	☐
J'aurais préféré avoir les rétroactions (feedback) à la fin de l'entretien	☐	☐	☐	☐
J'aurais souhaité avoir la possibilité de choisir la modalité des rétroactions (feedback) : soit audio et/ou par texte	☐	☐	☐	☐
J'ai trouvé que les étiquettes rouges ou vertes à côté des dialogues étaient constructives pour soutenir mon apprentissage	☐	☐	☐	☐
Les étiquettes rouges ou vertes sont essentielles pour qualifier le contenu des dialogues entre l'infirmière et le patient	☐	☐	☐	☐

E2. À mon avis, il y avait:

Trop de quiz ☐

Pas assez de quiz ☐

E3. **Si vous avez des commentaires à ajouter sur les quiz, rétroactions et étiquettes, vous pouvez les inscrire ici.**

Partie F: 5. Fidélité

La fidélité correspond au niveau de réalisme de la simulation numérique. La fidélité réfère à la vraisemblance entre la simulation numérique et une situation de soins réelle.

F1.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
L'histoire du patient virtuel ayant des difficultés à prendre son traitement était réaliste	☐	☐	☐	☐
L'environnement dans lequel se déroulait l'entretien ressemblait au bureau d'une infirmière	☐	☐	☐	☐
L'apparence du patient virtuel ressemblait au profil d'un homme vivant avec le VIH	☐	☐	☐	☐
La simulation numérique a permis de reproduire des interactions réalistes entre une infirmière et un patient	☐	☐	☐	☐

F2. **Si vous avez des commentaires à ajouter sur la fidélité/niveau de réalisme de la simulation numérique, vous pouvez les inscrire ici.**

Partie G: 6. Rôles perçus de la simulation numérique pour soutenir ma pratique professionnelle

Les questions qui suivent se rapportent aux rôles perçus de la simulation numérique pour soutenir votre pratique professionnelle dans deux contextes de prise de médicaments: 1) auprès de personnes vivant avec le VIH (PVVIH) et 2) auprès d'autres clientèles.

Veuillez indiquer votre degré de désaccord/d'accord sur une échelle allant de fortement en désaccord à fortement en accord. Cliquez sur "non-applicable"(je ne travaille pas auprès des PVVIH ou je travaille exclusivement auprès des PVVIH) lorsque l'énoncé ne correspond pas à votre situation.

G1.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord	Non applicable (Je ne travaille pas auprès des PVVIH)
La simulation numérique m'a permis de réfléchir à ma pratique infirmière dans un contexte global de soins offerts aux PVVIH.	☐	☐	☐	☐	☐
La simulation numérique m'a permis de réfléchir à ma pratique infirmière dans un contexte de soutien à la prise du traitement antirétroviral.	☐	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer mes habiletés de communication auprès des PVVIH.	☐	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer la santé des PVVIH.	☐	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer la qualité de la relation thérapeutique avec les PVVIH.	☐	☐	☐	☐	☐
Je me sens capable d'appliquer les habiletés de communication vues dans la simulation numérique auprès des PVVIH.	☐	☐	☐	☐	☐
En ayant participé à la simulation numérique, je me sens plus confiant(e) de pouvoir faire face à des situations comparables auprès d'autres PVVIH.	☐	☐	☐	☐	☐

G2.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord	Non applicable (Je travaille exclusivement avec les PVVIH)
La simulation numérique m'a permis de réfléchir globalement à ma pratique infirmière et pas seulement auprès des PVVIH.	☐	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer mes habiletés de communication auprès d'autres clientèles que les PVVIH.	☐	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer la santé d'autres clientèles que les PVVIH.	☐	☐	☐	☐	☐

