Nursing students' clinical learning: Combining simulation training with nursing home practice

A multimethod study

by

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Summary

Background: The traditional clinical practice model for first-year nursing students in Norwegian nursing education is placement in nursing homes for six to eight weeks supervised by on-site registered nurses. In nursing homes, increased care complexity, high workloads, and a limited number of registered nurses serving as student supervisors can pose significant challenges to students' clinical learning. Simulation training may provide an evidence-based learning alternative during students' clinical practice period. However, research on clinical practice models that combine simulation training with clinical practice in nursing homes for first-year nursing students is limited internationally and unexplored in a Norwegian context.

Aim: The overall aim of this thesis is to gain knowledge by investigating first-year students' experiences with and relevant outcomes of simulation training combined with clinical practice in nursing homes in a Norwegian context. To achieve the overall aim, we initially identified elements in simulation training (based on the National League for Nursing (NLN) Jeffries Simulation Theory) associated with student outcomes of satisfaction and self-confidence (Paper I). Second, student experiences of multiple simulation training as a supplement during the students' clinical practice period were investigated (Paper II). The Clinical Learning Environment Comparison Survey (CLECS) was then translated and tested for its psychometric properties (Paper III). The CLECS was used in the final investigation, in which student outcomes regarding knowledge acquisition, self-efficacy, and fulfilment of clinical learning needs were examined after integrating the simulation training as a partial replacement for clinical hours during the students' clinical practice period (Paper IV).

Methods: A multimethod design was employed. First, a study with a cross-sectional design using the NLN questionnaire (n = 187) was conducted to identify associations. Data were analysed using descriptive and correlation statistics (Paper I). The second study, which investigated student experiences (n = 27) had a qualitative descriptive study design with focus group interviews. Data were analysed using systematic text condensation (Paper II). The third study had a cross-sectional design with a longitudinal component (n = 122), and the CLECS' psychometric properties were investigated using validity and reliability statistics (Paper III). The fourth study had an experimental design with pre- and post-test comparisons of an intervention group (n = 52) versus a control group (n = 48) to examine student outcomes using a knowledge test and the General Self-Efficacy Scale. Furthermore, a descriptive, survey-based comparison was used to examine the fulfilment of clinical learning needs in the intervention group using the CLECS. Data in the fourth study were analysed using descriptive and inferential statistics (Paper IV).

Results: Active learning was significantly associated with satisfaction, while active learning and clear objectives were associated with self-confidence (Paper I). Three categories of student experiences were identified: *enhancing the reasoning behind care*, *transferring knowledge and experiences between learning environments*, and *enhancing the sense of mastery* (Paper II). The CLECS had acceptable construct validity and internal consistency, and most subscales displayed moderate to good test-retest reliability (Paper III). The mean improvement in knowledge acquisition from the pre- to post-test was higher in the intervention group than in the control group, and the difference was statistically significant, with a moderate to high effect size. No significant difference in self-efficacy improvement was observed. The intervention group scored the simulation training significantly higher on meeting their clinical learning needs compared with the nursing homes. Learning needs within the nursing process, self-efficacy, and the teaching–learning dyad especially excelled, showing moderate to high effect sizes (Paper IV).

Conclusions: This thesis suggests that simulation training (based on a theoretical framework), either as a supplement to or as a partial replacement for clinical hours, combined with clinical practice in nursing homes, might be of great benefit for Norwegian first-year nursing students. Active student engagement in simulation training may increase both student satisfaction and self-confidence, and the first-year students experienced enhanced knowledge, confidence, and mastery due to the simulation training after attending simulation training combined with clinical practice. Active student engagement, collective reflections, and feedback from facilitators and peers in the simulation training seemed pivotal for promoting the students' clinical learning during the practice period. The CLECS (Norwegian version) was proven adequate for evaluating clinical learning to meet students' learning needs and; combining simulation training with clinical practice in nursing homes was positively associated with knowledge acquisition and with meeting the clinical learning needs of first-year students, especially within the areas of the nursing process, self-efficacy, and the teaching-learning dyad.

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1 Introduction

Nursing education institutions are obligated to prepare students for their future responsibilities so that they can provide safe health care of high quality (Ministry of Education, 2020; Ministry of Education and Research, 2019). In Norway, the bachelor's degree in nursing is a three-year programme that follows the European Union (EU) directive, of which half of the time is assigned to mandatory, supervised clinical practice in different areas of health care services (EU Directive 2013/55/EU). The traditional clinical practice model for first-year nursing students in Norway is placement in nursing homes for six to eight weeks, supervised by on-site registered nurses (RNs) (Bjørk et al., 2014; Richardson et al., 2014). A patient is defined as a person to which the health care service provides or offers health care (Pasient- og bruker rettighetsloven § 1-3, 1999). Therefore, people admitted to nursing homes will be referred to as patients in this thesis.

Since the implementation of the Coordination Reform (Report No. 47 to the Storting, 2008–2009), the health conditions of patients transferred from hospitals to nursing homes have become more complex and treatment-intensive, with higher patient mortality (Abelsen et al., 2014; Glette et al., 2018). Hence, the scope of nursing practice in nursing homes has expanded, requiring an unprecedented increase in expected knowledge, required skills, and staff (Finnbakk et al., 2020; Glette et al., 2018). At the same time, nursing homes face problems recruiting and retaining a qualified workforce (The Norwegian Association of Higher Education Institutions, 2016). First-year nursing students' placements in nursing homes add pressure to this already stretched health care system (Roberts et al., 2019). The latter is, in part, related to the limited resources that the RNs in nursing homes have to adequately engage and supervise the students. Moreover, there is increasing enrolment of nursing students in nursing education programmes as a response to current and projected nursing shortages, which again puts pressure on clinical sites to host even more students (Perry et al., 2018; Roksvaag & Texmon, 2012). Despite these challenges, the traditional clinical practice model in nursing homes for Norwegian first-year nursing students has remained largely unchanged (Laugaland et al., 2021).

The focus of this thesis is on a clinical practice model in Norwegian nursing education that deviates from the traditional clinical practice model; *Simulation training combined with clinical practice in nursing homes*, with the ambition to improve the knowledge base in educational research for best educational practices to meet first-year students' clinical learning needs and enhance learning outcomes during clinical practice in nursing homes.

1.1 Outline of the thesis

The thesis consists of a synopsis and four papers. The first chapter introduces the theme of the thesis. In Chapter Two, the background of the thesis is presented through perspectives, challenges, and previous research relevant to first-year nursing students' clinical practice in nursing homes. The use of simulation training in nursing education and research on student experiences and outcomes of simulation training are then presented, followed by a statement of the aim of the thesis. In Chapter Three, the theoretical perspectives on clinical learning and the framework used for simulation design are described. Chapter Four presents the methods used in the thesis as well as ethical considerations. Chapter Five presents the main results in each of the four papers and the results across the papers. A discussion of the results, methodological considerations, and strengths and limitations of the research are presented in Chapter Six. Chapter Seven offers conclusions and implications for practice and future research.

2 Background

Clinical practice in nursing homes represents the first clinical opportunity for Norwegian first-year nursing students to link nursing knowledge to the care of real patients. Nursing knowledge includes both theoretical knowledge (knowing that) and practical knowledge (knowing how) (Benner & Wrubel, 1982). The nursing domain-specific characteristics of clinical learning include patient experiences, the demand for clinical reasoning, and integrated knowledge acquisition and use in clinical situations (Benner, 2015; Berman et al., 2014). First-year nursing students will hereafter also be referred to as ‘nursing students’ or ‘students’.

2.1 Preparation for clinical practice in nursing homes

Prior to clinical practice in nursing homes, Norwegian nursing students are introduced to theoretical knowledge in anatomy, pathophysiology, and nursing care at nursing education institutions. Additionally, they practice skills such as measurement of blood pressure and heart and respiratory rates, insertion of urinary catheters, and maintenance of the principles of hygiene at the institution’s skill centre. The nursing process, which has been highlighted as an important tool for placing nursing knowledge into practice and increasing the quality of nursing care, is introduced to the students as a framework for meeting nursing home patients’ often complex health conditions and care needs (McCuistion et al., 2020; Yilmaz et al., 2015). The nursing process involves understanding the rationale for patients’ treatment plans, understanding patients’ pathophysiologies, identifying patients’ problems, implementing care, prioritising care, performing appropriate assessments, and assessing the outcomes of care provided (Ehnfors et al., 2015; McCuistion et al., 2020).

2.2 The nursing home as a learning arena

The share of older people with chronic and complex diseases has increased and will continue to increase in the years ahead (Tønnessen et al., 2016; WHO, 2016). In order to build effective, coordinated health care systems to meet the needs of an ageing population, there has been a shift of responsibilities and tasks from specialists to primary health care services (Abelsen et al., 2014; Boeckxstaens & De Graaf, 2011; Larue et al., 2015). In Norway, the Coordination Reform, which was implemented in 2012 (Report No. 47 to the Storting, 2008-2009), has led to expanded responsibilities for nursing homes in terms of active treatment and terminal care, and thus a shift towards a more acute care or palliative function (Finnbakk et al., 2020; Glette et al., 2018). Organisational changes and the ageing population have made nursing homes complex parts of the health care service system (Mays et al., 2018; Nordström, 2018; Wangmo et al., 2017). However, staffing and competence do not seem to have been adjusted accordingly (Abelsen et al., 2014; Bruvik et al., 2017).

Providing care quality in nursing homes includes dimensions such as safe, effective, patient-centred, timely, and efficient care (The Norwegian Directorate of Health, 2019; WHO, 2021). As the care needs of nursing home patients may change frequently and often unexpectedly, providing care quality in nursing homes requires a highly skilled workforce (Killett et al., 2013; Nordström, 2018). RNs in nursing homes are considered key contributors to care quality and have multiple roles that include patient care, clinical decision-making, leadership, and student supervisor responsibilities (Dellefield et al., 2015). However, partly due to problems in recruiting and retaining RNs in nursing homes, RNs often constitute a small segment of the workforce employed in nursing homes (Gautun, 2020). Moreover, balancing patient care, administrative work, and student supervision is reported as a major challenge among RNs (Arkan et al., 2018; Jayasekara et al., 2018). In addition, not all RNs in nursing homes are specialised supervisors, and some lack experience in the supervision of students (Harrington et al., 2012; Jayasekara et al., 2018). These circumstances have been found to affect the quality of student supervision and feedback on students' learning progression (Adamson et al., 2018; McIntosh et al., 2014; Vatnøy et al., 2020).

Challenges such as limited access to RN supervisors and inefficiency of time spent in nursing homes have been reported by students (Jonsén et al., 2013; Morrell & Ridgway, 2014; Sulivan et al., 2019). Many students experience their clinical practice as stressful (Gurková & Zeleníková, 2018) and that feedback has a low priority for their RN supervisors (Adamson et al., 2018). Limited feedback may lead students to question their knowledge and skills, making them unsure about what is expected of them and their learning progression (Admi et al., 2018). Feelings of incompetency when caring for patients may result in performance anxiety (Dinmohammadi et al., 2016; Sharif & Masoumi, 2005), which again may influence the students' confidence, attitudes, and learning during clinical practice (Algoso & Peters, 2012; Perry et al., 2018). In a Norwegian study exploring challenges in providing effective clinical student practice in nursing homes, variation in learning assessments and a lack of quality assurance in addition to low levels of RNs were highlighted (Laugaland et al., 2021).

In nursing homes, students experience a wide range of patient situations and clinical procedures. However, it is the RN supervisor's role to help students make sense of these experiences through analytical reasoning (Perry et al., 2018). Students must learn how to recognise a situation in which a particular aspect of theoretical knowledge applies and begin to develop practical knowledge that allows the refinement, extension, and adjustment of textbook knowledge (Benner, 2015; Tanner, 2006). However, students report difficulties integrating theoretical knowledge into practice (Dinmohammadi et al., 2016; Günay & Kılınç, 2018), collecting and evaluating patient data, and using the data to devise nursing care that meets patients' needs (Yilmaz et al., 2015). Because the entire nursing process rests on the accuracy of the data collected, it is imperative that students gain proficiency in basic physical assessment (McCuistion et al., 2020; Yilmaz et al., 2015). To build these competencies, supervision and feedback are essential for students because they do not yet have the deep background knowledge to recognise the whole clinical situation or make qualitative distinctions within a clinical situation (Benner, 2015). However, the supervision provided in nursing homes tends to be more task-oriented than focused on these more complex aspects of nursing, revealing a gap between students' clinical learning needs and realities (Ironside et al., 2014; Papathanasiou et al., 2014; Sulivan et al., 2019).

2.3 Simulation training in nursing education

Simulation training may enhance students' integration of theoretical and practical knowledge, ability to reflect, and capacity to give and receive feedback (Jeffries & Rodgers, 2021). Indeed, national and international nursing education programmes have implemented simulation training (Adib-Hajbaghery & Sharifi, 2017; Hayden et al., 2014). In this thesis, the conceptual definition of simulation training in Bland et al. (2011) is used:

A dynamic process involving the creation of a hypothetical opportunity that incorporates an authentic representation of reality, facilitates active student engagement, and integrates the complexities of practical and theoretical learning with opportunity for repetition, feedback, evaluation, and reflection (p. 668).

There are various types of simulation training, such as role playing, games, virtual reality, and scenario-based patient simulation training using standardised patients (trained human actors) or human patient simulators (HPSs). HPSs are fully programmable, computerised, whole-body manikins that enable imitation of physiological parameters in different health conditions and make it possible to imitate a patient's verbal and physiological reactions to care (Liaw et al., 2014; Shin et al., 2015). In this thesis, 'simulation training' refers to scenario-based simulation training with HPSs.

Simulation training allows nurse educators to develop desired patient experiences and disease processes encountered by students, ensuring equal learning experiences that cannot be guaranteed in clinical practice (Gates et al., 2012; Kelly et al., 2014). For first-year students, simulation training may provide an opportunity to be exposed to experiences that they may not have access to in their nursing home practice and to gain an appreciation of the unpredictable nature of clinical practice (Gates et al., 2012). Patient situations and environments can be created to mimic how they may occur in real clinical settings (or close to them), and the students may be provided with immediate feedback on their performance (Hamstra et al., 2014; Lioce et al., 2015).

Simulation fidelity reflects the level of realism incorporated into the patient scenario. The International Nursing Association for Clinical Simulation and Learning (INACSL) defines simulation fidelity as 'the ability to view or represent things as they are to enhance believability' (INACSL, 2016c, p. 42). Due to the advanced technology, the use of HPSs may enhance the fidelity of many simulated scenarios (Jeffries & Rogers, 2012). Educators can create and manipulate patient scenarios in which the HPS's physiological parameters replicate aspects of a real patient's condition and enhance physical fidelity (Founds et al., 2011; Gates et al., 2012). However, fidelity also depends on an effective simulation design that promotes high student immersion (Hamstra et al., 2014). Immersion describes the level at which the students become engaged in the scenario (Lioce et al., 2020) and conveys the sense that they have of being immersed as they would if it were a real-world experience (Gaba, 2007). In addition to physical fidelity, INACSL (2016c) includes conceptual fidelity, which is described as ensuring that elements in the scenario relate to each other in a realistic way, and psychological fidelity, which is described as mimicking the contextual elements found in clinical environments. These are all considered important aspects of fidelity for promoting participant engagement.

Simulation training provides students with opportunities to integrate theoretical knowledge with practice while they are making real-time clinical decisions (Bland et al., 2011). Pedagogically, simulation training puts students in a learning situation in which they need to be active and in control of their learning and create habits of thinking and reflection (Jeffries & Rodgers, 2021). In the case of older nursing home patients, often with multiple diseases, the HPS can highlight the patients' clinical signs and symptoms within the scenario and train students to deal with situations such as patient deterioration. An important benefit compared to clinical practice is that simulation training occurs in an environment without the risk of harming patients, allowing students to make mistakes (Mills et al., 2014). Mistakes become an opportunity for students to learn and achieve competencies by analysing and reflecting on them.

2.3.1 The structure of simulation training

To promote effective learning, the INACSL Standards of Best Practice in Simulation recommend structuring each simulation training session from briefing to scenario to debriefing, led by a facilitator (INACSL, 2016b, 2016c). The facilitator is an instructor who joins the students in every part of the experience. Briefing, a scenario, and debriefing are considered the core components of a successful simulation experience (Cant & Cooper, 2010; INACSL, 2016c).

Briefing is an activity that takes place before the onset of the scenario and is important, as it prepares students to understand what they are going to do and what they will be simulating (Husebø et al., 2012; McDermott, 2016). The facilitator's role in briefing is to prepare the students for the simulation, providing them with information about the scenario, the objectives of the simulation training, the environment, the HPS, crucial equipment, and the need for mutual respect and confidence between the participants (INACSL, 2016b; Jeffries & Rodgers, 2021).

The *scenario* includes a starting point with the initial circumstances of the patient, structured participant activities with responses from the patient (e.g., the HPS), such as verbal responses or changes in vital signs, and an end point, which is the stage at which the scenario is expected to end (INACSL, 2016c).

Debriefing is a form of reflective practice, which means a guided reflection of a realistic event (e.g., the scenario) strategically planned to promote professional reflective comportment (Dreifuerst et al., 2021). Debriefing, including feedback from facilitators and peers, follows the scenario to allow learners to revisit the experience reflectively and learn from what happened (Dreifuerst, 2009; Shinnick et al., 2011). In reflective debriefing, as well as in the scenario, the students are provided with an opportunity to assume an active role during the learning process (Al Sabei & Lasater, 2016). The debriefing promotes bridging content, knowledge, and experience and an understanding of the thinking and actions that occurred during the scenario, while the students are given the opportunity to share reactions and emotions about the learning experience with each other (Dreifuerst et al., 2021).

INACSL (2016a) emphasise that the debriefing must be congruent with the objectives of the simulation training and conducive to learning and that the debriefing must support confidentiality, trust, feedback, and reflection. They recommend that the debriefing be facilitated by an experienced person (INACSL, 2016a). Steinwachs (1992) presents a debriefing framework with three phases – the descriptive, analytic, and application phases – and provides several suggestions for questions the facilitator can ask in each phase of the debriefing to promote reflection and student engagement. Steinwachs (1992) underscores that the facilitator's job in debriefing is to concentrate on how to encourage students to reflect on their experiences and perspectives, explore these experiences, and learn from them. Another approach to debriefing called ‘PEARLS’ (Promoting Excellence and Reflective Learning in Simulation) (Eppich & Cheng, 2015; INACSL, 2016a) comprises the description, analysis, and application phases described by Steinwachs (1992). However, PEARLS adds an initial reaction phase in which the students share reactions and emotions related to the experience.