L'intégration des enseignements assistés par la simulation numérique me permettra d'améliorer la qualité de la relation thérapeutique avec d'autres clientèles que les PVVIH.	☐ ☐ ☐ ☐ ☐
Je me sens capable d'appliquer les habiletés de communication vues dans la simulation numérique auprès d'autres clientèles que les PVVIH.	☐ ☐ ☐ ☐ ☐
En ayant participé à la simulation numérique, je me sens plus confiant(e) de pouvoir faire face à des situations comparables auprès de clientèles autres que les PVVIH.	☐ ☐ ☐ ☐ ☐

G3.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord	Non applicable/Je n'ai pas fait d'erreurs
J'ai appris des erreurs que j'ai faites lors de ma participation à la simulation numérique.	☐	☐	☐	☐	☐

G4.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
À la suite de ma participation à la simulation numérique, j'ai repéré certains aspects de ma pratique professionnelle que je pourrais améliorer.	☐	☐	☐	☐
Je n'ai rien appris de nouveau en participant à cette simulation numérique.	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra d'augmenter l'usage du discours-changement.	☐	☐	☐	☐
L'intégration des enseignements assistés par la simulation numérique me permettra de diminuer l'usage du discours-maintien.	☐	☐	☐	☐
La simulation numérique m'a permis de prendre conscience des éléments qui peuvent faciliter la relation thérapeutique avec le patient.	☐	☐	☐	☐
La simulation numérique m'a permis de prendre conscience des « pièges » qui peuvent rendre difficile la relation thérapeutique avec le patient.	☐	☐	☐	☐
Ma participation à des enseignements assistés par la simulation numérique m'a aidé(e) à comprendre comment les notions théoriques (issues de l'entretien motivationnel) pouvaient être appliquées dans ma pratique.	☐	☐	☐	☐
Ma participation à des enseignements assistés par la simulation numérique a été une expérience d'apprentissage utile pour mon développement professionnel continu.	☐	☐	☐	☐

G5. **Si vous souhaitez ajouter un commentaire sur les rôles perçus de la simulation numérique sur votre pratique professionnelle, vous pouvez l'inscrire ici.**

Partie H: 7. Votre perspective sur l'atteinte des objectifs de cette simulation.

Indiquez votre degré de désaccord/d'accord relatif à la mesure dans laquelle votre participation à la simulation numérique a permis d'atteindre les objectifs suivants.

H1.

	Fortement en désaccord	En désaccord	En accord	Fortement en accord	J'avais déjà une bonne maitrise du sujet
Repérer les interventions infirmières qui contiennent des pièges pouvant fermer la communication avec le patient	☐	☐	☐	☐	☐
Repérer les interventions infirmières qui contiennent des pièges pouvant favoriser le statu quo (discours-maintien)	☐	☐	☐	☐	☐
Identifier les interventions infirmières qui favorisent l'ouverture sur le vécu du patient	☐	☐	☐	☐	☐
Choisir les interventions infirmières qui favorisent la communication sur le changement (discours-changement)	☐	☐	☐	☐	☐
Décrire les principes cohérents avec l'entretien motivationnel qui structurent l'enseignement au patient	☐	☐	☐	☐	☐
Cibler les éléments clés importants à inclure dans l'enseignement au patient	☐	☐	☐	☐	☐
Identifier les principes permettant de bâtir un plan d'action avec le patient (en lien avec la prise des médicaments, tout en préservant le secret de sa séropositivité vis-à-vis sa mère.)	☐	☐	☐	☐	☐
Identifier les indices dans le discours du patient qui témoignent d'un discours-changement	☐	☐	☐	☐	☐

H2. **Est-ce que votre participation à cette simulation numérique a permis d'atteindre d'autres objectifs qui n'ont pas été mentionnés ?**

Oui ☐

Non ☐

H3. **Veuillez décrire votre réponse**

H4. **Si vous souhaitez ajouter un commentaire sur l'atteinte des objectifs de cette simulation, vous pouvez l'inscrire ici.**

Partie I: 8. Questionnaire d'acceptabilité

Les questions qui suivent reposent sur votre appréciation de la simulation numérique.

Ceci ne vise pas à vérifier vos connaissances : il n'y a pas de bonne ou de mauvaise réponse. Sur une échelle de "Fortement en désaccord à Fortement en accord", indiquez votre degré de désaccord/d'accord par rapport à chacun des énoncés.

I1. Qualité du système

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
L'utilisation de la simulation numérique m'a permis d'avoir du contrôle sur le déroulement de mon apprentissage	☐	☐	☐	☐
Le contenu de la simulation numérique était présenté adéquatement dans son ensemble	☐	☐	☐	☐
La simulation numérique m'a offert de la flexibilité quant au moment de mon apprentissage	☐	☐	☐	☐
La simulation numérique m'a offert de la flexibilité quant au lieu de mon apprentissage	☐	☐	☐	☐
La simulation numérique était interactive	☐	☐	☐	☐

I2. Qualité de l'information

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
Le contenu de la simulation numérique était novateur	☐	☐	☐	☐
La simulation numérique a répondu à mes besoins d'apprentissage	☐	☐	☐	☐
Le niveau de difficulté du contenu pédagogique de la simulation numérique était approprié	☐	☐	☐	☐

I3. Qualité des services associés à la simulation numérique

	Fortement en désaccord	En désaccord	En accord	Fortement en accord	Non applicable/Je n'ai pas utilisé ces services
J'ai pu obtenir des services de soutien adéquats à l'intérieur même de la simulation numérique pour aider mon apprentissage (ex : guide utilisateur)	☐	☐	☐	☐	☐
J'ai pu obtenir des services de soutien adéquats de la part des administrateurs de la simulation numérique pour les aspects techniques de l'application	☐	☐	☐	☐	☐
Globalement, les services de soutien reliés à la simulation numérique étaient satisfaisants	☐	☐	☐	☐	☐

I4. Qualité de l'interface utilisateur

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
L'interface de la simulation numérique était conviviale	☐	☐	☐	☐
La disposition de la simulation numérique était bien structurée	☐	☐	☐	☐
Globalement, l'interface utilisateur de la simulation numérique était satisfaisante (ex. design général, images 3D, couleurs, étapes de consultation)	☐	☐	☐	☐

I5. Utilité perçue

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
Utiliser la simulation numérique m'a semblé plus efficace qu'un autre type de formation que j'aurais pu recevoir	☐	☐	☐	☐
Utiliser la simulation numérique m'a permis d'être plus performant(e) lors de mes activités d'apprentissage	☐	☐	☐	☐
La simulation numérique a été utile à mon apprentissage	☐	☐	☐	☐

I6. Facilité d'utilisation perçue

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
Utiliser la simulation numérique ne m'a pas demandé trop d'effort mental	☐	☐	☐	☐
J'ai trouvé la simulation numérique facile à utiliser	☐	☐	☐	☐
J'ai rapidement développé de l'aisance à utiliser la simulation	☐	☐	☐	☐

I7. Plaisir d'utilisation perçu

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
J'ai trouvé l'utilisation de la simulation agréable	☐	☐	☐	☐
La navigation dans la simulation numérique était plaisante	☐	☐	☐	☐
J'ai eu un certain plaisir à utiliser la simulation numérique	☐	☐	☐	☐

I8. Intention d'utiliser

	Fortement en désaccord	En désaccord	En accord	Fortement en accord
Je consulterais la simulation numérique sur une base régulière dans le futur si elle était disponible en ligne	☐	☐	☐	☐
J'utiliserais fréquemment la simulation numérique dans ma pratique si elle était disponible en ligne	☐	☐	☐	☐
Je recommanderais que la simulation numérique soit mise à la disposition d'autres infirmières	☐	☐	☐	☐
Je recommanderais que la simulation numérique soit mise à la disposition d'autres professionnels de la santé	☐	☐	☐	☐

Partie J: 9. Questions ouvertes

J1. Quels sont les éléments qui ont le plus suscité votre intérêt ?

J2. Quels sont les éléments que vous avez les moins appréciés ?