2.3.2 Student experiences and outcomes of simulation training

Simulation training has become a widely used teaching strategy to prepare and train students for clinical practice (Cant & Cooper, 2017; Larue et al., 2015). Some research has found barriers to students’ acceptance of simulation training, such as performance anxiety, being watched by others, and demanding and stressful scenarios, and that it may be perceived as a less realistic experience than an actual patient encounter (Al-Ghareeb & Cooper, 2016; Solli et al., 2020). However, simulation training seems well accepted overall by nursing students (Cant & Cooper, 2017; D’Souza et al., 2017; Foronda et al., 2013).

Literature reviews of simulation training, either used as an alternative to traditional classroom lectures or as preparation for clinical practice, have shown that students are mainly satisfied with simulation training and achieve self-confidence in learning (Haddeland et al., 2018; Shin et al., 2015; Skrable & Fitzsimons, 2014). An integrative review highlighted that simulation training contributes to diverse learning experiences, knowledge retention, and skill acquisition (D’Souza et al., 2017). While an umbrella review showed that simulation training significantly improved self-efficacy in pre- and post-test studies (Cant & Cooper, 2017), a systematic review and meta-analysis found no significant effect on students’ self-confidence and self-efficacy but demonstrated improved knowledge and performance (La Cerra et al., 2019). The latter is in line with Haddeland et al. (2018), who showed that knowledge and performance increased when using simulation training to improve students’ ability to recognise and respond to deteriorating patients.

A limiting factor in reporting the overall effectiveness and outcomes of simulation training is the lack of studies with experimental and comparative research designs (Cant & Cooper, 2017; Husebø et al., 2018). Extensive evidence agrees, however, that simulation training has positive effects on students' learning and outcomes when it is integrated into nursing education programmes (Cant & Cooper, 2017; Cantrell et al., 2017; Husebø et al., 2018). Research investigating first-year students' experiences with and outcomes when combining supplementary simulation training with clinical practice in nursing homes is, however, limited. Only one previous study by Khalaila (2014) was identified prior to this PhD study. The identified study used a pre-test/post-test design and reported that students' caring ability and self-confidence rose, while the level of anxiety decreased, after combining supplementary simulation training with clinical practice in nursing homes (Khalaila, 2014).

Internationally, practice models that partly replace clinical practice hours with simulation training have gained acceptance (Gates et al., 2012; Hayden et al., 2014; Larue et al., 2015). Research on student outcomes when partly replacing clinical hours in the areas of medical-surgical care, obstetrics, paediatrics, and mental health care reports equal or slightly better results when compared to traditional clinical practice (Curl et al., 2016; Hayden et al., 2014; Larue et al., 2015; Soccio, 2017). Empirical studies of the replacement of clinical hours with simulation training are, however, still sparse (Bogossian et al., 2019), and studies exploring partial replacements of clinical hours in nursing homes for first-year students were not identified prior to this PhD study. In a United States (US) national, randomised, controlled study, no statistically significant differences were identified between intervention groups replacing up to 50% of clinical hours in different clinical practice areas with simulation training and control groups with traditional clinical practices (Hayden et al., 2014). However, the study showed a possible advantage of partial replacement in community health areas, including nursing homes, for the development of clinical competency (Hayden et al., 2014; Larue et al., 2015).

2.4 The rationale for the thesis

Although traditional clinical practice models have been considered irreplaceable in developing students' competencies as future nursing professionals (Ironside et al., 2014; Jayasekara et al., 2018; Murphy et al., 2012), evidence suggests that the traditional approach to clinical learning may be insufficient (Harder, 2015; Leighton et al., 2021; Roberts et al., 2019). Simulation training may provide an evidence-based learning alternative during students' clinical practice to optimise the students' learning opportunities and promote effective clinical learning (Harder, 2015; Kardong-Edgren, 2021). As previously highlighted, knowledge of the effects of simulation training combined with clinical practice in nursing homes on first-year students' experiences and outcomes is limited internationally and unexplored in a Norwegian context. This thesis represents an attempt to contribute knowledge to this field of educational research.

2.5 Aim of the thesis

The overall aim of this thesis is to gain knowledge by investigating first-year students' experiences with and relevant outcomes of simulation training combined with clinical practice in nursing homes in a Norwegian context.

2.5.1 Specific objectives and research questions of each paper

Paper I

Objective: The objective of the first paper was to identify elements in simulation training associated with nursing students' satisfaction with the simulation activity and self-confidence in managing the simulated patient situation.

Research question: *Which elements in educational practices and simulation design are associated with students' satisfaction with simulation training and self-confidence in managing simulated patient situations?*

Paper II
Objective: The second objective was to explore nursing students' experiences of supplementary simulation training as a tool to support learning during clinical practice in nursing homes.

Research question: *How do students experience simulation training as a tool to support learning during clinical practice in nursing homes?*

Paper III
Objective: The third objective was to translate the Clinical Learning Environment Comparison Survey (CLECS) into Norwegian and to evaluate the psychometric properties of the Norwegian version.

Research question: *What are the psychometric properties of the CLECS (Norwegian version) using a sample of Norwegian nursing students?*

Paper IV
Primary objective: The primary objective of the fourth paper was to examine nursing students' knowledge acquisition and self-efficacy in integrating a partial replacement of clinical hours in nursing homes with simulation training.

Research questions: *Is there a difference in knowledge acquisition between students attending simulation training combined with clinical practice and students attending traditional clinical practice in nursing homes?*

Is there a difference in general self-efficacy between students attending simulation training combined with clinical practice and students attending traditional clinical practice in nursing homes?

Secondary objective: The secondary objective was to examine perceptions of how learning needs were met in the simulated versus the clinical environment.

Research question: *Is there a difference in perceptions of how well learning needs are met in the simulated environment compared to the clinical environment among students attending simulation training combined with clinical practice?*

In this thesis, both simulation training used as a supplement during clinical practice in nursing homes (Paper II) and simulation training used as a partial replacement for clinical hours during clinical practice in nursing homes (Paper IV) will be referred to as *simulation training combined with clinical practice* or as *the combined practice model*, while the traditional clinical practice model will be referred to as *traditional clinical practice.*

3 Theory

Experiential learning may assist nursing students with assessment, identifying nursing interventions, and providing safe and accurate care for patients (Benner, 1984). Because simulation training is an experiential learning activity (Jeffries & Rogers, 2012), experiential learning theory represents the overall theoretical perspective in this thesis for understanding how simulation training may promote clinical learning during first-year students' clinical practice in nursing homes. The guiding principle of this theory is the ability to transfer theoretical knowledge and apply it in a practice setting, leading to deeper learning. First, in this chapter, Kolb's (2015) cyclical process of experiential learning and Zull's (2002) elaborated explanations of how students learn through Kolb's (2015) learning cycle are presented. Subsequently, the NLN Jeffries Simulation Theory, which was used as the guiding framework for the practical design and implementation of the simulation training described in the four appended papers, is presented.

3.1 Kolb's experiential learning and the learning cycle

Kolb (2015), an educational researcher, summarises the characteristics of experiential learning by defining it as '*the process whereby knowledge is created through the transformation of experience*' (p. 49).

According to Kolb (2015), memorisation, or recollection of ideas taught, does not equal learning, as this process does not improve or reshape our understanding. Students need to be actively involved in gaining knowledge through experience, with active reflection being an integral component of the learning process (Kolb, 2015). Kolb's experiential learning theory is based on John Dewey's claim that learning must be grounded in experience, Kurt Lewin's ideas of the importance of active learning, and Jean Piaget's emphasis on the interaction between the person and environment (Kolb, 2015). Kolb's theory is well supported as a foundation for simulation training (Aebersold, 2018; Dreifuerst, 2009). Simulation training facilitates experiential learning through diverse perspectives to understand and reflect on real-world experiences, problem-solving, and decision-making, which may foster thinking and clinical reasoning skills in nursing students (Jeffries & Rogers, 2012, 2021).

Experiences are central to Kolb's (2015) theory. However, Kolb (2015) acknowledges that something must be generated by an experience for it to be defined as learning. Kolb (2015) views learning as a cyclical process with four stages – concrete experience, reflective observation, abstract conceptualisation, and active experiment – in which each stage is mutually supportive of and feeds into the next. Concrete experiences are the basis for observations and reflections, reflections are distilled into abstract concepts from which new implications for action can be drawn, and at last, these implications can be actively tested, creating new experiences (Kolb, 2015) (Figure 1).

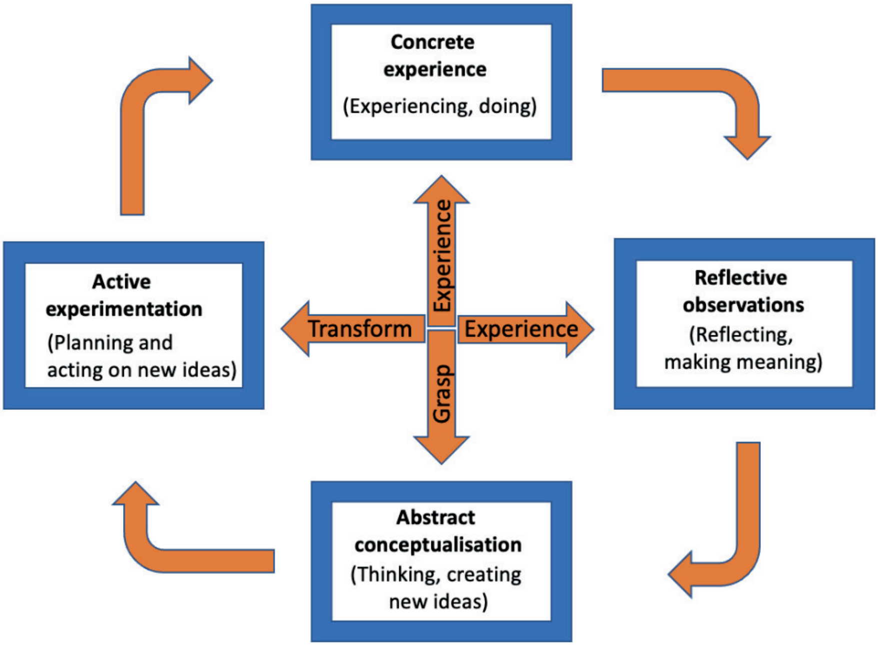

Figure 1 – Author's illustration based on Kolb's (2015) experiential learning cycle.

Kolb (2015) claims that no stage of the learning cycle is effective on its own. Ideally, students must complete all four stages – experiencing, reflecting, thinking, and acting – to develop new knowledge. In the experiencing stage, students engage in an activity or task. It is not enough to passively watch; the students must be actively engaged in this stage, one way or another. As applied in simulation training, experience occurs initially when students engage in a simulation scenario (Jeffries & Rodgers, 2021). After engaging in the experience, the next step in the learning cycle occurs when the students step back to reflect on the experience (Kolb, 2015). This stage allows the students to ask questions and discuss the experience with others making meaning, and to identify any discrepancies between current ideas and the experience itself. The students will attempt to draw conclusions about the experience by reflecting on their prior knowledge, using familiar ideas, or discussing possible theories with peers (Kolb, 2015). According to Kolb (2015), students move from the reflection stage to the thinking stage when they begin to create new ideas and perspectives. The reflection and thinking stages of the learning cycle are mirrored in the debriefing phase of simulation training, in which theoretical knowledge and experience are tied together by reflecting on and analysing the events and performance involved in a scenario. Ultimately, the students will create new ideas and knowledge that may improve future decision-making and actions (Jeffries & Rodgers, 2021). The final acting stage in the learning cycle is the process in which the students plan and act on their new ideas and put their newly gained knowledge into practice. The acting stage creates new experiences, and with each new experience, students can integrate new observations into their current understanding, and the cycle continues (Kolb, 2015).

Zull (2002) supports Kolb's (2015) suggestions that the four stages in the learning cycle should be completed for deeper learning to occur. He claims that Kolb's (2015) learning cycle arises naturally from the structure of the learner's brain and matches the four areas of the cortex and their functions at each stage of the cycle. What he brings to Kolb's learning cycle is his insight into the functions the brain performs: getting information through experience (for which the brain relies on the sensory cortex), making meaning of information through reflective observations (relying on the back integrative cortex), creating new ideas from these meanings through abstract conceptualisation (using the front integrative cortex), and acting on those ideas through active experiment (which requires the motor cortex) (Zull, 2002) (Figure 2).

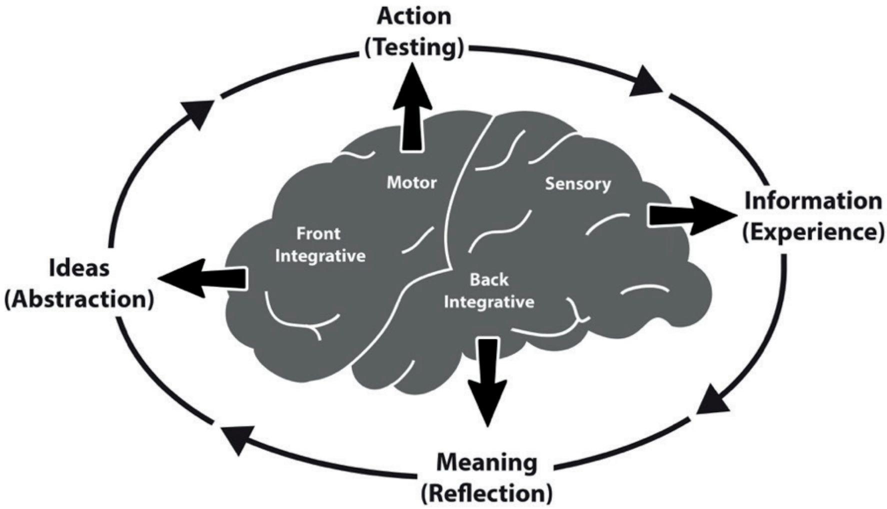

Figure 2 – Author's illustration based on Zull's (2002) link between the learning cycle and areas of the brain.

Like Kolb (2015), Zull (2002) claims that an overreliance on certain stages of the learning cycle (and thus an overreliance on certain parts of the learner's brain) to the exclusion of others will produce incomplete learning; true learning requires the activation and use of all four areas of the cortex (Zull, 2002). In terms of the learning cycle, the sensory brain is where our concrete experience is first recorded. The sensory brain gathers raw materials for reflection, abstraction, and action. The raw material is organised and rearranged through reflective observations, making meaning using the back cortex functions. However, learners also need to use their front cortex functions and convert information into ideas, plans, and actions to test their own knowledge. Thus, the art of directing and supporting proposals and application of new ideas occurring in the front of the brain is part of the art of leading a student towards comprehension (Zull, 2002).

Additionally, Zull (2002) describes the fear centre located in the back of the brain and the pleasure centre located in the front of the brain as two competing regions that impact students' learning. Negative emotions due to an overreaction from the fear centre may overpower cognition; to allow learning from an experience to flow from the back of the brain to the front of the brain, where the experience will be conceptualised and stored, the students must feel safe and believe that they can be successful (Zull, 2002). Thus, to promote learning, educators must create learning environments that reduce the risk of overreaction from the fear centre (Zull, 2002).

In line with Kolb (2015) and Zull (2002), Benner (1984) emphasises that experience is a prerequisite for becoming an expert and states that the development of knowledge in novice nursing students is composed of the extension of practical knowledge. However, nursing students are expected to integrate the knowledge that arises from observations and actions while practising (Fowler, 2008). The ability to reflect on and analyse daily practice and care experiences is a fundamental process in deeper learning and ensuring professional development; students need experiences as well as active engagement with the knowledge earned (Benner, 2015; Kolb, 2015; Mills & Brand, 2017). Based on Kolb's (2015) learning cycle and Zull's (2002) further elaborations of how students learn through the cycle, reflection on experiences, proposing ideas, and testing new knowledge gained are believed to be needed for integration and for students to see the full meaning of an experience in this thesis. The task for the educator is thus to help the students search for new knowledge and perspectives by promoting the use of the stages in Kolb's (2015) learning cycle. This way, complexity may develop, and information and knowledge may become comprehension (Kolb, 2015; Zull, 2002).

3.2 Framework for design of simulation training

The NLN Jefferies Simulation Theory, which evolved from the original NLN Jeffries Framework developed in 2005 (Jeffries & Rodgers 2021), was used as the guiding framework for the practical design and implementation of the simulation training in this PhD study. The NLN Jeffries Simulation Theory offers a tool that facilitates clear directions and guidance in the development and delivery of simulation training. Kolb's cyclical approach to knowledge building is mirrored in simulation designs based on the NLN Jefferies Simulation Theory. In this design, the students are provided with information to help them plan and prepare for the simulation experience. Students are then engaged in the simulation scenario as a concrete experience, after which they evaluate actions through reflection and then assimilate the experience and pre-existing knowledge into new knowledge and perspectives that will influence future decision-making and actions (Jeffries & Rogers, 2012).

The NLN Jeffries Simulation theory includes context, background, and simulation design characteristics. These elements lead to the simulation training itself, which includes a dynamic interaction between the facilitator and the students through the use of appropriate educational practices (Jeffries & Rodgers, 2021). Facilitator factors, student factors, educational practice elements, and simulation design elements have to be considered when planning simulation training to maximise its educational effects and achieve high-level student outcomes, such as satisfaction, self-confidence, and knowledge (Jeffries & Rogers, 2012; Jeffries & Rodgers, 2021) (Figure 3).