J3. Quelles sont les recommandations que vous suggéreriez pour améliorer cette simulation numérique ?

J4. Auriez-vous autre chose à rajouter ? (optionnel)

Partie K: 10. Votre avis sur ce questionnaire

Tout au long du questionnaire, les échelles de réponses étaient formulées ainsi :

Fortement en désaccord- En désaccord – En accord – Fortement en accord.

Aucun choix de réponse ne comportait une valeur « neutre », c'est-à-dire, « Ni en désaccord, Ni en accord. »

Veuillez svp indiquer, pour chaque énoncé, la réponse qui se rapporte le plus à ce que vous ressentez.

K1. Tout au long du questionnaire, sélectionner un choix de réponse sans avoir la possibilité de me positionner de manière « neutre » (ni en désaccord, ni en accord) a été pour moi…

- Très difficile ☐
- Difficile ☐
- Ni difficile ni facile ☐
- Facile ☐
- Très facile ☐

K2. Tout au long du questionnaire, si j'avais eu la possibilité de choisir une option "neutre" (ni en désaccord, ni en accord)...

- Cela aurait fortement changé mes réponses ☐
- Cela aurait légèrement changé mes réponses ☐
- Cela n'aurait fait aucune différence ☐

K3. Du fait que je n'avais pas la possibilité de choisir une option neutre en complétant le questionnaire, je me suis sentie…

- Pleinement forcé(e) de prendre position ☐
- Forcé(e) de prendre position ☐
- Ni forcé(e) ni libre de prendre position (indifférent(e), je ne me suis pas posé de questions à ce niveau) ☐
- Libre de prendre position ☐
- Pleinement libre de prendre position ☐

Partie L: 11. Questions obligatoires pour le processus d'accréditation

L1. **L'activité respectait-elle le Guide éthique de la formation continue* de la Faculté des sciences infirmières de l'Université de Montréal ?**

Cette question est en lien avec le guide éthique de la formation continue de la Faculté des sciences infirmières de l'Université de Montréal.

Pour visualiser le guide, veuillez cliquer sur le lien suivant :

Guide éthique de la formation continue

Ce guide peut être consulté à l'adresse suivante : https://fsi.umontreal.ca/etudes/accreditations/ dans la section "outils".

Oui ☐

Non ☐

L2. **Aviez-vous l'impression qu'il y avait un biais commercial durant l'activité éducative ?**

Oui ☐

Non ☐

Nous vous remercions d'avoir complété ce questionnaire !

Vous recevrez prochainement une invitation par courriel pour participer à un groupe de discussion en ligne (via Zoom ou Skype), si vous avez accepté d'être recontacté(e).

Ce groupe de discussion fait partie intégrante de ce projet de recherche et constitue la dernière étape de participation (qui se fait sur une base volontaire).

Ce groupe de discussion réunira des infirmières et infirmiers ayant participé au simulateur numérique, pour échanger sur leurs expériences respectives.

Annexe M. Courriel envoyé aux infirmières pour les inviter à participer à la composante qualitative de l'étude mixte

Bonjour à vous toutes et tous,

Si vous recevez ce message, c'est que vous êtes infirmière/infirmier et vous avez participé au projet de simulation numérique.

Vous avez également accepté d'être recontacté(e).

Pour terminer le projet, je cherche 4 à 8 personnes qui ont complété la simulation et qui veulent se joindre à un groupe de discussion en ligne (skype, zoom ou autre) pour partager leur expérience sur le projet : vos opinions pour l'améliorer, pour en faciliter l'usage, ce que vous avez aimé, moins aimé.

La durée sera de 75 minutes et chacun recevra une carte prépayée de 50 $ pour sa participation.

Vous êtes intéressé(e) ?

Vous avez jusqu'au 26 août pour compléter vos disponibilités (hyperlien vers le sondage doodle)

Vous trouverez en pièce jointe les informations reliées à cette phase qualitative du projet.

J'animerai moi-même les discussions, avec un ou une collègue qui prendra des notes.

Dans tous les cas, je vous remercie beaucoup pour votre participation au projet.

Geneviève

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Annexe N. Formulaire d'information et de consentement pour les infirmières qui ont participé à la composante qualitative de l'étude mixte

FORMULAIRE D'INFORMATION ET DE CONSENTEMENT

Titre du projet :	Développement et évaluation d'une simulation numérique destinée aux infirmières qui accompagnent les personnes vivant avec le VIH dans la prise des antirétroviraux
Chercheuse responsable au CHUM (codirectrice):	José Côté, inf., Ph. D., titulaire de la Chaire de recherche sur les nouvelles pratiques de soins infirmiers, professeure titulaire, Université de Montréal, chercheuse régulière au Centre de recherche du CHUM (CRCHUM)
Étudiante-chercheuse :	Geneviève Rouleau, inf., Ph.D (c), candidate au doctorat, Université Laval
Chercheuse responsable à l'Université Laval (directrice) :	Marie-Pierre Gagnon, professeure titulaire à l'Université Laval, chercheuse régulière au centre de recherche sur les soins et les services de première ligne de l'Université Laval (CERSSPL-UL)
Chercheuse membre du comité d'encadrement de la thèse :	Lauralie Richard, chercheuse, Département de Pratique Générale et Santé Rurale, École de médecine de Dunedin; Nouvelle-Zélande; professeure associée, FSI, Université de Montréal
Collaborateurs :	Sylvie Dubois, inf., Ph. D., directrice nationale des soins infirmiers et autres professionnels au ministère de la Santé et des Services sociaux du Québec (MSSS) Renée Descôteaux, directrice des soins infirmiers et des regroupements clientèles, CHUM Jérôme Pelletier, étudiant au doctorat, FSI, Université Laval; Professeur Université du Québec à Rimouski Rock Lévesque, infirmier-chef au département de prévention de santé toxicomanie du CHUM Kenneth Monteith, directeur de la Coalition des organismes communautaires québécois de lutte contre le VIH/sida (COCQ-sida)

	Valérie Martel-Laferrière, microbiologiste-infectiologue au CHUM, chercheuse CRCHUM
	Hélène Morin, infirmière à l'Unité hospitalière de recherche, d'enseignement et de soins sur le sida (UHRESS) du CHUM
	Alexandra de Kiewit, patiente-partenaire, Organisme Stella
	Programme national de mentorat sur le VIH et les hépatites, CHUM
Compagnie partenaire :	Interaction Healthcare
Organisme subventionnaire :	Instituts de recherche en santé du Canada (IRSC), Réseau de recherche en interventions en sciences infirmières du Québec (RRISIQ)
Identifiant multicentrique :	MP-02-2017-6452
No de projet au CHUM:	18.243

PRÉAMBULE

Nous sollicitons votre participation à ce projet de recherche parce que vous avez complété votre participation au simulateur numérique portant sur une situation infirmière clinique auprès d'un patient virtuel pour qui la prise du traitement antirétroviral (TAR) était difficile et vous avez rempli le questionnaire en ligne. Par le fait même, vous avez accepté d'être recontacté pour obtenir des informations sur cette présente phase qualitative s'inscrivant dans la recherche.

Cependant, avant d'accepter de participer à ce projet et de signer ce formulaire d'information et de consentement, veuillez prendre le temps de lire, de comprendre et de considérer attentivement les renseignements qui suivent. Ce formulaire peut contenir des mots que vous ne comprenez pas. Nous vous invitons à poser toutes les questions que vous jugerez utiles à la chercheuse responsable du projet ou à l'étudiante-chercheuse et à leur demander de vous expliquer tout mot ou renseignement qui n'est pas clair.