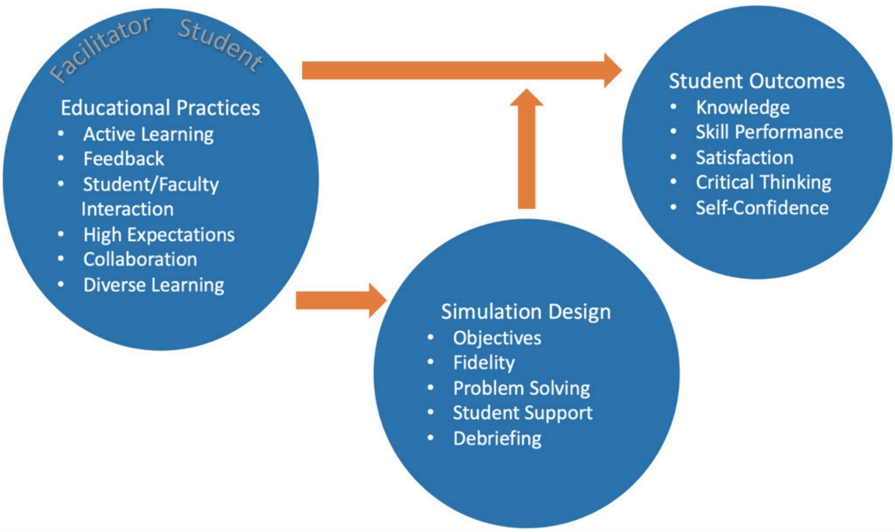

Figure 3 – Author's illustration based on the original NLN Jeffries Framework (Jeffries & Rogers, 2012).

The facilitator must be able to respond to emerging student needs by adjusting educational strategies during the simulation training and providing appropriate feedback and debriefing (Jeffries & Rodgers, 2021). The facilitator must also be able to explain the patient background in the scenario to the students, organise who will take certain roles in the scenario, promote group thinking, give cues and feedback to aid the nursing process, and facilitate student reflections on the experience (Founds et al., 2011; INACSL, 2016b).

Student factors, such as programme level, preparedness for simulation training, and possible performance anxiety among the students, are also important to consider (INACSL, 2016c; Jeffries et al., 2015). This means, for example, that the students' programme levels must be taken into account by adjusting the complexity of the scenario (Lindsey and Berger, 2009) or that the facilitator must demonstrate a positive attitude, calmness, and trustworthy behaviour to decrease performance anxiety (INACSL, 2016b; Solli et al., 2020).

Educational practices include elements such as promoting active learning through active student participation, offering opportunities to reflect and discuss ideas and concepts, and providing feedback and cues to help students (Jeffries & Rodgers, 2021). Other elements of educational practices included in the theory include promoting collaboration between students with opportunities to work together, allowing student-faculty interactions that are learner-centred and meet the students' learning needs, and providing diverse learning experiences (Jeffries & Rodgers, 2021).

Simulation design includes elements such as providing specific learning objectives and appropriate problem-solving complexity. Other design elements, such as ensuring sufficient fidelity levels, including decisions about equipment and surroundings, support from facilitators, and debriefing strategies, also need to be considered when planning simulation training experiences (Jeffries & Rodgers 2021).

Experiential learning is one of the key educational theories used to explain how simulation training can support or enhance clinical learning (Aebersold, 2018), and many of the elements presented in the NLN/Jeffries Simulation Theory, such as active student engagement in the learning process, opportunities to reflect on the experience, opportunities to discuss ideas and concepts, and the interaction between the student and the learning environment, are associated with enhanced learning in Kolb's (2015) experiential learning theory. In addition to experiential learning theories and the NLN Jeffries Simulation Theory, the 2016 INACSL Standards for Best Practice in Simulation, which provide evidence-based standards for developing, facilitating, and measuring the effectiveness of simulation training, are commonly used to guide the development and evaluation of simulation training (Aebersold, 2018). Another commonly used framework is the Kirkpatrick model of training effectiveness, which is a model based on the premise that learning can be classified into four levels: reaction, learning, behaviour, and results (Aebersold, 2018; Kirkpatrick & Kirkpatrick, 2006). In this PhD study, the use of experiential learning theory and the NLN Jeffries Simulation Theory as a practical guiding framework for designing and implementing the simulation training were chosen because both theories underscore the importance of integrating information gained through concrete experience with pre-existing knowledge to create new knowledge and perspectives (Jeffries & Rodgers, 2021; Kolb, 2015). As in experiential learning theory and simulation training designs based on the NLN Jeffries Simulation Theory, the ability to reflect on and analyse experiences and performances constitutes a foundation of professional nursing practice (Benner, 1984).

4 Methods

This chapter presents the overall research design of the PhD study as well as the philosophical underpinnings of the methodological choices made. Furthermore, the design of the simulation training used in the PhD, the research design and methods used in the individual papers, and ethical considerations are described and presented.

4.1 Overall research design

A multimethod design was employed to provide answers to the aim of the thesis. This means that different methods were used to answer the different objectives of the individual papers, each method conducted rigorously and complete in itself (Morse, 2010). Choosing the multimethod design was motivated both by the complementarity of using qualitative and quantitative research approaches, as they may provide different information, and by a wish to verify some of the findings derived from one type of data through the findings from another type (Creswell & Creswell, 2018). As such, using both quantitative and qualitative approaches led to a broader understanding than could be gained by either approach alone (Polit & Beck, 2017).

Initially, a quantitative approach was used to identify elements in simulation training associated with outcomes of student satisfaction and self-confidence (Paper I). The findings influenced the design and implementation of the simulation training used in the combined practice model (Papers II and IV). Second, the combined practice model was explored using an 'exploratory sequential' inspired strategy (Creswell & Creswell, 2018, p. 224), which started by using a qualitative approach to explore student experiences with receiving the combined practice model (Paper II). The findings from the qualitative approach gave rise to new questions: does the combined practice model result in greater knowledge acquisition and self-efficacy among students compared to traditional clinical practice, and are clinical learning needs better met in simulation training than in nursing homes? These questions revealed a need for a valid tool to compare the simulated and clinical learning environments, resulting in the translation and psychometric testing of the CLECS (Paper III), and formed the basis for the research questions that were tested in the final quantitative investigation (Paper IV). The datasets included were as follows:

Initially: Quantitative: A dataset from first-year students (2016) who completed questionnaires after attending simulation training (Paper I)

Exploratory sequential inspired: Qualitative → Data from focus group interviews with first-year students (2017 and 2018) after exposure to the combined practice model (Paper II)

↓

Quantitative → Dataset from first-year students (2019) that completed the CLECS (Norwegian version) after attending simulation training and traditional clinical practice to perform psychometric testing using the CLECS in a Norwegian context (Paper III)

↓

Quantitative → Dataset from first-year students (2020) that completed questionnaires before and after being exposed to the combined practice model or following the traditional clinical practice model (Paper IV)

4.2 Philosophical underpinnings

The qualitative and quantitative research approaches used in this PhD study were seen as compatible, as their different philosophical origins share common ground (Racher & Robinson, 2002). Qualitative approaches are often considered to be located within the interpretivist paradigm. Interpretivists are concerned with understanding the world as it is based on the subjective experiences of individuals. Interpretivists do not deny that there is an objective reality; however, they believe that truth is relative and relies on how human beings construct and interpret the world in different contexts (Creswell, 2014). This PhD study shares the interpretivist view of lifeworld experiences as valid knowledge, and using the qualitative approach led to findings regarding student experiences that could otherwise have been invisible or lost (Paluck, 2010).

Quantitative approaches are often considered to be located within the positivist paradigm or the post-positivist paradigm. Unlike the interpretive paradigm, which rejects the view that meaning exists in the world independently of people's, and thus also the researcher's, consciousness and interpretation (Creswell, 2014; Williams, 2000), positivists seek an objective reality based on careful observations and measurements. Knowledge constitutes hard data, is objective, and is therefore independent of the values, interests, and feelings of the researcher (McPherson et al., 2015). However, in the post-positivist paradigm, it is recognised that hypotheses and background knowledge held by the researcher can strongly influence what is observed, how it is observed, and the outcome of what is observed (Guba, 1990). The epistemology of objectivity is therefore also abandoned in post-positivism in the recognition that objectivity can never be fully attained; it is always 'someone's' reality (Racher & Robinson, 2002). In this PhD study, statistically significant associations and differences were found using a quantitative approach. However, these were results found by a team of researchers, with data collected in specific contexts, scales that were developed by people with their own assumptions and interpretations, and statistical tests that are themselves based on sets of assumptions (Shadish et al., 2001). Both the qualitative and quantitative approaches in this PhD study therefore shared the common notion that the known and the knower cannot be separated, and that knowledge is gained through 'lived experience'.

The philosophical point of view in this thesis does not imply that quantitative and qualitative approaches have identical epistemological perspectives. Instead, it implies the belief that knowledge in educational research may be broadened and strengthened by data collected by different methods. Qualitative and quantitative approaches, originally rooted in different epistemological perspectives, are seen as complementary ways of doing educational research.

4.3 Design of the simulation training

The simulation training described in all four appended papers included briefing, patient scenarios, and debriefing. The elements from the NLN Jeffries simulation theory that were specifically considered in designing the simulation training relate to providing clear objectives, fidelity level, and reflective debriefing. Elements were also taken from educational practices focused on promoting active learning and collaboration and soliciting feedback from facilitators and peers (Jeffries et al., 2015; Jeffries & Rodgers, 2021).

The simulation training was designed by the PhD candidate in collaboration with educators of first-year nursing students at a university college and aimed at promoting students' observation, physical assessment, problem-solving, decision-making, and reflection skills. Expected learning outcomes and suggested learning situations from the first-year programme for clinical practice in nursing homes served as the basis for developing the scenarios and learning objectives for the simulation training (Appendix 1).

The students attended the simulation training in groups of a maximum of 10 students and received information about the scenarios and learning objectives approximately one week prior to the simulation training, as recommended in the guiding literature (Jeffries & Rogers, 2012). They also received suggestions about relevant reading material from their syllabus to prepare themselves for the simulation training.

All simulation training included a briefing, followed by the patient scenario using an HPS (NursingAnne®; Laerdal™) as the patient, and finally, a facilitated debriefing, as recommend (INACSL, 2016c; Jeffries & Rodgers, 2021). Each simulation training had a timeframe of three hours, and all the facilitators involved were experienced with simulation training. Facilitator guides containing instructions for the simulation training were written by the PhD candidate to standardise the different phases of the simulation training and to decrease the confounding effects of multiple facilitators.

In the briefing, the facilitators aimed to create a welcoming atmosphere and prepared the students for the scenario to reduce students' possible performance anxiety (McDermott, 2016; Zull, 2002). During the scenarios, the students were assigned roles as nurses and observers. The observers took notes about the events in the scenario related to the learning objectives. This was done to transition the observers from simply watching to actively observing (Kolb, 2015; O'Regan et al., 2016).

The scenarios required the ability to merge theoretical and practical knowledge to assess and act in accordance with the simulated patients' needs. The scenarios were adjusted to the students' syllabi, earlier classroom lectures, and skills training and linked to an actual situation in a nursing home. However, the scenarios were made challenging to provide the participants with the possibility of testing and expanding their capabilities in patient situations, reflecting the reality of complex nursing home patients. To create an appropriate challenge while still allowing the students to be successful (Lindsey & Berger, 2009; Zull, 2002), the patients' main diseases were chosen from the first-year students' syllabus. During the scenarios, the facilitators were instructed not to intervene if the students omitted specific types of care or made flawed clinical decisions. This was done to not interfere with the students' problem-solving efforts and prevent the students from taking on a more passive role (Jeffries & Rogers, 2012; Kolb, 2015). However, the students could take a 'time out' during the scenario if they were stuck and needed to reason with each other or needed cues from the facilitator. A high level of fidelity was incorporated into the scenarios by using an HPS and ensuring that the vital signs of the HPS reflected the patient's diagnosis, ensuring an environment designed to replicate nursing homes, and promoting student engagement (Hamstra et al., 2014; Huston et al., 2018; Jeffries & Rodgers, 2021).

In the debriefing, the facilitators let the students explore the scenario, but they also provided input on the discussion and feedback on the basis of their experience, expertise, and training. The facilitators ensured that relevant issues that occurred during the scenarios were identified and discussed and that all participants (those who held roles as nursers and observers) contributed actively to the debriefing. Additionally, the facilitators ensured that the reflections did not go off track and made sure that feedback from both facilitators and peers during the simulation training was constructive and conveyed in a positive way (Ganley & Linnard-Palmer, 2012; Jeffries & Rodgers, 2021). Since observation and assessment of vital signs and management of patients' physiological deterioration are generic nursing competencies (Ministry of Education and Research, 2019), the overall objective for all scenarios was to apply the nursing process systematically while encountering different patient situations.

To not 'give away' the scenarios before they started, only those objectives that provided general information and context for the students were disclosed prior to the simulation training to enhance the students' opportunities to learn and to recognise when they needed to apply prior learning (Kolb, 2015; Lioce et al., 2015). However, the facilitator could guide the students towards identifying specific performance objectives and expected actions related to each of the scenarios during the debriefing. An overview of the scenarios and the patient situations and objectives presented to the students are presented in Table 1.

Scenarios used in the simulation training			
	Scenarios	Situation presented to the students	Objectives presented to the students
Scenario 1	Nursing home patient with chronic pulmonary disease deterioration	Nursing home patient, female, 75 years old, sufferers from COPD, uses Ventoline 2 mg x 4 administered by inhalation. The patient is anxious. Her skin is warm and sweaty.	-Perform relevant clinical observations and measure vital signs
Scenario 2	Nursing home patient with dementia, developing delirium caused by urinary retention	Nursing home patient, male, 89 years old with a mild degree of dementia and chronic urinary retention. A permanent catheter and a urine sample for bacteriological cultivation are ordinated. The patient's behaviour has changed, with deteriorating confusion. The patient has been given Stesolid 2 mg without effect.	-Identify the patient's problems, needs, and possible complications -Make clinical decisions, prioritise actions based on vital sign assessments, knowledge, and trained skills
Scenario 3	Administrati on of medications to a nursing home patient with left	Nursing home patient, male, 75 years old, sufferers from a left ventricular heart failure. The patient uses heart medications, and is scheduled for his intramuscular injection with B12	-Evaluate the effect of actions and make

	ventricular heart failure	depot 1 mg. The patient is not cooperating and seems to struggle with his breath while lying down. He does not want his medication.	decisions about further actions

Table 1 – The scenarios and specified learning objectives

4.3.1 The simulation training – Papers I and III

The simulation training described in Papers I and III included Scenario 1 (Table 1) and was piloted with enrolled first-year students at the university college in 2015. By the time of the data collection (Paper I: 2016, Paper III: 2019), this simulation training was implemented as a mandatory supplement for all first-year students after their clinical practice in nursing homes.

Nurse educators at the university college facilitated the simulation training. All students held the roles of both nurses and active observers by repeating the scenario twice and switching roles. To guide the debriefing phase of the simulation training, the descriptive, analytic, and application phases described by Steinwachs (1992) were used as the debriefing approach. During the descriptive phase, the students were asked to describe what had happened in the situation, and what their principal challenges were. In the analytic phase, the students were encouraged to explore what decisions they had made and why they had made them. They were also challenged to analyse the situation theoretically and to explore parallels with real-world situations. During the application phase, the students were asked to reflect on how they could improve their nursing care and decision-making activities in future patient encounters based on their experiences and new understandings.

4.3.2 The simulation training combined with clinical practice – Papers II and IV

The students who received the combined practice model attended simulation training on three separate days during their seven weeks of clinical practice in nursing homes, and Scenarios 1, 2, and 3 were used (Table 1). In relation to Paper II, the students used three of their self-study days during the practice period to attend the simulation training. In relation to Paper IV, the students were allowed 3 days of absence from the nursing homes to attend the simulation training (a partial replacement of 10.7% of traditional clinical practice) (Figure 3).

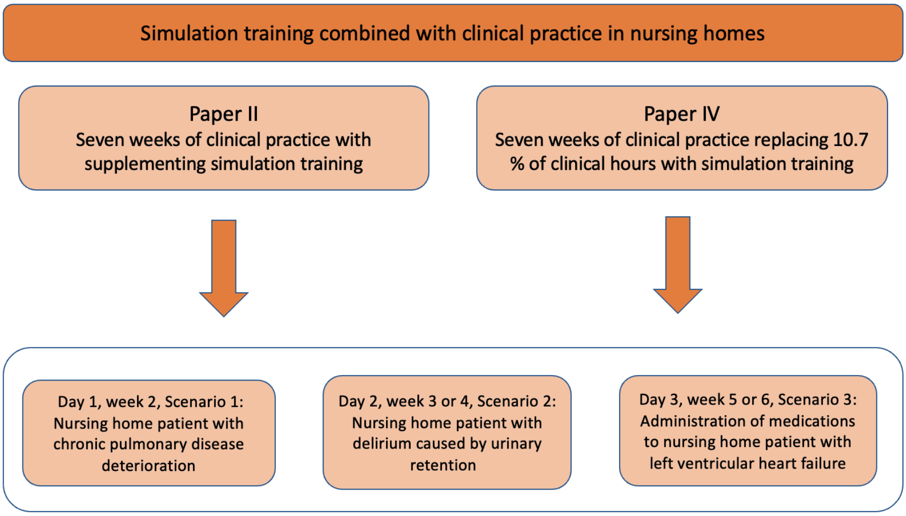

Figure 4 – The combined practice model for Papers II and IV.

The students were assigned roles as nurses in at least one of the three scenarios. Promoting active learning, ensuring that all participants actively engaged in all phases of the simulation training, and focusing on the learning objectives were especially emphasised.

All the facilitators had formal facilitator education. In the qualitative study (Paper II), the PhD candidate held the role of facilitator, while in the quantitative study (Paper IV), two assistant professors at the university college served as facilitators (the fifth author of Paper IV and an additional assistant professor not involved in the study). None of the facilitators or researchers were involved in any evaluation or grading of the participants.

The reaction, description, analysis, and application phases described in PEARLS were used to guide the debriefing (Eppich & Cheng, 2015). This debriefing framework was chosen for the combined practice model because it is a blended approach that allows the facilitator to tailor their strategy in the analysis phase based on the level of insight and experience of the students (Eppich & Cheng, 2015). This approach to debriefing is in line with Kolb (2015), who states that a teacher can intervene when learning seems stalled, but as the students begin to progress again, it is time to withdraw. In the reaction phase, the students were asked to share their reactions and how they felt immediately after the simulation scenario. In the description phase, the students were asked to summarise their perspectives on key events or problems faced during the scenario to ensure a shared understanding of the main elements of the scenario. In the analysis phase, the students were challenged to analyse the situation theoretically and to systematically examine the scenario, what aspects were managed effectively, and aspects that were more challenging. Once issues were identified, the facilitator promoted more in-depth discussions to close performance or knowledge gaps, but they could also provide feedback and teaching as appropriate if issues were not resolved in the discussions (Eppich & Cheng, 2015). In the application phase, the students were encouraged to provide suggestions on how they could improve their nursing care and decision-making abilities in future patient encounters based on their new knowledge.