NATURE ET OBJECTIFS DU PROJET

Rappelons-le, ce projet de recherche poursuit comme but principal de développer et d'évaluer une simulation numérique destinée aux infirmières dans un contexte d'adhésion au TAR. Trois objectifs découlent de ce but : 1) décrire cette pratique infirmière d'accompagnement à la prise du TAR et comprendre les défis qui l'entourent; 2) développer la simulation numérique; et 3) l'évaluer auprès des infirmières. Votre participation est à présent sollicitée pour répondre au troisième objectif, et plus particulièrement, à la phase qualitative, en essayant de mieux comprendre votre expérience de participation à cette simulation numérique.

NOMBRE DE PARTICIPANT(E)S ET DURÉE DE LA PARTICIPATION

Le nombre total de participants (infirmières et d'infirmiers) visé pour cette phase qualitative varie entre quatre et huit participants, lesquels ont participé à la phase quantitative. Une diversité de perceptions et d'expériences

est recherchée pour la phase qualitative, laquelle sera obtenue à partir des réponses au questionnaire en ligne post-simulation.

La durée prévue pour votre participation à un groupe de discussion en ligne sera de 75 minutes, un temps requis permettant d'échanger avec d'autres infirmières sur leur participation à la simulation.

La participation à cette étude est prévue hors de vos heures de travail, à moins d'avoir l'autorisation de votre supérieur immédiat pour y participer sur votre temps professionnel. La planification de ce groupe de discussion (le moment, l'heure, l'endroit) sera convenue avec les potentiels participants et l'équipe de recherche, en fonction de leurs disponibilités et de leurs contextes professionnels, lorsque la simulation et le questionnaire en ligne seront complétés.

NATURE DE LA PARTICIPATION DEMANDÉE ET DÉROULEMENT DU PROJET

Si vous acceptez de participer à la phase qualitative évaluative de ce projet de recherche et après avoir approuvé le présent formulaire d'information et de consentement en format électronique, vous serez invité(e) à :

- Participer au groupe de discussion en ligne d'une durée d'environ 75 minutes pour échanger avec d'autres infirmières sur votre expérience de participation à la simulation numérique. La plateforme utilisée sera Zoom (avec une connexion Internet), et donc, vous aurez la possibilité de voir les autres participants par vidéo, tout comme Skype. Par contre, vous pourrez également vous connecter « hors ligne » avec la modalité « audio » seulement, selon votre convenance et le matériel dont vous disposez (si vous avez ou non accès à une caméra par exemple). Le contenu audiovidéo sera d'abord enregistré et ensuite retranscrit, avec votre consentement.

- La plateforme Zoom sera accessible seulement aux infirmières qui auront consenti à participer au groupe de discussion en ligne (soit par visioconférence ou audioconférence, avec possibilité d'utiliser la messagerie instantanée.) Pour accéder à la plateforme, il vous faudra cliquer sur un lien sécurisé envoyé par l'étudiante-chercheuse au moment convenu. Le contenu audio sera enregistré, avec votre consentement.

RISQUES ET INCONVÉNIENTS

La confidentialité des échanges durant le groupe de discussion dépend de l'engagement réciproque des participants à ne pas divulguer l'identité des autres participants et de la nature des échanges avec des personnes n'ayant pas participé à la rencontre. L'équipe de recherche discutera de l'importance de cette entente de confidentialité au tout début de la tenue du groupe de discussion. La participation à ce groupe de discussion en ligne pourrait engendrer des inconvénients chez certains participants, tels que des questionnements, un stress, en plus de difficultés techniques liées à l'usage de la plateforme Zoom. L'étudiante-chercheuse et/ou des membres de l'équipe de recherche seraient alors à votre disposition pour vous soutenir.

En dépit des mesures prises pour assurer la confidentialité, l'intégrité et la sécurité des données transmises en ligne, l'utilisation d'Internet comporte certains risques d'intrusion par des tiers, de manipulations, de pertes de

données et d'identification. Veuillez éviter l'utilisation d'une connexion sans fil pour transmettre des données sensibles. »

AVANTAGES

Il se peut que vous retiriez un bénéfice personnel de votre participation à ce projet de recherche, mais on ne peut vous l'assurer. À tout le moins, les résultats obtenus contribueront à l'avancement des connaissances dans ce domaine.

CONFIDENTIALITÉ

Durant votre participation à ce projet, l'étudiante-chercheuse recueillera et consignera dans un dossier de recherche les renseignements vous concernant. Seuls les renseignements nécessaires pour répondre aux objectifs scientifiques de ce projet seront recueillis.

Ces renseignements peuvent comprendre les informations concernant votre lieu de pratique, vos rôles comme infirmière et infirmier qui accompagnent les personnes vivant avec le VIH dans la prise de leurs médicaments. D'autres renseignements tels que votre nom, votre sexe de même que le nombre d'années de pratique dans le domaine du VIH vous seront demandés.

Tous les renseignements recueillis demeureront confidentiels dans les limites prévues par la loi. Afin de préserver votre identité et la confidentialité des renseignements, vous ne serez identifié(e) que par un numéro de code (seulement dans la base de données de recherche de l'étudiante-chercheuse, et non durant votre participation à l'étude puisque pour avoir les heures de formation accréditée, la « liste de présences » et donc, votre identité, est requise.) La clé du code reliant votre nom à votre dossier de recherche sera conservée par la chercheuse responsable et l'étudiante-chercheuse.

L'étudiante-chercheuse fera parvenir à l'organisme subventionnaire ou à ses représentants, les données codées vous concernant. Ces données n'incluent pas votre nom ni votre adresse. L'organisme subventionnaire utilisera les données à des fins de recherche dans le but de répondre aux objectifs scientifiques du projet décrits dans le formulaire d'information et de consentement.

Les données en elles-mêmes ou combinées aux données provenant d'autres projets, pourront être partagées avec les organismes réglementaires canadiens ou d'autres pays ou avec les partenaires commerciaux de l'organisme subventionnaire. Ce transfert d'information implique que vos données pourraient être transmises dans d'autres pays que le Canada. Cependant, l'organisme subventionnaire respectera les règles de confidentialité en vigueur au Québec et au Canada, et ce, dans tous les pays. Ces données seront conservées pendant dix ans après la fin de l'étude par la chercheuse responsable, l'étudiante-chercheuse et l'organisme subventionnaire.

Les données codées pourraient aussi servir pour d'autres analyses de données reliées au projet ou pour l'élaboration de projets de recherches futurs.

Les données pourront être publiées dans des revues spécialisées ou faire l'objet de discussions scientifiques, mais il ne sera pas possible de vous identifier.

À des fins de surveillance et de contrôle, votre dossier de recherche pourra être consulté par une personne mandatée par le comité d'éthique de la recherche du CHUM ou par l'établissement, par une personne mandatée par des organismes publics autorisés ainsi que par des représentants de l'organisme subventionnaire. Toutes ces personnes et ces organismes adhèrent à une politique de confidentialité.

Vous avez le droit de consulter votre dossier de recherche pour vérifier les renseignements recueillis, et les faire rectifier au besoin, et ce, aussi longtemps que la chercheuse responsable du projet, l'étudiante-chercheuse ou l'établissement détiennent ces informations. Cependant, afin de préserver l'intégrité scientifique du projet, vous pourriez n'avoir accès à certaines de ces informations qu'une fois votre participation terminée.

COMMUNICATION DES RÉSULTATS GÉNÉRAUX

Les résultats de cette étude seront communiqués dans un article scientifique et dans des présentations scientifiques et/ou professionnelles. Les résultats pourront être mis à votre disposition sur demande. La demande devra être faite par écrit auprès de la chercheuse responsable ou de l'étudiante-chercheuse.

FINANCEMENT DU PROJET

L'étudiante-chercheuse a reçu un financement des IRSC et du RRISIQ pour mener à bien ce projet de recherche.