4.4 Design and methods

An overview of the designs, data collection methods, and data analyses used in the four appended papers is presented in Table 2.

Paper	Design	Data collection method	Data analyses
Paper I	Cross-sectional	Self-reported questionnaire	Descriptive and correlation statistics
Paper II	Qualitative descriptive	Focus group interviews	Systematic text condensation
Paper III	Cross-sectional with a Longitudinal component	Self-reported questionnaire	Validity and reliability statistics
Paper IV	Experimental and descriptive survey-based comparison	Knowledge test and self-reported questionnaires	Descriptive and inferential statistics

Table 2 – Overview of designs, data collection methods, and data analyses

4.4.1 Sampling, participants, and setting

Self-selected nonprobability sampling techniques (convenience and purposive sampling) were used to recruit participants in relation to all four appended papers. A nonprobability sampling technique means that the researchers use non-random criteria, such as the availability, geographical proximity, or expert knowledge of the individuals they want to research, to answer a research question (Etikan et al., 2016). A sample is self-selected when inclusion or exclusion are determined by whether the students themselves agree or decline to participate in the sample (Lavrakas, 2008). In relation to Paper IV, the self-selected sample was randomly assigned to either an intervention or a control group.

For practical and resource reasons, participants from a university college at which some of the researchers were employed were chosen. The participants were all first-year students in their second semester of the Bachelor of Nursing Education programme, and all the simulation training was held at the university college's simulation lab. The participating students came from the pool of enrolled first-year students over a period of four years. None of the participating students had previous simulation training experiences. An overview of the participants related to each paper is presented in Table 3.

Paper	Participants	Age	Female/Male
Paper I	n = 187	24.21 (mean)	90/10 %
Paper II	n = 27	24.51 (mean)	96.3/3.7 %
Paper III	n = 122	23.26 (mean)	84.6/16.4 %
Paper IV	Intervention: n = 52 Control: n = 45	23.08 (mean) 22.51 (mean)	90.4/9.6 % 87.7/12.3 %

Table 3 – Paper, number of participants, mean age, and gender.

The design and methods used for each paper are elaborated in the following headings.

4.4.2 Paper I

Objective

The objective was to identify elements in simulation training associated with nursing students' satisfaction with the simulation activity and self-confidence in managing the simulated patient situation.

Design

A cross-sectional study design was used since the study's intention was to identify associations, not to prove causality (Mann, 2003).

Sample and recruitment

First-year students enrolled at the university college in the spring of 2016 (n = 202) were invited to participate, and 187 (92.6%) volunteered after attending the simulation training that included Scenario 1 (Table 1). Information about the study was sent by e-mail by the PhD candidate one week before the simulation training commenced. As no personal information or demographics of the participants were collected, the participants' mean age and gender distribution were estimated based on the university college's public student register of enrolled first-year students (Table 3).

Questionnaire

Permission to use the Norwegian version of the NLN questionnaire (Appendix 2) was obtained. The questionnaire contains three student self-reported measurement instruments that are theoretically grounded in and reflect elements in the NLN Jeffries Simulation Theory: the Student Satisfaction and Self-Confidence in Learning Scale (SSSCL), the Simulation Design Scale (SDS), and the Educational Practices Questionnaire (EPQ).

The SSSCL is a 13-item questionnaire designed to assess student satisfaction and self-confidence after attending simulation training (Jeffries & Rizzolo, 2006). The scale consists of satisfaction with current learning (five items) and self-confidence in learning (eight items). The responses are graded from 1 (strongly disagree) to 5 (strongly agree) on a five-point scale.

The SDS questionnaire is a 20-item questionnaire designed to evaluate the presence and importance of five central simulation design elements (National Leauge of Nursing, 2020): objectives and information (five items), support (four items), problem solving (five items), feedback/guided reflection (four items), and fidelity/realism (two items) (Jeffries & Rizzolo, 2006).

The EPQ is a 16-item questionnaire designed to evaluate the presence and importance of four central elements of educational practices in simulation training (National Leauge of Nursing, 2020): active learning (10 items), collaboration (two items), diverse ways of learning (two items), and high expectations (two items) (Jeffries & Rizzolo, 2006).

Responses related to the presence of elements in simulation design (SDS) and in educational practices (EPQ) are graded from 1 (strongly disagree) to 5 (strongly agree) on a five-point scale, in addition to the alternative 'Not applicable'. Responses related to the importance of elements in simulation design (SDS) and in educational practices (EPQ) are graded from 1 (not important) to 5 (very important) on a five-point scale.

Respondent subscale scores (on a scale of one to five) in all three instruments are calculated by summing the respondent's answers to the items included in a subscale and dividing that sum by their number of answers on the subscale.

<u>Data Collection</u>

A paper version of the NLN questionnaire was administered to the students by the facilitators after they finished the simulation training and collected in sealed boxes. Those who did not agree to participate either left or stayed and delivered an empty questionnaire. The questionnaire took 15 minutes to complete.

<u>Data analysis</u>

IBM SPSS Statistics, version 22 was used. Student satisfaction and self-confidence (SSSCL) mean scores and standard deviations (SD) were calculated as well as the presence and importance of educational practices (EPQ) and simulation design (SDS) mean scores and SD. Missing data were, on average, 0.45% (SSSCL), 1.8% (SDS), and 2.1 (EPQ). The 'not applicable' responses in the SDS and EPQ were relatively low, occurred randomly (SDS 0.8%, EPQ 2.9%), and were treated as missing data in the analyses. To explore significant associations between the independent variables (nine variables from the SDS and the EPQ) and the dependent variables (two variables from the SSSCL), multiple linear regression analyses were used. The dependent and independent variables are presented in Table 4.

Instruments	Elements/variables	Items
	Independent variables	
Simulation Design Scale (SDS)	*Objectives and information*	5
	Support	4
	Problem solving	5
	Feedback/guided reflection	4
	Fidelity (realism)	2
Educational Practices Questionnaire (EPQ)	*Active learning*	10
	Collaboration	2
	Diverse ways of learning	2
	High expectations	2
	Dependent variables	
Student Satisfaction and Self-confidence in Learning Scale (SSSCL)	*Satisfaction with current learning*	5
	Self-confidence in learning	8

Table 4 – Dependent and independent variables

Regression analyses: The sample size of 187 was within an acceptable size for regression analyses (Field, 2018; Tabachnick & Fidell, 2013). Multiple linear regression analysis was chosen because this technique is useful for quantifying the strength of associations between multiple variables (Field, 2018; Lavrakas, 2008). Forced entry was chosen, as the independent variables from the SDS and the EPQ were elements drawn from the NLN Jeffries Simulation Theory (Jeffries & Rogers, 2012; Polit & Beck, 2017). The independent variables significantly associated with satisfaction and self-confidence (SSSCL) were also tested using stepwise regression, but this procedure yielded no outcome other than forced linear multiple regressions.

Data analyses for testing assumptions of multiple linear regression: The dependent variables and independent variables were modestly skewed towards the right but considered normally distributed. A linear relationship between the dependent and independent variables (Field, 2018) was confirmed by creating scatterplots and partial regression plots. Multicollinearity was tested through correlational bivariate analyses and a test for variance inflation factors (VIF) (Field, 2018). The independent variables were considered eligible for inclusion;

the correlation coefficients were below 0.6, and no VIF values exceeded 2.2 (Bowerman & O'Connel, 1990; Field, 2018). The Durbin–Watson statistic was used to test whether the values of the residuals were uncorrelated (Field, 2018; Lavrakas, 2008), and gave values close to the non-correlation value of 2 (Field, 2018): 1.9 with satisfaction as the dependent variable, and 2.1 with self-efficacy. Pearson correlation was used to test for homoscedasticity in the data (Field, 2018). With self-confidence as the dependent variable, the correlation value of 0.04 was non-significant ($p = 0.6$), indicating homoscedasticity in the data. With satisfaction, the correlation value of 0.36 was significant ($p < 0.001$) but weak.

4.4.3 Paper II

Objective

The objective was to explore nursing students' experiences with supplementary simulation training as a tool to support learning during clinical practice in nursing homes.

Design

A qualitative descriptive design was chosen. By using this design, the researchers stay close to the data and to the surfaces of words and events (Bradshaw et al., 2017; Sandelowski, 2000).

Sample and recruitment

A total of 350 first-year students over a period of two years (2017 and 2018) were informed both orally and by e-mail of the study by the PhD candidate. They were informed that participation included attending simulation training using three of their self-study days during their upcoming clinical practice in nursing homes (the combined practice model), followed by a focus group interview. Students could report their interest in participation by voluntarily sending the PhD candidate an e-mail.

A purposeful random sampling strategy was used because the number of volunteering students was expected to be greater than could be studied due to the resources available and the nature of the research design and aim (Palinkas et al., 2015; Patton, 2015). The students were informed that the participants would be randomly selected by individuals not involved in the study from among those who reported their interest to the PhD candidate. In 2017, 20 students reported their interest, and 10 participants were randomly selected before the clinical practice period commenced in January. In 2018, 51 students reported their interest, and 10 (attending their clinical practice period in January) and 10 (attending their clinical practice period in March) were randomly selected. Written informed consent was obtained from the participants. Three participants left the nursing education programme in 2018, leaving a total of 27 participants (in 2017: n = 10, and in 2018: n = 9 and n = 8).

Data Collection

Data were collected through three focus group interviews held at the university college at the end of each clinical practice period, one in the spring of 2017 and two in the spring of 2018. The focus group sizes of eight to ten participants were within the recommended group sizes for focus groups (Malterud, 2012a; Polit & Beck, 2017). Focus groups were chosen because the researcher can take a peripheral role in moderating discussions, enabling the participants to explore the issues of importance to them, generate their own questions, and pursue their own priorities (Kitzinger, 1995; Krueger & Casey, 2015). This interactive process of sharing and comparing perspectives and engaging in discussions generated by other group members may yield more insights than the equivalent number of individual interviews (Kitzinger, 1995; Krueger & Casey, 2015).

A semi-structured interview guide was used to initiate dialogue and maintain focus on the discussions during the focus group interviews. The literature on qualitative interviews (Brinkmann & Kvale, 2015) guided the development of the interview guide (Appendix 3). The main question for the discussions was how the participants experienced simulation training combined with clinical practice in nursing homes. Additionally, a few predetermined questions related to the students' learning and learning outcomes in the two environments were formed. However, the moderator had the freedom to follow a line of inquiry or other issues of relevance introduced by the participants (Hsieh & Shannon, 2005). The PhD candidate acted as the moderator, along with an assistant moderator not involved in the study in the first focus group. In the second and third groups, the fourth author of Paper II acted as the assistant moderator. The interviews were audio recorded and lasted from 1 hour to 1 hour and 19 minutes.

Data analysis

Data transcription was performed by the PhD candidate word by word. Pauses, laughter, and confirming sounds from the others were marked with notes. The recordings were deleted after transcription. The transcribed data were analysed inductively as a collective effort by the research team using systematic text condensation (STC) (Malterud, 2012b). STC was chosen because it is a descriptive approach, presenting the experiences of the participants closely as expressed by themselves rather than exploring the possible underlying meanings of what was said (Malterud, 2012b).

Investigator triangulation was applied to enhance the intersubjectivity and credibility of the findings (Krueger & Casey, 2015). In the first step of the data analysis, the transcripts were read several times by the researchers to get an impression of the whole and to identify preliminary themes guided by the aim of the study. Three preliminary themes were discussed and adjusted within the research team. In the second step, meaning units were identified by reading the transcripts line by line and marking them with codes related to the negotiated themes. The codes were then used to organise the related meaning units into three code groups. In the third step, the meaning units were sorted into two subgroups in each code group by the research team. The subgroups within each code group were changed several times during this process because many of the meaning units could fit into more than one of the initial subgroups, indicating that the groups were too similar. Eventually, the meaning units within each subgroup were reduced to a condensate, maintaining as far as possible the original terminology applied by the participants. In the fourth step, the content of each code group was summarised under three categories to generalise descriptions and examine those descriptions against the empirical data. The result was an analytic text presenting the most salient content and meaning.

4.4.4 Paper III

Objective

The objective was to translate the CLECS into Norwegian and evaluate the psychometric properties of the Norwegian version.

The original CLECS

The CLECS is specifically designed to examine and compare students' perceptions of how well clinical learning needs are met in a simulated versus a clinical environment (Leighton, 2015). The CLECS, as presented by the developer Leighton (2015), consists of six subscales representing areas of students' learning needs related to aspects of patient care: communication (four items), nursing process (six items), holism (six items), critical thinking (two items), self-efficacy (four items), and the teaching–learning dyad (five items) (Leighton, 2015). For each item, responses are graded from 1 (not met) to 4 (well met) on a four-point scale, in addition to the alternative 'not applicable'. For each item, the students set a score for both the clinical environment and the simulated environment, which allowed an evaluation of each environment score separately and a comparison to be made between the environment scores (Leighton, 2015). The content validity of the original CLECS was established by the developer through collaboration with an expert panel. Its internal consistency was verified using Cronbach's alpha, and a confirmatory factor analysis (CFA) confirmed the construct validity of the six-factor model (Leighton, 2015).

There is no established method for scoring the CLECS. In the present study, respondent subscale scores (on a scale from one to four) were calculated by summing the respondent's answers to the items included in the subscale and dividing that sum by their number of answers on the subscale. Higher scores indicate that learning needs are met, and lower scores indicate that learning needs are not met.

Translation procedure

The PhD candidate served as the translation project manager, obtained permission from the developer to translate and use the CLECS, and coordinated each stage of the translation procedure. The process of translating instruments developed by the World Health Organization (WHO) guided the translation. This method was chosen because it has been refined in the course of several

WHO studies and includes forward translation, expert panel, back translation, pre-testing, and cognitive interviewing (WHO, 2018).

Forward translation: Two forward translators were engaged to reduce the risk that the translation included too much of one person's style of writing (Wild et al., 2005). One assistant professor and one associate professor knowledgeable in English-speaking culture performed individual forward translations. They were informed by the PhD candidate that the translation should capture the conceptual meaning of the statements in the CLECS, rather than being a literal translation (WHO, 2018; Wild et al., 2005).

Expert panel: The expert panel was established to identify and resolve inadequate expressions/concepts of the translations as well as any discrepancies between the forward translations and the original version of the questions (WHO, 2018). The expert panel consisted of a professor who was an experienced translator, two forward translators, an assistant professor experienced in developing and translating instruments, and two additional assistant professors experienced with simulation training. The expert panel reviewed the translations, made critical decisions, and reached a consensus, resulting in one complete translated version of the CLECS (Epstein et al., 2015).

Back translation: Back translation was performed to ensure that the same meaning persisted when the translation was conveyed back into the source language (WHO, 2018). A professional English translator performed the back translation. The back translator was fluent in Norwegian, had no former knowledge of the CLECS, and did not see the source or any version in another language (Wild et al., 2005). The back translation of the CLECS was sent to the survey developer. In one item (Item 14: discussing the patient's developmental needs), the developer expressed that the two versions differed in conceptual meaning, and the wording was subsequently changed by the expert panel.

Pretesting and cognitive interviewing: Six second-year students familiar with simulation training pretested the CLECS (Norwegian version) with a subsequent focus group interview. The last author of Paper III, who was experienced with qualitative interviewing techniques (WHO, 2018), held the role of interviewer in collaboration with the PhD candidate. Alternative words or expressions were discussed, and the students agreed that the ones chosen conformed best to their language. Under the subscale 'nursing process', the students preferred that patient *problem* should be changed into patient *problems* because patients usually have more than one problem. 'Problem' was therefore changed into 'problems', which also corresponded better to the original version.

Psychometric testing of the CLECS (Norwegian version)

The CLECS (Norwegian version) was finalised in February 2019 (Appendix 4). Questions including age, gender, and whether the respondents were willing to be contacted for a retest were added to the survey.

Design

A cross-sectional design, which included a longitudinal component to extend the observations of the same respondents beyond a single moment and employ statistical testing to analyse changes over time, was used (Caruana et al., 2015).

Sample, recruitment, and data collection

First-year students enrolled at the university college in the spring of 2019 (n = 139) who had completed clinical practice in nursing homes and had at least one simulation training experience (Scenario 1, Table 1), as suggested by the developer of the CLECS (Leighton, 2015), were invited to participate. Information about the study was given orally and by e-mail by the PhD candidate one week before the simulation training commenced. Those who volunteered (n = 122, 87.8%) signed a written informed consent form and answered paper versions of the CLECS, which were distributed by the facilitators after the simulation training and collected in sealed boxes. The survey took from 10 to 15 minutes to complete. A retest was distributed electronically after 14 days by the PhD candidate to those who accepted a retest (n = 89) and provided their e-mail addresses at baseline. The e-mail addresses were recoded as ID numbers on the returned retests (n = 40, 45%).

Data analysis

The data were analysed using IBM SPSS Statistics Version 26 and AMOS Graphics (an IBM SPSS module). Missing data were, on average, 1.4%, ranging from 0 to 4.1%, counting both the simulated and the clinical environments. Frequency on item level of the alternative ‘not applicable’ in the data from the clinical environment occurred randomly and was, on average, 0.76%. In the data from the simulated environment, high frequencies of the alternative ‘not applicable’ were found on four items: Item 2, *Communicating with interdisciplinary team* (22.1%), Item 4, *Providing information and support to patients’ families* (53.3%), Item 15, *Discussing patients’ spiritual needs* (47.5%), and Item 16*, Discussing patients’ cultural needs* (49.2%). Due to these high ‘not applicable’ frequencies, the psychometric analyses were based on data from the clinical environment.

Construct validity: CFA was used to determine how the hypothesised six-factor model of the CLECS fitted our data by using goodness-of-fit indices as evidence of construct validity (Shek & Yu, 2014; Sun, 2005). The hypothesised six-factor model and number of corresponding items in the CLECS are presented in Table 5.