COMPENSATION

Chaque personne qui participera au groupe de discussion en ligne recevra une carte prépayée d'une valeur de 50$. Vous aurez accès gratuitement à la simulation numérique de même qu'à trois heures de formation accréditée (HFA) par la Faculté des sciences infirmières de l'Université de Montréal pour l'ensemble de votre participation au projet.

EN CAS DE PRÉJUDICE

En acceptant de participer à ce projet, vous ne renoncez à aucun de vos droits ni ne libérez les chercheuses, l'organisme subventionnaire ou l'établissement de leur responsabilité civile et professionnelle.

PARTICIPATION VOLONTAIRE ET POSSIBILITÉS DE RETRAIT

Votre participation à ce projet de recherche est volontaire. Vous êtes donc libre de refuser d'y participer. Vous pouvez également vous retirer de ce projet à n'importe quel moment, sans avoir à donner de raisons, en faisant connaître votre décision à la chercheuse responsable du projet ou à l'étudiante-chercheuse.

Votre décision de ne pas participer à ce projet de recherche ou de vous en retirer n'aura aucune conséquence sur vos relations avec vos supérieurs ni sur votre employabilité ou sur vos relations avec les chercheuses et les autres intervenants.

La chercheuse responsable du projet de recherche, l'étudiante-chercheuse, le comité d'éthique de la recherche du CHUM ou l'organisme subventionnaire peuvent mettre fin à votre participation, sans votre consentement, si de nouvelles découvertes ou informations indiquent que votre participation au projet n'est plus dans votre intérêt, si vous ne respectez pas les consignes du projet de recherche ou s'il existe des raisons administratives d'abandonner le projet.

Si vous vous retirez ou êtes retiré(e) du projet, l'information déjà obtenue dans le cadre de ce projet (via les enregistrements et les notes prises par l'étudiante-chercheuse) sera néanmoins conservée, analysée ou utilisée pour assurer l'intégrité du projet.

Toute nouvelle connaissance acquise durant le déroulement du projet qui pourrait avoir un impact sur votre décision de continuer à participer à ce projet vous sera communiquée rapidement.

PERSONNES-RESSOURCES

Si vous avez des questions ou éprouvez des problèmes en lien avec le projet de recherche, ou si vous souhaitez vous en retirer, vous pouvez communiquer avec madame José Côté, chercheuse responsable du projet, ou avec l'étudiante-chercheuse aux coordonnées suivantes :

- José Côté, 514-890-8000 poste 15536, jose.cote@umontreal.ca
- Geneviève Rouleau, 514-890-8000 poste 12744, genevieve.rouleau.chum@ssss.gouv.qc.ca (entre 8h00 et 16h00 du lundi au vendredi)

Pour toute question concernant vos droits en tant que participant(e) à ce projet de recherche ou si vous avez des plaintes ou des commentaires à formuler, vous pouvez communiquer avec le commissaire local aux plaintes et à la qualité des services du CHUM au numéro 514- 890-8484.

SURVEILLANCE DES ASPECTS ÉTHIQUES

Le comité d'éthique de la recherche du CHUM a approuvé le projet et assurera le suivi du projet pour les établissements du réseau de la santé et des services sociaux du Québec participant.

CONSENTEMENT

J'ai pris connaissance du formulaire d'information et de consentement. On m'a expliqué le projet de recherche et le présent formulaire d'information et de consentement. On a répondu à mes questions et on m'a laissé le temps voulu pour prendre une décision. Après réflexion, je consens à participer à ce projet de recherche aux conditions qui y sont énoncées.

En cliquant sur le bouton « accepter », je ne renonce cependant à aucun de mes droits légaux ni ne libère les chercheuses, l'établissement et l'organisme subventionnaire de leur responsabilité civile et professionnelle.

<u>En cliquant sur le bouton « J'accepte », j'atteste :</u>

- Avoir pris connaissance du formulaire d'information et de consentement;

- Consentir volontairement et librement à participer à la phase qualitative de ce projet de recherche.

[BOUTON J'ACCEPTE]
[BOUTON JE REFUSE]

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