Instrument	Subscales (factors)	Items
The CLECS	*Communication*	4
	Nursing process	6
	Holism	6
	Critical thinking	2
	Self-efficacy	4
	Teaching-learning dyad	5

Table 5 – The hypothesised factor model and number of corresponding items in the CLECS

The chi-square/degrees of freedom-ratio ($\chi 2$/df), *p*, comparative fit index (CFI), root mean square error of approximation (RMSEA), and p_{close} were used as goodness-of-fit indices. A $\chi 2$/df ratio of two or below was considered acceptable (Byrne, 1989; Carmines & Mclver, 1981). The chi-square value and model degrees of freedom calculate a *p*-value used to reject a null hypothesis representing perfect fit; thus, the *p*-value should exceed 0.05 (Browne & Cudeck, 1993). The CFI was considered acceptable at 0.9 (Bryant & Yarnold, 1995). An RMSEA value of 0.06 or less was considered indicative of an acceptable model fit (Sun, 2005). The p_{close} was used to test the hypothesis that the RMSEA was greater than 0.05. Thus, a non-significant p_{close} would indicate that the fit of the model was 'close' (Schermelleh-Engel & Moosbrugger, 2003).

Internal consistency and test-retest reliability: Cronbach's alpha values exceeding 0.7 were classified as good (Streiner, 2003). Whether all items contributed to the scales they were assumed to belong to was determined by computing the Cronbach's alpha value if the item was deleted. Additionally, it was checked whether all items were more highly correlated with the factor they were assumed to belong to (CITC) than with any other factor. Test-retest reliability was assessed by the intraclass correlation coefficient (ICC) (Liu et al., 2016). ICC estimates with 95% confidence intervals were calculated based on a single-rater measurement, absolute agreement, and two-way mixed-effects model. ICC values lower than 0.5 were considered indicative of poor test-retest reliability, values between 0.5 and 0.75 of moderate reliability, values between 0.75 and 0.9 of good reliability, and values greater than 0.9 of excellent reliability (Koo & Li, 2016).

4.4.5 Paper IV

Primary objective

The primary objective was to examine nursing students' knowledge acquisition and self-efficacy in integrating a partial replacement of clinical hours in nursing homes with simulation training.

Secondary objective

The secondary objective was to examine perceptions of how learning needs were met in the simulated versus the clinical environment.

Design

An experimental design with pre- and post-test comparisons of an intervention group versus a control group was used to examine knowledge acquisition and self-efficacy. The experimental design was chosen because it is the best research approach available for testing cause-and-effect relationships through the use of controls imposed by manipulation (the combined practice model), comparison (the use of a control group), and randomisation (every student had an equal chance of being assigned to any group) (Polit & Beck, 2017; Shadish et al., 2001). How learning needs were met in the simulated versus the clinical environment were investigated using a descriptive survey-based comparison in the intervention group.

The intervention group attended the seven-week practice period of 224 hours in nursing homes, of which 24 hours (10.7%) were replaced by simulation training, while the control group attended the traditional seven-week practice period of 224 hours in nursing homes.

Questionnaires

A knowledge test specifically designed for the purpose was used, as no appropriate knowledge tests were located in the literature. The test covered nursing knowledge that was integrated into the students' syllabus and in learning outcomes for clinical practice in nursing homes (Appendix 1). Neither of the two facilitators involved in delivering the simulation training knew the content of the knowledge test; thus, they could not affect the results in that way.

Previous simulation research has used both multiple-choice tests and true or false statements to measure knowledge acquisition (Guillaume et al., 2014; Haddeland et al., 2021). Therefore, the PhD candidate, in collaboration with an assistant professor at the university college, both experienced in making questions for student exams, developed 100 knowledge questions containing both true or false statements and multiple-choice questions. These were tested on eight third-year and seven first-year students to solicit comments and views on the content, degree of difficulty, and structures of the questions. The students expressed that the true and false statements and some of the multiple-choice questions were too easy, and that the test was extensive and time consuming. The test was therefore reduced to 30 questions, all composed as five-option, text-based questions. The components of each question were as follows:

- The stem of the question, which included a situation or described the patient, the patient's problem or health care needs, and a question, or an incomplete statement.
- Three incorrect answers and a 'don't know' alternative.
- The correct answer.

The correct answer was the only choice that gave 1 point (in a score range from 0 to 30 points). A panel of experts comprising four assistant professors was consulted to ensure the content validity of the knowledge test (Polit & Beck, 2017). Questions, content, and whether desirable knowledge was covered in the test were discussed. Four second-year students were then asked to evaluate the structure and meanings of the questions, wording, and test instructions (Willis, 2005). They recommended that study participants be informed that the content of the test was difficult. This was noted, and at the time of the pre-and post-tests, it was repeated that the results would not be used to evaluate individual performance. The knowledge test was finalised in the spring of 2019 (Appendix 5) and piloted in a group of 15 second-year nursing students. Based on their scores, a provisional SD was estimated (mean score 16.7, SD 3.9). Respondent scores on the knowledge test, were calculated on a scale of 0 to 30 by summing the respondent's correct answers to the questions.

The Norwegian version of the General Self-Efficacy Scale (GSE) (Appendix 6), which is a 10-item psychometric scale designed to assess optimistic self-beliefs to cope with difficult demands, was used to measure self-efficacy (Røysamb et al., 1998). The GSE was originally developed in the German language (Jerusalem & Schwarzer, 1992; Schwarzer & Jerusalem, 1995). The GSE is a one-dimensional scale based on the construct of self-efficacy at a generalised level and not for specific tasks (Kusurkar, 2013; Schwarzer & Jerusalem, 1995), and it is commonly used to examine the impact of simulation training on self-efficacy (Kameg et al., 2010; Li et al., 2019; Saied, 2017). The response options in the GSE are presented along a 4-point scale, from 1 (not at all true) to 4 (exactly true) for each item. Respondent scores on a scale of 10 to 40 are calculated by summing the respondent's answers to yield a total score. Higher scores indicate higher perceived general self-efficacy, while lower scores indicate lower perceived general self-efficacy (Artino, 2012).

The Norwegian version of the CLECS, as described in Paper III, was used to measure perceptions of how learning needs were met (Appendix 4).

Sample and recruitment

Group sample sizes were estimated for both the knowledge test and the GSE using the following formula: $n = 2 \times (SD: \Delta)^2 \times k$, where n stands for the number of participants in each group, SD is the SD of the observations, Δ is the difference one wishes to detect, and *k* is a constant that depends on the selected significance level and test strength (Lindbæk & Skovlund, 2002). Two-sided tests at the 5% level and a test strength of 80% were chosen and yielded *k* = 7.9 (Lindbæk & Skovlund, 2002). Based on the pilot testing of the knowledge test, the SD was estimated at 3.9, and Δ was set to a difference of three points. Using the formula ($n = 2\,(3.9{:}\,3)^2 \times 7.9 = 26.7$), the result was 27 participants in each group. Regarding self-efficacy, Δ was set to a difference of three points and SD at 4.8 based on the mean results of two previous pre- and post-test simulation studies using the GSE (Kameg et al., 2010; Li et al., 2019). Using the formula ($n = 2\,(4.8{:}\,3)^2 \times 7.9 = 40.4$), the result was 40 participants in each group. The estimated group sample sizes were confirmed by a statistician.

In August 2019, the first-year students were informed orally by the PhD candidate about the upcoming study scheduled for the spring of 2020. They were informed that those who reported their interest by voluntarily sending an e-mail to the PhD candidate would be randomly assigned to either an intervention or a control group. They were also told about the combined practice model and pre- and post-test observations. The initial plan was to recruit participants from both first-year classes (A and B). However, due to the coronavirus pandemic, which closed the university college in the spring of 2020, only one class (A) was able to complete participation. Of the 116 (n = 116) students (A), 103 agreed (n = 103, 88.8%), signed a written informed consent form, and were randomly assigned to either the intervention (n = 52) or control (n = 51) group. Randomisation was performed by the university administration staff using the random *between* function in Microsoft Excel. Three students from the control group left the education programme before the pre-test.

<u>Data Collection</u>

Pre- and post-tests were completed by both groups in a large auditorium at the university college one week prior to and one week following the clinical practice period, respectively. The questionnaires were electronic and made in a way that prevented missing items, and they took from 40 to 55 minutes to complete. An overview of the data collection is presented in Table 6.

Group	Pre-test before the practice period in January 2020	The practice period of seven weeks	Post-test after the practice period in March 2020
Intervention	Knowledge test General Self-Efficacy scale	Clinical practice with simulation in weeks two, four, and six	Knowledge test General Self-Efficacy scale CLECS (Norwegian version) *
Control	Knowledge test General Self-efficacy scale	Traditional clinical practice	Knowledge test General Self-efficacy scale
*CLECS: Clinical Learning Environment Comparison Survey			

Table 6 – Data collection, instruments, and different time points

Data analysis

IBM SPSS Statistics Version 26 was used. Students who missed the post-test were excluded from the analyses. The post-test was completed by 88 of the 97 students who completed the pre-test (90.7%). Among these, 50 students were in the intervention group and 38 in the control group, with dropout rates of 3.8% and 20.8%, respectively. The 'not applicable' responses on the CLECS occurred randomly, were relatively low (CLECS 3.2%), and were treated as missing data in the analyses.

Descriptive statistics provided means and SDs for continuous variables and frequencies/proportions for categorical variables. Analyses to detect differences within and between the groups were performed using paired sample *t*-tests and independent sample *t*-tests (two-tailed) (Polit & Beck, 2017). Effect sizes were calculated to assist in the interpretation of the results' practical significance (Kirk, 2001). Cohen's *d* (which uses pooled standard deviations) was used to calculate the effect sizes within the groups (Lenhard & Lenhard, 2016). Because of unequal group sizes, Hedges' g (which uses pooled weighted standard deviations) was used to calculate the effect sizes between the groups (Lenhard & Lenhard, 2016). To interpret the effect size results, Cohen (1988) was used: small effect = 0.2, medium effect = 0.5, and large effect = 0.8.

Data analyses for testing assumptions for t-tests: Shapiro-Wilks tests were used to test whether pre- and post-test scores were approximately normally distributed within the groups (Frost, 2020), and *p*-values above 0.05 indicated a normal distribution. Regarding normality in the scores of how learning needs were met, histograms indicated that the assumption of normality was reasonably met. The assumption of homogeneity of variance was tested using Levene's test of equality of variances (Field, 2018). The *p*-values were greater than 0.05, and the group variances were therefore treated as equal (Frost, 2020).

4.5 Ethical considerations

This PhD study followed accepted ethical standards and implied no risk of harm to students or others. The Norwegian Centre for Research Data (NSD) was contacted by phone for advice concerning the need for written informed consent regarding Paper I. Since no personal information was collected, they argued that their approval was not needed and that participants gave their consent simply by answering the questionnaire. NSD approved the research for Papers II, III, and IV (Appendixes 7, 8, and 9), and written informed consent was obtained from the participants. The data collected were anonymised and stored according to the rules of NSD and could not be traced back to the participants. The questionnaires and written informed consent forms were stored in a locked safe in a locked office, and only the PhD candidate had access to the questionnaires and consent forms. The respondents to the electronic questionnaires were given different codes instead of names. The audio-recorded interviews were kept on a secured portable device provided by the university college, and only the PhD candidate had access to the recorded interviews. The interviews were deleted immediately after transcription. No names were obtained during the interviews, and each participant was given a code in writing. The students were informed that the results from the interviews would be presented at a group level, but that anonymised citations would be used in reporting, to which the participants gave their approval. Obtaining data about age and gender could have threatened anonymity, but since only the PhD candidate had access to the questionnaires, consent forms, and interviews, anonymity was ensured.

The PhD candidate informed the students about the different studies orally and/or by mail. There is a large majority of women in nursing education, and there were few male students among the participants. Because principles of voluntariness among the participants dominated the recruiting process, there were no specific efforts to recruit more male participants. However, the distribution of male and female participants reflected the normal gender distribution in Norwegian nursing education. The exception was in relation to Paper II, in which only one male student was randomly drawn from the students who reported their interest in participating. In relation to Papers I and III, the simulation settings were part of the participants' ordinary programme, which might have led the students to perceive that responding to the questionnaires was also included in the programme. Therefore, the principle of voluntariness was strongly emphasised when the questionnaires were distributed by the facilitators. However, the presence of nurse educators as facilitators may have shaped the way the volunteering students answered the questionnaires.

In relation to Papers II and IV, the students were invited to report their interest in participating to the PhD candidate by voluntarily sending the PhD candidate an e-mail to reduce the possibility that students would feel pressured to participate. In relation to Paper II, the PhD candidate facilitated the simulation training and acted as a moderator in the focus group interviews. It was taken into account that the PhD candidate held a superior role to the participants, and it was emphasised to create a relationship of trust between the PhD candidate and the participants. The participants were informed that the PhD candidate had no contact with the clinical practice sites, nurse supervisors, or nurse educators during the clinical practice period. It was also clearly stressed that the PhD candidate had no evaluation or grading responsibilities, and that what the participants shared both in the simulation training and the interviews would not have any effect on their grades or clinical evaluations. However, the randomly drawn participants from the volunteering participants knew that the PhD candidate was exploring the combined practice model. Using a detached moderator instead of the PhD candidate may have made it easier for the participants to answer honestly in the interviews.

There are also ethical issues associated with how the intervention was conducted (Papers II and IV) since not all the volunteering students were provided with simulation training, leading to inequity between the students. In the qualitative part (Paper II), only the randomly selected volunteers were provided with the simulation training due to resource issues and the qualitative design. In the last quantitative investigation (Paper IV), the control group did not receive simulation training because there was a need to balance the obligation to provide a possible beneficial intervention (the combined practice model) to all the participants, with the aim of producing information that would ultimately promote best practices among all future students. All enrolled first-year students were, however, scheduled for simulation training at the end of their second semester. However, due to the coronavirus, the simulation training scheduled for all first-year students in the spring of 2020 had to be cancelled.

5 Results

In this chapter, a presentation of the results for each of the four appended papers is presented, followed by a review of the results across the papers.

5.1 Paper I

Olaussen, C., Heggdal, K., & Tvedt, C. R. (2019). Elements in scenario-based simulation associated with nursing students' self-confidence and satisfaction: A cross-sectional study. *Nursing Open*, *7*(1), 170-179. doi:10.1002/nop2.375

The results showed that the students felt self-confident in managing the simulated patient situation (mean 4.16, SD 0.39) and were satisfied with the simulation training (mean 4.32, SD 0.44). The mean scores of the students' perceptions of the presence and importance of elements in the simulation design and educational practices were high (Table 7).

	Items	Presence of items		Importance of items	
Simulation design characteristics		Mean (n)	SD	Mean (n)	SD
Objectives/information	5	4.44 (184)	0.53	4.51 (182)	0.52
Support	4	4.54 (184)	0.55	4.55 (180)	0.57
Problem-solving	5	4.39 (184)	0.55	4.50 (180)	0.53
Feedback/guided reflection	4	4.73 (183)	0.41	4.71 (180)	0.47
Fidelity (realism)	2	4.82 (183)	0.39	4.83 (178)	0.40
Educational practices questionnaire		Mean (n)	SD	Mean (n)	SD
Active learning	10	4.39 (184)	0.41	4.34 (177)	0.49
Collaboration	2	4.90 (184)	0.26	4.68 (179)	0.55
Diverse ways of learning	2	4.55 (184)	0.54	4.52 (178)	0.55
High expectations	2	4.58 (184)	0.60	4.54 (178)	0.60
Table legends and abbreviations: SD: standard deviation					

Table 7 – Mean score of students' responses on the presence and importance of simulation design characteristics and educational practices

In the multivariate linear regression analysis with *satisfaction* as the dependent variable, active learning was significantly associated with satisfaction, explaining 35.3% of the variance ($R^2 = 0.35$, adjusted $R^2 = 0.35$, F = 11.96, $p < 0.001$). With active learning as the only independent variable, the results showed that 27.8% ($R^2 = 0.28$) of the variance in satisfaction was explained by this element.

With *self-confidence* as the dependent variable, clear objectives, support, and active learning were significantly associated with self-confidence, explaining 30.8% of the variance ($R^2 = 0.31$, adjusted $R^2 = 0.31$, F = 9.96, $p < 0.001$). Using only these three independent variables, the results showed that active learning and clear objectives were associated with self-confidence, explaining 28.1% ($R^2 = 0.29$) of the variance, while subscale support was not significantly associated with self-confidence in this part of the analysis.

We concluded that while educators should pay attention to and consider all elements in the NLN Jeffries Simulation Theory to develop a successful simulation experience, educators should be particularly concerned with providing opportunities for active learning and conveying clear learning objectives for simulation training. Since the results indicated that active learning may increase both satisfaction with the learning activity and self-confidence in managing the simulated patient situation, promoting active participation in the learning process was especially emphasised in the simulation training in the combined practice model (Papers II and IV).

5.2 *Paper II*

Olaussen, C., Aase, I., Jelsness-Jørgensen, L. P., Tvedt, C. R., & Steindal, S. A. (2020). Supplementing clinical practice in nursing homes with simulation training: A qualitative study of nursing students' experiences. *SAGE Open Nursing*, 6, 1–11. doi:10.1177/2377960820981786

Three categories of student experiences were identified:
1) Enhancing the reasoning behind care: The students expressed that the supplementary simulation training helped them gain new and broader knowledge related to the reasoning behind care in nursing homes. Through the

collective reflections in the debriefing, they explored theoretical explanations of nursing, complemented each other's knowledge, and discovered new connections between clinical experiences and theoretical knowledge. The students expressed that analysing the simulated patient situation in the debriefings made them search for and discover parallels between the simulated experiences and real patient experiences and situations at their nursing homes.

2) Transferring knowledge and experiences between the learning environments: Knowledge and skills learned in the simulation training were actively used at the nursing homes, and experiences from the nursing homes were used in the simulation training. The students expressed that they became more skilled in observing and assessing their patients at the nursing homes and in theoretically justifying their actions in real patient situations due to the simulation training. The way they were trained to approach their patients in the simulation training was used in real patient encounters, and the students expressed that the focus on integrating theory and practice in the simulation training helped them discover new learning opportunities when caring for their patients.

3) Enhancing the sense of mastery: Through the simulation training, the students discovered that they had more knowledge than they initially thought, which was described as encouraging and motivating. They gained the courage to ask their nurse supervisors more questions at the nursing homes, explored new learning situations, and felt more confident in their own knowledge and skills while practicing. The students expressed that feedback from the facilitator and peers during the simulation training reassured them and increased their feelings of confidence and mastery.

We concluded that the simulation training seemed to consolidate the students' learning, enhance their motivation, confidence, and sense of mastery, and consequently encourage their efforts to seek out new challenges, explore, and learn in both the clinical and the simulated environment.

5.3 Paper III

Olaussen, C., Jelsness-Jørgensen, L. P., Tvedt, C. R., Hofoss, D., Aase, I., Steindal, S. A. (2021). Psychometric properties of the Norwegian version of the clinical learning environment comparison survey. *Nursing Open*, *8*(3), 1254-61. doi:10.1002/nop2.742

Internal consistency

Almost all items (97%) in the CLECS (Norwegian version) were more strongly correlated with the subscale under which the hypothesised CFA model subsumed them. The Cronbach's alphas by subscale were acceptable and ranged from 0.69 to 0.89. Exclusion of any item from its own subscale did not noticeably increase Cronbach's alpha values.

Test-retest reliability

For four of the six subscales in the CLECS, the ICC exceeded 0.5, indicating moderate to good test-retest reliability. Low test-retest reliability values (< 0.5), however, were observed in the communication and critical thinking subscales at 0.41 and 0.42, respectively.

Construct validity

Using the χ^2/df, RMSEA, p_{close}, and CFI fit indices, different aspects of goodness of fit were evaluated, and the results showed that these fit indices together confirmed the hypothesised model (Table 8).

χ2	df	χ2/df	*p*	CFI	RMSEA	p_{close}
427.03	303	1.409	< 0.001	0.915	0.058	0.150

χ2 = chi square, df = degrees of freedom, χ2/df = chi square to df ratio, *p* = p value, CFI = the Comparative Fit Index, RMSEA = the root mean squared error of approximation

Table 8 – Goodness-of-fit indices (n = 122)

We concluded that the CLECS' hypothesised six-factor model had acceptable construct validity and good internal consistency and that most of the subscales displayed moderate to good test-retest reliability.

5.4 Paper IV

Olaussen, C., Steindal, S. A., Jelsness-Jørgensen, L. P., Aase, I., Stenseth, H. V., & Tvedt, C. R. (2022). Integrating simulation training during clinical practice in nursing homes: An experimental study of nursing students' knowledge acquisition, self-efficacy and learning needs. *BMC Nursing, 21*(1), 47. https://doi.org/10.1186/s12912-022-00824-2

No statistically significant differences in demographic characteristics and baseline pre-test results were identified between group participants who completed both the pre- and post-tests (Table 9).

	Control n = 38	Intervention n = 50	*p*
Age: mean (SD)	22.9 (4.4)	23.3 (5.7)	0.7
Female: n = (%)	32 (84.2)	45 (90.0)	0.4
Years working in health care as nursing assistants or health care assistants: mean (SD)	1.4 (2.1)	2.0 (2.1)	0.2
Former higher education in other professions or areas: n = (%): 1. No former higher education 2. Former bachelor/master's degree	30 (78.9) 8 (21.1)	43 (86.0) 7 (14.0)	0.4
Pre-test knowledge	11.8 (3.9)	13.2 (4.1)	0.1
Pre-test self-efficacy	29.1 (3.8)	28.2 (4.6)	0.3
Table legends and abbreviations: n: number of participants; SD: standard deviation; *p*: *p*-value			

Table 9 – Demographic variables and pre-test results of study participants who completed both pre- and post-tests.

Knowledge acquisition

Differences in mean knowledge scores from the pre- to post-test within the control group and within the intervention group were statistically significant (Table 10).

Control n = 38						
	Pre-test	Post-test	Mean diff.	95% CI		
				Lower	Upper	*p*
Knowledge (Mean (SD))	11.8 (3.9)	14.0 (4.1)	2.2 (3.5)	1.0	3.3	0.001
Intervention n = 50						
	Pre-test	Post-test	Mean diff.	95% CI		
				Lower	Upper	
Knowledge (Mean (SD))	13.2 (4.1)	17.6 (3.6)	4.4 (3.8)	3.3	5.5	< 0.001
Table legends and abbreviations: SD: standard deviation; Mean diff.: mean difference between pre- and post-test; CI: confidence interval; *p*: *p*-value.						

Table 10 – Comparisons of pre- and post-test knowledge scores within the control and intervention groups

The mean improvement in knowledge from the pre-test to post-test was higher in the intervention group than in the control group (Table 10), and the difference in knowledge improvement between the groups (mean difference = 2.2, SD = 0.8) was statistically significant ($p < 0.01$), with a medium to large effect size (Hedges' $g = 0.6$).

Self-efficacy

Differences in self-efficacy scores from pre- to post-test within the control group and within the intervention group were not statistically significant (Table 11).

Control n = 38						
	Pre-test	Post-test	Mean diff.	95% CI		
				Lower	Upper	*p*
Self-efficacy (Mean (SD))	29.1 (3.8)	30.3 (3.5)	1.2 (4.0)	-0.1	2.5	0.08
Intervention n = 50						
	Pre-test	Post-test	Mean diff.	95% CI		
				Lower	Upper	
Self-efficacy (Mean (SD))	28.2 (4.6)	28.9 (3.9)	0.7 (3.8)	-0.4	1.8	0.2
Table legends and abbreviations: SD: standard deviation; Mean diff.: mean difference between pre- and post-test; CI: confidence interval; *p*: *p*-value.						

Table 11 – Comparisons of pre- and post-test self-efficacy scores within the control and intervention groups

Differences in mean self-efficacy improvement from the pre-test to the post-test between the intervention and control groups (mean difference = 0.5, SD = 0.8) were not statistically significant (*p* = 0.6), and the effect size was small (Hedges' *g* = 0.1).

Learning needs

The students scored the simulated environment higher on meeting their learning needs compared with the clinical environment in all six subscales of the CLECS. The mean differences between the clinical environment scores and the simulated environment scores were statistically significant (p < 0.05). The effect size values indicated practical significance in the areas of nursing processes, self-efficacy, and the teaching–learning dyad (Table 12).

	Simulated	Clinical					
Variables	Mean (SD)	Mean (SD)	Mean diff. (SD)	95% CI Lower	95% CI Upper	*p*	d_{Cohen}
Communication (four items)	3.4 (0.5)	3.1 (0.6)	0.3 (0.7)	0.1	0.5	<.01	0.4
Nursing Process (six items)	3.7 (0.3)	3.0 (0.6)	0.7 (0.7)	0.5	0.9	<.001	1.0
Holism (six items)	3.0 (0.6)	2.8 (0.7)	0.2 (0.7)	0.0	0.4	<.04	0.3
Critical Thinking (two items)	3.6 (0.6)	3.3 (0.7)	0.3 (0.8)	0.1	0.5	<.01	0.4
Self-Efficacy (four items)	3.4 (0.6)	3.0 (0.7)	0.4 (0.5)	0.2	0.5	<.001	0.7
Teaching–Learning Dyad (five items)	3.8 (0.3)	3.1 (0.7)	0.8 (0.7)	0.6	1.0	<.001	0.9

Table legends and abbreviations: SD: standard deviation; Mean diff: mean difference between clinical and simulated environment; CI = confidence interval; *p*: *p*-value; d_{Cohen}: effect size.

Table 12 – The intervention group's (n = 50) reports of how well learning needs were met in the clinical practice environment versus the simulated environment

We concluded that the partial replacement of clinical hours by simulation training was positively associated with knowledge acquisition and meeting the clinical learning needs of first-year nursing students, and that these results are promising regarding simulation training as a viable partial replacement for traditional clinical practice in nursing homes to improve clinical learning.

5.5 Results across papers

The results (Papers I and II) indicate that active engagement in simulation training may positively affect first-year students' self-confidence. This is indicated by the high mean scores in self-reported satisfaction and self-confidence after attending simulation training (Paper 1) and by the students' experiences of enhanced confidence and mastery due to the simulation training when receiving the combined practice model (Paper II). In addition to enhanced confidence and mastery, the students experienced enhanced knowledge (Paper II). The combined practice model did not result in significant general self-efficacy improvement on the statements measured, but a significant improvement in knowledge acquisition was observed (Paper IV). By using the CLECS (Norwegian version) (Paper III), the simulation training was perceived to better fulfil clinical learning needs than the nursing homes on the statements measured. Learning needs within the nursing process, self-efficacy, and the teaching-learning dyad especially excelled (Paper IV).

6 Discussion of results and methodological considerations

In this chapter, students' experiences and outcomes related to simulation training combined with clinical practice in nursing homes (the combined practice model) are first discussed. A discussion of simulation training as a partial replacement for clinical hours follows. Finally, the methodological considerations, strengths, and limitations of the research in this PhD study are presented and discussed.

6.1 Simulation training combined with clinical practice in nursing homes – experiences and outcomes

6.1.1 Confidence, mastery, and self-efficacy

Low self-confidence may interfere with the ability to acquire new knowledge and tackle challenging learning situations (Lapkin et al., 2010; Lundberg, 2008). The pedagogical idea behind identifying elements associated with student satisfaction and self-confidence (Paper I) was that students may become better equipped for learning by gaining increased self-confidence (Najjar et al., 2015).

This PhD study indicates that promoting active student engagement in simulation training may increase both student satisfaction and self-confidence (Paper I). In line with previous studies (Crafford et al., 2019; Ogilvie et al., 2011), the students in this PhD study expressed that being actively engaged in simulation training led to positive emotions, such as feeling more prepared for real patient situations (Paper II). Kolb (2015) believes that the key to learning is involvement. To acquire new knowledge, students must actively engage (Kolb, 2015). However, high expectations of active student engagement may also cause uncomfortable feelings, such as performance anxiety, in students (Jeffries & Rodgers, 2021). As learning implies stepping out of one's comfort zone, students need to take on challenges that may cause temporarily uncomfortable emotions (Dieckmann et al., 2012; Kolb, 2015). Therefore, a certain level of frustration, doubt, or performance anxiety might be necessary to acquire new knowledge and competencies (Al-Ghareeb et al., 2017; Dieckmann et al., 2012). Extensive levels of uncomfortable emotions, however, may become so overwhelming that they inhibit students' cognitive processing and performance (Al-Ghareeb et al., 2017; Zull, 2002). According to Zull (2002), uncomfortable emotions that naturally arise in students when they are challenged must be balanced with positive emotions, such as feeling safe and having a belief in their own learning progression. Vella (2002) claims that creating a learning environment in which students feel safe does not inhibit the natural challenge that lies in learning new concepts, skills, or attitudes.

Students' clinical practice in nursing homes may offer opportunities for growth and professional development when there are clear learning objectives and the students have access to appropriate supervising role models (Keeping-Burke et al., 2020; Laugaland et al., 2021). However, students are sometimes found to view nursing homes' pedagogical atmospheres and the content of the supervisory relationship negatively (Keeping-Burke et al., 2020; Skaalvik et al., 2011). A safe learning environment is characterised by an inviting setting, trust in the relevance of learning objectives, trust and support between educators and students, and trust in the competence of the educator (Vella, 2002). In this PhD study, students exposed to the combined practice model experienced being actively engaged and challenged in a simulation environment in which they felt safe (Paper II). The overall objective of the simulation training was to apply the nursing process systematically in different patient situations, which was aligned with the desired learning outcomes of the students' clinical practice period. Additionally, the students experienced gaining feedback from peers and seasoned facilitators on performance and learning progression conveyed in a positive and constructive way (Paper II). As such, the safe learning environment in the simulation training may have prevented uncomfortable emotions caused by being challenged from becoming too overwhelming. This may, again, have laid the foundation for the students' experiences of enhanced confidence and mastery due to the simulation training provided in the combined practice model (Paper II).

Both confidence and mastery experiences relate to self-efficacy, which is described by Bandura (1997) as a belief in one's own capability to succeed in the face of difficult challenges and demands. A student with high perceived self-efficacy has faith in their aptitude that future desired educational goals can be achieved. According to Bandura (1997), confidence and self-efficacy can work in a positive correlation, which means that more confident students may be likelier to succeed. Additionally, mastery experiences have a strong effect on a student's self-efficacy development because they are the most authentic indicators of one's capabilities (Bandura, 1997). However, although students experienced an enhanced sense of confidence and mastery due to the simulation training in the combined practice model in this PhD study (Paper II), no significant difference in self-efficacy improvement was observed between students receiving the combined practice model and those who attended traditional clinical practice (Paper IV). As research reviews mostly report improved self-efficacy as an outcome of simulation training (Cant & Cooper, 2017; Curl et al., 2016; Labrague et al., 2019), this was an unexpected result. However, this result is in line with a recent systematic review that did not identify significant effects on self-efficacy of simulation training (La Cerra et al., 2019). The conflicting research results regarding perceived self-efficacy due to simulation training may be caused by differences in how self-efficacy is measured. In this PhD study, the fact that perceived general self-efficacy was measured and compared (Røysamb et al., 1998), rather than self-efficacy related to patient care, may have influenced the results (Paper IV). However, prior simulation training studies in the fields of psychiatric nursing, community health care nursing, communication, and paediatrics have reported significant differences in self-efficacy when using general self-efficacy scales (Kameg et al., 2010; Li et al., 2019; Saied, 2017).

A balanced combination of difficulty and support is described as optimal for learning, as it may produce higher levels of learning than students can attain on their own (Kolb, 2015). In this PhD study, the students experienced being exposed to challenging scenarios, questions, and tasks in the simulation training while gaining support from facilitators and peers (Paper II). The balance between being challenged and supported may have motivated the students to test and expand their capabilities, which again may have contributed to the high levels of perceived self-confidence (Paper I), the experiences of confidence in their own knowledge and skills, and the enhanced sense of mastery (Paper II). Although no significant general self-efficacy improvement was observed (Paper IV), enhanced confidence and mastery may lay the foundation for the further development of self-efficacy (Bandura, 1997).

6.1.2 Knowledge acquisition

A significant knowledge improvement in both the students who received the combined practice model and the students who attended traditional clinical practice was observed in this PhD study (Paper IV). This was an expected result, as any educational intervention (both the combined practice model and traditional clinical practice) should result in an increase in students' knowledge. However, simulation training has been found to be superior to other teaching methods in improving knowledge (La Cerra et al., 2019), and the students that received the combined practice model had a significantly higher knowledge improvement than the students exposed to the traditional clinical practice model (Paper IV).

Kolb's (2015) description of the cyclical method of learning may explain the higher level of knowledge improvement among the students exposed to the combined practice model (Paper IV). Kolb (2015) claims that deep learning results from grasping experience and transforming it. The simulation training may have allowed for deep learning, as the students moved from concrete experiences to reflective observation, abstract conceptualisation, and finally, to active testing (Kolb, 2015; Zull, 2002). As applied in the simulation training, student engagement in the scenarios provided concrete experiences and served as the primary sources of learning. The debriefing during the simulation training addressed the second and third phases of Kolb's (2015) learning cycle. In the debriefing, grasping the experience and transforming it were promoted by encouraging the students to reflect on, analyse, and interpret information recalled from the scenarios. Previous perspectives and concepts held by the students were challenged, which may have promoted the students' creation of new perspectives and ideas for future patient encounters (Eppich & Cheng, 2015). Finally, corresponding to the fourth stage of Kolb's learning cycle, the students expressed that they used their new perspectives and ideas both in patient encounters at the nursing homes and in the next simulation training (Paper II).

As previously highlighted, central to the idea of experiential learning is the belief that experience (sensory input) alone does not lead to learning (Kolb, 2015; Zull, 2002). For students in clinical practice in nursing homes, learning that mainly relies on sensory input through daily routine experiences to the exclusion of reflection, abstract conceptualisation, and active experiment may provide incomplete learning (Kolb, 2015; Zull, 2002). In line with previous research (Adamson et al., 2018; Algoso & Peters, 2012; Ironside et al., 2014), students in this PhD study experienced that reasoning and reflections around nursing care and daily practice with their RN supervisors were given a low priority (Paper II). The supervision tended to be related to daily routine care and recognising situations in which a particular aspect of theoretical knowledge should be applied was not always easy to do by themselves (Paper II). This supports Benner's (1984) premise that novices have little experience with situations faced in a new environment and thus have little understanding of how to apply their pre-existing knowledge. According to Kolb (2015), students need guidance in developing new perspectives and testable ideas. Student supervision in nursing homes has often been found to focus on activities of daily living, such as bathing, feeding, changing linens, or assisting the patient to the chair, which may have the result that students frequently miss cues indicating that the patient situations are more complex than merely completing assigned tasks (Ironside et al., 2014; Pront & McNeill, 2019). Students need guidance to learn how to see both the medical and nursing implications of a situation since the nursing implications always require an understanding of the pathophysiological and diagnostic aspects of the patient's clinical presentation and disease (Benner, 1984). However, daily routines in nursing homes often allow only brief and formal meetings on work-related logistics (Etherton-Beer et al., 2013; Nordström, 2018) and not for deeper reflection within the team (Nordström, 2018). In this PhD study, the students experienced that the simulation training offered additional opportunities to reflect on experiences, their own performance, patient situations, and theoretical knowledge with peers and facilitators during the practice period, which helped them gain new and broader knowledge (Paper II). The additional collective reflections linking theory to practice in the simulation training may have aided deeper learning during the practice period (Kolb, 2015; Morell-Scott, 2018). Moreover, promoting the use of the stages of the learning cycle in the simulation training may have helped the students in the search for new perspectives while practicing and thus achieved broader knowledge than could be achieved by relying mostly on sensory input alone (Kolb, 2015; Zull, 2002).

6.1.3 Meeting clinical learning needs

Nursing students expect to learn the necessary skills and practical applications of theory when entering clinical practice (Holmlund et al., 2010). In this PhD study, students experienced a lack of integration of theory into practice in nursing homes (Paper II), which is in line with previous research (Adamson et al., 2018; Arkan et al., 2018). Unmet learning needs of students in clinical practice should drive changes in traditional clinical practice models (Leighton, 2015). The use of validated evaluation tools may help educators identify areas of clinical learning that need improvement. In this PhD study, the CLECS was proven adequate as guidance for nurse educators to evaluate clinical learning to meet students' learning needs (Paper III). The results, which used the CLECS to evaluate the fulfilment of clinical learning needs in simulation training versus nursing homes (Paper IV), indicate that simulation training has the potential to compensate for learning needs that are not properly met in nursing homes during the students' practice period.

Learning needs within the nursing process, self-efficacy, and the teaching–learning dyad seemed to be better met during the students' practice period due to the simulation training in the combined practice model (Paper IV). The learning objectives of the simulation training may explain why nursing process learning needs were perceived to be better met in the simulation training than in the nursing homes (Paper IV), as well as the students' experiences of enhanced skills in performing patient observations and assessments (Paper II). The objectives for the scenarios focused on nursing observations, assessments, and evaluations of care, which are important features of the nursing process (Ehnfors et al., 2015). In any patient encounter, nurses must attend to changes in a situation, which requires the skill of grasping every aspect of the change and converting it to purposeful data (Tanner, 2006). Focusing on the nursing process in the simulation training may have enhanced students' understanding of the nursing process and how to use it when encountering a patient situation.

The inconsistency between the students' positive reports regarding the fulfilment of learning needs related to self-efficacy in the simulation training and the lack of observed self-efficacy improvement when employing the combined practice model was a more surprising result (Paper IV). However, the use of specific self-efficacy measures, as opposed to general self-efficacy measures, has been advocated to better draw on capability beliefs within a special domain of interest (Artino, 2012; Pajares, 1996). Thus, the inconsistency in the self-efficacy results in this PhD study may have been caused by the fact that the statements related to self-efficacy learning needs pointed more directly to self-efficacy in patient care than the general statements used to measure self-efficacy improvement.

The teaching–learning dyad was defined by Leighton (2015) as the interactive relationship between supervisors/educators and students in which both have shared responsibility for the learning outcomes. Students early in their nursing programme require nurturing, guidance, and support (Bradbury-Jones et al., 2011; Matthew-Maich et al., 2015). As in previous research (Arkan et al., 2018; Norman et al., 2005), students in this PhD study reported that they sometimes felt left on their own in the nursing homes (Paper II). In simulation training, support, feedback, and collaboration are inherent features (Jeffries et al., 2015). The facilitators in the simulation training were entirely committed to the students' learning, and the students were encouraged to ask questions, challenge others, take on challenges, and share their perspectives (Paper II). The facilitators' support, feedback, and commitment to the students' learning during the simulation training may have played a major role in why teaching-learning dyad needs were perceived to be better met in the simulation training than in the nursing homes (Paper IV).

6.2 Simulation training as a partial replacement for clinical hours

This PhD study has demonstrated that simulation training, combined with clinical practice in nursing homes, has the potential to positively influence students' experiences during the clinical practice period and enhance students' learning outcomes (Papers II and VI). A recent study by Sullivan et al. (2019) found that students in simulation training performed at higher levels and accomplished more learning outcomes in half the time compared with those in a traditional clinical environment. Admittedly, many of the visual and other cues the students may obtain from real patient interactions are not currently able to be adequately reproduced in simulation training (Ross et al., 2022), and in this PhD study, students agreed that no simulator could replace interactions with complex, unique human beings (Paper II). A recent review found that students valued the chance to build relationships with older people, improve their communication skills, and assist older people with their daily living activities in nursing homes (Keeping-Burke et al., 2020). Because such skills are integral to the development of professional relationships between nurses and their patients, this cannot be achieved solely through simulation training. Additionally, in simulation training, the students are not required to cope with the workplace pressures of competing demands. Learning how to care for one or two simulated patients at a time does not necessarily replicate the complex and time-pressured nature of being a nurse (Ross et al., 2022). However, simulation training combined with clinical practice may provide additional supervision by nurse educators, reflection, and time to understand complex concepts of nursing (Schaumberg, 2015). Furthermore, simulation training may help uncover self-identified gaps in both theoretical and practical knowledge that can motivate students to fill those gaps (Pront & McNeill, 2019). As such, implementing simulation training combined with clinical practice may provide students with the advantages of both environments, and a limitation in one environment may be compensated for by a strength of the other.

Traditionally, nursing students are required to undertake a minimum number of clinical hours during their nursing education, which complements their theory-based learning. In Norway, the EU directive specifies that 2,300 hours (50%) of the nursing education programme must be dedicated to supervised clinical practice (EU Directive 2013/55/EU). This 50% requirement can be challenging for nurse education institutions since it does not consider aspects such as a lack of qualified supervisors, which in turn may affect the quality of students' clinical practice. In Australia, students are only required to complete a minimum of 800 hours of clinical practice (Roberts et al., 2019), and in the US, the amount of required clinical hours differs from state to state, and no minimum hours are outlined by national regulatory boards (Hungerford et al., 2019). A common challenge internationally for nursing education institutions is, however, to meet the growing demand for RNs while sustaining the quality of the educational experience and achieving the desired student outcomes (Bogossian et al., 2019). Owing to the need to increase the number of nursing students, the partial replacement of clinical practice hours with simulation training may be an alternative that still ensures educational quality (Bogossian et al., 2019; Hayden et al., 2014). A growing body of evidence reporting equal or slightly better learning outcomes supports the use of simulation training to replace up to 50% of clinical practice hours (Curl et al., 2016; Hayden et al., 2014; Larue et al., 2015; Soccio, 2017).

In the United Kingdom (UK), the Nursing and Midwifery Council has given permission to replace 13% of the 2,300 required clinical practice hours with simulation training (Moule et al., 2006). This permission was based on a report that found that partial replacement helped students achieve desired learning outcomes and gain experiences they did not gain in clinical practice, while giving the students enhanced self-confidence (Moule et al., 2006). In this PhD study (Paper IV), 10.7% of the required 240 clinical hours in nursing homes during the students' second semester of their education programme were replaced by simulation training, which resulted in improved knowledge and positive student perceptions of how clinical learning needs were met. This is promising regarding simulation training as a viable replacement for a portion of the required clinical hours in nursing homes to improve clinical learning. However, the EU directive defines clinical practice as direct contact with healthy or sick people and/or groups (EU Directive 2013/55/EU), which currently precludes simulation training as an alternative replacement in Norway. Implementing combined practice models that partly replace clinical hours will require a dispensation from the EU directive or a redefinition of what constitutes clinical practice.

Although the use of simulation training as a partial replacement for clinical hours has been used with some success internationally (Curl et al., 2016; Hayden et al., 2014; Soccio, 2017), differences in the amount of replacement, differences in approaches to simulation training and clinical practice, measurement tools used for evaluation, and clinical areas of exposure make the generalisability of research results difficult (Roberts et al., 2019). Therefore, the way simulation training is defined and used if implementing a partial replacement of clinical hours in Norwegian nursing education requires national regulations to ensure that all nursing education institutions provide clinical education of the same standard and with quality learning experiences. Additionally, partly replacing clinical hours with simulation training has resource implications. Because simulation training involves only a small number of students at the time, a considerable amount of faculty time and nurse educator resources are required. Although the number of replaced clinical hours in this PhD study was brief (10.7%; Paper IV), arranging simulation training for 52 students required two nurse educators to work for nine full working days in addition to several hours of preparation of content and logistics. Besides faculty time, the availability of simulation facilities and scheduling issues are known challenges that may be faced by educators (Al-Ghareeb & Cooper, 2016). Thus, the idea of partly replacing clinical hours with simulation training to improve clinical learning still needs further exploration; however, the results of this PhD study look favourable in terms of the potential related to clinical practice in nursing homes.

6.3 Methodological considerations

The quality of the research and the strengths and limitations that may have influenced the results of this PhD study are discussed in this section. First, the overall research design and sampling strategy are discussed. The quality of the research in the qualitative and quantitative parts is then further elaborated under the following headings. The concept of trustworthiness (Graneheim & Lundman, 2004) is of relevance to the qualitative part (Paper II), while validity and reliability are mainly associated with quantitative research (Polit & Beck, 2017) and are therefore relevant to the quantitative part (Papers I, III, and IV).

6.3.1 Overall research design

A multi-method design was considered appropriate for answering the aim of the thesis. It was perceived that the combination of qualitative and quantitative approaches could broaden the results of the PhD study, as they provide different information on what is studied, and a disadvantage of one approach may be compensated for by an advantage of the other (Creswell & Creswell, 2018). In this way, the multimethod design made the research sounder, establishing important knowledge on the research topic. The exploratory sequential inspired strategy may be seen as a strength, as some of the findings in the qualitative part (Paper II) gave rise to questions that were tested in the quantitative part (Paper IV). A further strength was that the sample of participants that provided the findings in the qualitative part did not participate in the follow-up instrument testing and outcome measurement in the quantitative part (Creswell & Creswell, 2018).

6.3.2 Sampling strategy and participants

Self-selected nonprobability sampling techniques (convenience and purposive) were used to recruit participants. In both convenience sampling and purposive sampling, the researchers are subjective and bias in choosing the subjects of the study (Etikan et al., 2016). Questions could be raised concerning who volunteered for participation out of the available students (Polit & Beck, 2017). The volunteers might have had a positive attitude in advance towards simulation training, and it is possible that students who enjoyed active and social learning experiences were the ones who signed up. However, the high response rates obtained made the risk of non-response bias (non-responders from a sample differing in a meaningful way from responders) relatively small in the quantitative part of the study (Polit & Beck, 2017). Additionally, the random selection of the relatively high number of volunteering potential participants in the qualitative part may have balanced the risk of selecting only the most positive of the students (Patton, 2015).

6.3.3 The qualitative part – Paper II

It was decided that a qualitative descriptive approach would suit the aim of thoroughly exploring the students' experiences. When choosing the qualitative descriptive approach, it was recognised that no description is free from interpretation, that many interpretations of reality exist, and that the knowledge provided was socially constructed by the participants – but also by the researchers (Bradshaw et al., 2017; Sandelowski, 2000). What was offered was a subjective interpretation of experiences, however strengthened and supported by participant quotations.

Trustworthiness

In qualitative research, trustworthiness poses the following question: can the findings be trusted? Criteria of trustworthiness that are commonly used are reflexivity, credibility, dependability, and transferability (Graneheim & Lundman, 2004; Malterud, 2013).

Reflexivity refers to the process of critical self-reflection about oneself as a researcher and the research relationship (Korstjens & Moser, 2017). Preconceptions include researchers' pre-existing experiences, hypotheses, and prejudices that influence any part of the research process. The PhD candidate had previously worked as a nurse educator for first-year students for many years and was experienced in facilitating simulation training. A preconception was that learning challenges in nursing homes, such as limited access to nurse supervisors and difficulties integrating theory and practice, could be mitigated by integrating multiple academic and practice-focused simulation training days facilitated by nurse educators. Throughout the research process, the researcher reflected on her own roles to remain aware of how she affected the study. To enhance transparency and reflexivity, preconceptions, the interview guide, the data collection, and the data analysis were discussed with other members of the research team, who had different backgrounds and pedagogical and research expertise than the PhD candidate. This exposed the PhD candidate to preconceptions challenging her own and critical questions and discussions regarding interpretations. There was also continuous dialogue between the PhD candidate and her main supervisor during the whole process.

Credibility was enhanced by recruiting participants relevant to the research topic (they all received the combined practice model) and the use of random sampling among those who volunteered (Palinkas et al., 2015; Patton, 2015). The analysis was discussed among all the researchers as a collective effort to be confident that the findings reflected what the participants said and to discuss alternate interpretations of the findings. While this investigator triangulation enhanced credibility (Krueger & Casey, 2015), credibility could have been further strengthened by returning the results of the data analysis to the participants to confirm interpretations. For practical reasons (the students had completed their education and left the university college), this was not possible. However, the validity of the immediate interpretations was assessed in the dialogue between the participants and the moderator during the interviews (Polit & Beck, 2017), as the moderator asked questions such as 'Have I understood you right if …?' and 'What do you mean when you say...?'

Variations exist in the literature regarding the optimum size of a focus group and suggested appropriate group sizes range from 4 to 12 participants (Muijeen et al., 2020). The focus group size of eight to ten participants in this study may have limited the details of some responses due to reduced airtime per participant. On the other hand, a group size of eight to ten participants may have generated more opinions and/or feelings about the topic than if the groups were smaller (Muijeen et al., 2020). Furthermore, using smaller groups could have made some of the participants feel pressured to talk more than they otherwise would to avoid silence in the group (Malterud, 2012a). The determination of the number of focus group interviews was guided by the concept of 'Information Power' introduced by Malterud et al. (2016). A review of the recordings of each focus group was performed before conducting the next interview to reflect on the quality of the dialogue (Malterud et al., 2016). Based on the participants' experiences with the topic of the study, their willingness to share their experiences, and the quality of the dialogue, three focus groups were considered to have generated sufficient information power and a rich variety of descriptions (Malterud et al., 2016). However, the PhD candidate's involvement with the participants, context, and educational practice enhanced the risk of not considering certain issues as important, taking things for granted, or making assumptions about what was said without seeking clarification during the interviews. Moreover, the established relationship between the PhD candidate and the participants through the simulation training enhanced the risk of participants changing their responses to 'help' the PhD candidate (Trowler, 2011). Strategies were included to overcome both the researcher effect and participant responses. First, the recognition of the relationship that already existed between the participants and the PhD candidate reduced the risk of potential problems. Being reflexive and critically examining assumptions and actions in relation to both data collection and analysis reduced the potential for the researcher effect. Second, the PhD candidate emphasised holding back her own opinions during the interviews to focus on listening to and understanding the perceptions of the participants, as recommended by Krueger and Casey (2015). The assistant moderator followed the interviews and supported the PhD candidate with follow-up questions and by including input from all the participants (Polit & Beck, 2017). Third, the interviews were carefully planned to create a nonthreatening environment that would encourage participants to share both negative and positive experiences. As the participants had attended the simulation training together prior to the focus group interviews, they knew each other well and seemed to have limited barriers around each other and the PhD candidate, and they shared a wide range of experiences, both negative and positive, from both learning environments. The PhD candidate’s adequate background and knowledge made her able to place comments in perspective and follow up on critical areas of concern (Krueger & Casey, 2015; Mercer, 2007), which may have engendered a greater level of candour than would otherwise be the case (Mercer, 2007). However, it must be taken into consideration that if a detached researcher had served as the moderator, different findings could have been reached.

Dependability was enhanced by using the same moderator, the same introduction to the interviews with a description of the interview format and agenda, and the same semi-structured interview guide in all three focus groups. Moreover, no major changes were made during the data collection. In focus groups, there is always a risk that some of the participants will set the agenda for opinions (Polit & Beck, 2017). However, all participants contributed to the discussions, and the findings were strikingly similar in all three groups, which indicates that this was not the case. Nevertheless, another composition of participants may have led to another group dynamic, which, again, may have led to different findings.

Transferability was safeguarded by reporting the context of the simulation training, a description of the sample, the research process, and descriptions of the findings. Participant citations were used in reporting, which helped enhance the possibility of transferability. This also strengthened the trustworthiness of the findings and interpretations (Graneheim & Lundman, 2004).

6.3.4 The quantitative part – Papers I, III, and IV

Validity refers to the degree to which the inferences are accurate and well-founded (Polit & Beck, 2017). In connection with instruments, validity is about the degree to which they measure what they are intended to. Reliability refers to how reproducible the results are under different conditions (the stability of an instrument) (Polit & Beck, 2017).

Internal validity

In assessing internal validity, one answers the question of whether the study measures what it sets out to measure. Threats to internal validity in the quantitative part of this study are types of confounding and extraneous variables because they provide alternative explanations for outcomes or changes in outcomes (Polit & Beck, 2017).

For Paper I, a cross-sectional study design was used. The primary limitation of this design is the lack of a control group, which makes it difficult to decide whether the first-year students' high levels of satisfaction and self-confidence were a result of the simulation training, their novel experience with simulation training, or their general self-confidence and satisfaction with their education. Empirical associations between the outcome measures of satisfaction and self-confidence, and elements in simulation training were identified, but because of the cross-sectional design, causality should not be inferred when interpreting the results.

For Paper IV, an experiential design with pre- and post-tests was used. Internal validity in experimental designs addresses the question of whether the observed changes in outcomes can be attributed to the intervention and not to other possible causes. In the real world, this can never be fully accomplished. Therefore, the experimental design must be evaluated with respect to the degree of internal validity that the design poses in the specific study (Salim et al., 2008). Strengths related to the internal validity of the experimental design (Paper IV) were the random assignments to create control and intervention groups, the groups being equivalent at baseline, and the use of the control group to understand the intervention effects (Polit & Beck, 2017). Random assignment eliminates selection bias by definition, leaving a role only for chance differences (Shadish et al., 2001). The same tests were administered in both the pre- and post-tests, which ensured that pre-testing effects and instrumentation were experienced equally under the conditions within the limits of chance. The participants in both groups may have been alerted or sensitive to both the knowledge acquisition and self-efficacy that the pre-tests were measuring, and as a result, their post-test scores may have been affected (Martella et al., 2013). The facilitators in the simulation training were blinded to the content of the knowledge test, which reduced the method bias that could have impacted the intervention group's test outcomes. However, the pre-test may have sensitised the participants in the intervention group so that they responded to the intervention differently than they would have with no pre-test (Martella et al., 2013). It is also possible that the knowledge test results would have been different if the intervention group members were not encouraged to prepare for the simulation training. Thus, the notion that simulation preparation may have been a confounder also needs to be considered. We could control neither for the participants' different experiences in clinical practice nor for the distribution of participants between private and municipal nursing homes. Although the intervention and control groups were placed in separate nursing homes to prevent the groups from influencing each other, the contamination of study content may have occurred, with students discussing simulation training and clinical experiences outside of the nursing homes. The loss of participants to follow-up was higher in the control group than in the intervention group, and the data analyses were therefore carried out only on participants with complete pre- and post-tests (Salim et al., 2008). If our loss of participants consisted of the most dedicated learners, this may have threatened the internal validity. However, there were no statistically significant differences in demographics or pre-test scores between the groups that completed both pre- and post-tests, which indicates that this was not the case.

A strength of Papers I and IV was that the sample sizes were adequate for supporting the results. Assumptions were reasonably met, except for the occurrence of heteroscedasticity in the data, with satisfaction as the dependent variable (Paper I). This may have created an inconsistency in the estimate of the standard error in this part of the analyses (Hayes & Cai, 2007). Heteroscedasticity in data can be solved using weighted regression (Field, 2018). However, ordinary least squares regression has been found to work well in the presence of mild heteroscedasticity (Long and Ervin (2000), and homoscedasticity is not required for the coefficient estimates to be unbiased, consistent, and asymptotically normal (Field, 2018; Hayes & Cai, 2007). Weighted regression was tested with satisfaction as the dependent variable and gave nearly the same result as least square regression (active learning was the only significant independent variable and explained 28.2% of the variance with weighted regression and 27.8% with least square regression). Because the heteroscedasticity did not alter the outcome of the analysis drastically (Hayes & Cai, 2007; Lavrakas, 2008; Long & Ervin, 2000), and weighted regression involves more data manipulation (Frost, 2019), it was decided to report the least squares regression with both of the dependent variables (Paper I).

The internal construct validity tests of the CLECS (Paper III) were performed on a relatively small sample. The suggested minimum subject-to-variable ratio differs from 3 to 20 times the number of variables (Garson, 2013; Mundfrom et al., 2005). A subjects-to-variables ratio no lower than 5:1, as suggested by Bryant and Yarnold (1995), was aimed for but not quite reached, as the ratio was 4.5:1. However, the CLECS model was developed with a randomly selected 50% of the dataset from the clinical environment and was confirmed by being tested on the entire clinical environment dataset, which strengthened the internal construct's validity results (Pohlmann, 2004). Furthermore, the use of multiple fit indices provided a holistic view of goodness of fit (Sun, 2005). The χ^2/df ratio was well below the upper limit recommended by Byrne (1989), the CFI was above the minimum limit recommended by Bryant and Yarnold (1995), and the p_{close} and RMSEA both met the criteria suggested by Browne and Cudeck (1993). However, because cut-off values for fit indices are not universally agreed upon, caution against strict reliance on the selected cut-offs should be made (Hu & Bentler, 1999; Sun, 2005). One goodness-of-fit indicator that spoke against the model was χ^2's *p*-value of less than 0.001, which rejected the null hypothesis representing perfect fit. However, models are almost always incorrect to some degree, and this test of exact fit often rejects the null hypothesis, even when the postulated model is only trivially false (MacCallum, 2003). A limitation of this PhD study was that the factor structure model for the simulated environment could not be evaluated because the respondents lacked sufficient simulation experience to match all the items in the CLECS and therefore too often ticked the 'not applicable' alternative. Although the suggested number of a minimum of one simulation experience (Leighton, 2015) was followed, using participants with multiple simulation experiences could have produced data that were more suitable for evaluating the factor structure model from the simulated environment.

Instrument validity

For Paper I, the Norwegian version of the NLN questionnaire (SSSCL, SDS, and EPQ) was chosen because it is theoretically grounded in the NLN Jeffries Simulation Theory. The basics of the theory are the declaration that learning outcomes, such as student satisfaction and self-confidence, are influenced by central elements in educational practices and simulation design (Jeffries & Rodgers, 2021; Jeffries & Rogers, 2012) . As each of these features corresponds to the self-reported measurement instruments in the NLN questionnaire, the use of the questionnaire was well aligned with the purpose of this part of the study (identifying elements in simulation training associated with self-confidence and student satisfaction). The low frequency of the use of 'not applicable' in the data indicates that our participants perceived the concepts and elements presented in the Norwegian version of the NLN questionnaire as familiar to the context. A recent study of the Norwegian version supports the construct validity and reliability of the SSSCL, SDS, and EPQ for the evaluation of simulation training in nursing education (Reierson et al., 2020).

For Paper IV, a knowledge test was specifically designed and contained questions with multiple-choice answers. Although the use of multiple-choice questions is a common approach in knowledge assessment, it has been debated whether they really fit the purpose, as such questions tend to assess lower levels of cognitive processing (Levett-Jones et al., 2011). Moreover, correct answers on a multiple-choice test do not necessarily correspond with students' use of knowledge to guide actions in real situations. The format of multiple choice is, however, not necessarily restricted to the assessment of superficial recall and recognition (Scully, 2017), and an effort was made to design some questions that tested for inferential reasoning rather than merely memorisation (Burns, 2010). This was done by first presenting a situation in which the students had to draw on various elements of their knowledge to interpret the situation and subsequently select appropriate responses (Scully, 2017). However, the authenticity of the assessment of knowledge acquisition may have been strengthened by encompassing various methods of knowledge measurement, such as adding constructed response items with short answers or essay-style questions (Scully, 2017). Strengths of the validity of the test were that a panel of experts (Polit & Beck, 2017) and a group of nursing students were consulted to ensure content validity, and that the final test version was piloted (Willis, 2005). The consulted group of students stated that the wording, meaning of the questions, and directions for completing the test were clear. The panel of experts represented important expertise related to the students' syllabus and educational goals and stated that the questions and content in the knowledge test covered desirable knowledge.

The Norwegian version of the GSE (Røysamb, 1997; Røysamb et al., 1998) was used to measure self-efficacy (Paper IV). A strength of the GSE is that it has been used internationally with success for three decades (Bonsaksen et al., 2013), and scale versions have been adapted for 33 languages. Several validation studies of the GSE have been carried out (Bonsaksen et al., 2013; Luszczynska et al., 2005) and confirmed a single-factor solution, indicating that the GSE measure is a unitary concept (Scholz et al., 2002; Schwarzer & Jerusalem, 1995). The GSE has also been found to be a good construct for assessing the effects of educational interventions, as it is sensitive to changes within short periods of time (Diehl et al., 2006; Dunlap, 2005). However, measurements such as the GSE, which is an undifferentiated, contextless measure of self-efficacy in general, do not necessarily tap into students' capability beliefs related to the specific domain of interest (Pajares, 1996). Measuring self-efficacy using items more tailored to assessing capability beliefs related to aspects of patient care may have been more aligned with the purpose of this part of the study.

To obtain data on how learning needs were met (Paper IV), the CLECS was translated and validated for its psychometric properties (Paper 3). The CLECS was originally developed in the US and used in a large-scale, national randomised controlled study to assess how clinical learning needs were met when partly replacing clinical hours with simulation training (Hayden et al., 2014; Leighton, 2015). The original intention and specified use of the CLECS were well aligned with the intervention in this study (simulation training combined with clinical practice in nursing homes) and the evaluation of how clinical learning needs were met using the combined practice model (Paper IV).

To ensure that conclusions drawn from the translated CLECS were based on differences and similarities between cultures and not on errors in translation, equivalence between the original and translated versions was emphasised (Wang et al., 2006). The relatively short completion time to finish the test (10–15 minutes) and the low number of missing data related to Paper III testified to the acceptability of the CLECS in the Norwegian setting. Furthermore, the relatively low frequency of the use of 'not applicable' in the data in relation to Paper IV indicates that the participants perceived the items presented in the CLECS (Norwegian version) as familiar in this context.

Reliability

An internal low reliability in measurements is a threat to statistical conclusions (Polit & Beck, 2017). The instruments in the NLN questionnaire (SSSCL, SDS, and EPQ), the CLECS, and the GSE were all tested for internal consistency. Cronbach's alpha in the measurements revealed acceptable values for the total scale levels (SSSCL: 0.78, SDS: 0.85, EPQ: 0.79, CLECS: 0.93, GSE: 0.94).

In Paper I, the participants were asked to fill in 49 items included in the three instruments in the NLN questionnaire. In Paper IV, the participants in both groups answered 40 items included in the knowledge test and the GSE, while the intervention group additionally answered 27 items in the CLECS. The number of items may have been perceived as high, leading to a risk of demotivation for seriously filling out the items. A low number of response options in surveys may decrease the variability in total scores and thus measurement precision (Simms et al., 2019). Both the GSE and the CLECS are only four-point scales that do not include a neutral option. Thus, the participants were forced to form an opinion instead of having the possibility of selecting a neutral response option if they did not have a strong preference.

In relation to Paper III, the sample of only 40 test-retest respondents (1.5:1) can be considered a limitation. Although the sample size of 40 was within what Terwee et al. (2012) rate as a moderate sample size for test-retest reliability (30–49 respondents), and the sample size was comparable to numerous other test-retest reliability studies (Park et al., 2018), the test-retest results should be interpreted with caution. Most of the subscales in the CLECS displayed moderate to good test-retest reliability. However, two subscales (communication and critical thinking) had poor test-retest reliability values which were caused by four items (Item 1: 'preparing to care for the patient' and Item 2: 'communicating with an interdisciplinary team' in the communication subscale; Item 17: 'anticipating and recognising changes in the patient's condition' and Item 18: 'taking appropriate action when the patient's condition changes' in the critical thinking subscale). The low test-retest correlations in these items may have been caused by instrument instability, such as problematic words, topics, or expressions (Blacker & Endicott, 2008; Furr & Bacharach, 2008). It may also have been caused by the fact that several retest results were returned after longer retest intervals than the 14 days that were planned, and time may have bleached these respondents' recollections and attenuated their evaluation of their experiences. In addition, because the test and retest situations were not identical, extraneous variables may have affected responses in random ways and masked the differences between the respondents' true scores (Furr & Bacharach, 2008). Thus, the unequal test-conditions make it difficult to determine whether differences in scores from test to retest were due to "true" differences or to "chance" errors.

<u>External validity</u>

External validity relates to the ability to generalise the results to other people, places, or times (Polit & Beck, 2017). Since nonprobability sampling techniques were used, the samples did not represent the population of all first-year students, which reduces external validity. However, even when random sampling is used, sample characteristics are seldom identical to population characteristics (Shadish et al., 2001). A strength was that the samples came from different first-year students over a period of four years. Nonetheless, the samples were limited to one school of nursing located in a geographic location in the south-eastern region of Norway. Thus, different cultural conditions and contexts must be considered before generalisation. A multisite strategy with two or more university colleges and the same inclusion criteria would have strengthened the generalisability (Polit & Beck, 2017). However, to different degrees, all causal or correlational relationships are context dependent, so generalisation is always at issue (Shadish et al., 2001). This point reiterates the importance of replicating studies because no single study is ever enough.

7 Conclusions

The overall aim of this thesis is to gain knowledge by investigating first-year students’ experiences with and relevant outcomes of simulation training combined with clinical practice in nursing homes in a Norwegian context.

This thesis suggests that simulation training (based on a theoretical framework), either as a supplement to or as a partial replacement for clinical hours, combined with clinical practice in nursing homes, might be of great benefit for first-year nursing students in Norwegian nursing education. In the first, quantitative part of the PhD study, the results indicated that through simulation training, students experience active engagement that may increase both student satisfaction and self-confidence (Paper I). In the qualitative part (Paper II), the findings indicated that combining simulation training with clinical practice in nursing homes enhanced students’ potential for reasoning and reflecting on experiences and socialising and learning with peers during the practice period. Active student engagement, collective reflections, and supportive feedback from facilitators and peers in the simulation training seemed pivotal for promoting the students’ clinical learning during the practice period, and the students experienced enhanced knowledge, confidence, and mastery. In the last, quantitative part of the PhD study, the use of the CLECS (Norwegian version) was proven adequate as guidance to evaluate clinical learning to meet clinical learning needs (Paper III), and the positive student experience of enhanced knowledge identified in the qualitative part (Paper II) was verified (Paper IV). By partly replacing clinical hours with simulation training, the students exposed to the combined practice model significantly increased their knowledge acquisition compared to students who attended only traditional clinical practice. The combined practice model was also associated with meeting students’ clinical learning needs due to the simulation training, especially within the areas of the nursing process, self-efficacy, and the teaching–learning dyad.

7.1 Implications

This thesis provides useful knowledge that may have implications for nursing students and for educational institutions, nurse educators, and policymakers in their efforts to improve first-year students' clinical learning during clinical practice in nursing homes.

In this PhD study, we have demonstrated that simulation training combined with clinical practice in nursing homes has the potential to positively influence first-year students' experiences during the practice period and enhance the students' learning outcomes. Unexperienced nursing students need support, confirmation, and collective reflection, as this may enhance the students' confidence to actively take on challenges and learn during their clinical practice period. For first-year students, simulation training may be a valuable learning supplement during their clinical practice as it provides additional experiences and supervision that facilitate reflection and time to understand complex concepts of nursing. This study suggests that implementing incorporated academic and practice-focused simulation training during students' clinical practice in nursing homes may challenge students to develop and utilise knowledge and expand their capabilities, which is essential for promoting professional development and patient care.

For educational institutions and nurse educators, an important step in improving nursing students' clinical learning is to evaluate how students' clinical learning needs are met. To evaluate clinical practice and simulation training in nurse education programmes so that both strategies can be optimally combined, the use of valid evaluation tools is encouraged. In this PhD study, the CLECS was translated into Norwegian and evaluated for its psychometric properties. Until now, no valid instrument that provides nurse institutions and nurse educators with directions on how to best combine clinical practice and simulation training to meet students' clinical learning needs has been available in Norway. The CLECS (Norwegian version) could be integrated into Norwegian nursing education for course and programme evaluations. It may also be used as a guide for tailoring simulation training sessions that can compensate for unfulfilled learning needs in clinical practice. However, in future studies, the test-retest reliability of the CLECS (Norwegian version) should be further evaluated, and the factor structure of the CLECS should be confirmed with data that also include the simulated environment.

This PhD study also provides promising evidence regarding simulation training as a viable replacement for a portion of the required clinical hours in nursing homes to improve clinical learning. However, the Norwegian obligation to the EU directive means that the possible replacement of clinical hours in Norway is an international political matter and not up to national educational institutions themselves. A redefinition of what is considered clinical practice in the EU directive, which also includes simulation training, would allow for more flexibility in Norwegian nursing education. Such a redefinition could also provide enhanced opportunities to increase educational capacity without necessarily having to reduce the quality of the education. However, to validate a possible practice change across the country, continued research into the possible advantages or disadvantages of simulation training as a partial replacement for clinical hours is needed. Further work also includes studies exploring the extent to which clinical hours can be replaced without compromising the quality of students' clinical education, the costs involved, and the resources needed. A practice change across the country will require national regulations on the number of hours that can potentially be replaced along with regulations on and requirements for the simulation training used as a replacement.

References

Abelsen, B., Gaski, M., Nødland, S. I., & Stephansen, A. (2014). *Samhandlings-reformens konsekvenser for det kommunale pleie- og omsorgstilbudet*. Nasjonalt senter for distriktsmedisin. http://arkiv.nsdm.no/filarkiv/File/rapporter/IRIS_202014-382_20Samhandlingsreformens_20konsekvenser.pdf

Adamson, E., King, L., Foy, L., McLeod, M., Traynor, J., Watson, W., & Gray, M. (2018). Feedback in clinical practice: Enhancing the students experience through action research. *Nurse Education in Practice, 31*, 48–53. https://doi.org/ 10.1016/j.nepr.2018.04.012

Adib-Hajbaghery, M., & Sharifi, N. (2017). Effect of simulation training on the development of nurses and nursing students' critical thinking: A systematic literature review. *Nurse Education Today, 50*, 17–24. https://doi.org/10.1016/j.nedt.2016.12.011

Admi, H., Moshe-Eilon, Y., & Sharon, D. (2018). Nursing students' stress and satisfaction in clinical practice along different stages: A cross-sectional study. *Nurse Education Today, 68*, 86–92. https://doi.org/10.1016/j.nedt.2018.05.027

Aebersold, M. (2018). Simulation-based learning: No longer a novelty in undergraduate education. *The Online Journal of Issues in Nursing, 23*(2), 1-1. https://doi.org/10.3912/OJIN.Vol23No02PPT39

Al Sabei, S. D., & Lasater, K. (2016). Simulation debriefing for clinical judgment development: A concept analysis. *Nurse Education Today, 45*, 42–47. https://doi.org/10.1016/j.nedt.2016.06.008

Al-Ghareeb, A. Z., & Cooper, S. J. (2016). Barriers and enablers to the use of high-fidelity patient simulation manikins in nurse education: An integrative review. *Nurse Education Today, 36*, 281–286. https://doi.org/10.1016/j.nedt.2015.08.005

Algoso, M., & Peters, K. (2012). The experiences of undergraduate Assistants in Nursing (AIN). *Nurse Education Today, 32*(3), 197–202. https://doi.org/10.1016/j.nedt.2011.08.002

Arkan, B., Ordin, Y., & Yllmaz, D. (2018). Undergratuate nursing student's experience related to their clinical learning environment and factors affecting to their clinical learning process. *Nurse Education in Practice, 29*, 127–132. https://doi.org/10.1016/j.nepr.2017.12.005

Artino, A. R. (2012). Academic self-efficacy: From educational theory to instructional practice. *Perspectives on Medical Education, 1*(2), 76–85. https://doi.org/10.1007/s40037-012-0012-5

Bandura, A. (1997). *Self-efficacy: The exercise of control*. W.H. Freeman & Co., Ltd.

Benner, P. (1984). *From novice to expert, excellence and power in clinical nursing practice*. Addison-Westley Publishing Company.

Benner, P. (2015). Curricular and pedagogical implications for the Carnegie study, educating nurses: A call for radical transformation. *Asian Nursing Research, 9*(1), 1–6. https://doi.org/10.1016/j.anr.2015.02.001

Benner, P., & Wrubel, J. (1982). Skilled clinical knowledge: The value of perceptual awareness. *Nurse Educator, 7*(3), 11–17.

Berman, A., Beazley, B., Karshmer, J., Prion, S., Van, P., Wallace, J., & West, N. (2014). Competence gaps among unemployed new nursing graduates entering a community-based transition-to-practice program. *Nurse Educator, 39*(2), 56–61. https://doi.org/10.1097/nne.0000000000000018

Bjørk, I. T., Berntsen, K., Brynildsen, G., & Hestetun, M. (2014). Nursing students' perceptions of their clinical learning environment in placements outside traditional hospital settings. *Journal of Clinical Nursing, 23*, (19-20) 2958–2967. https://doi.org/10.1111/jocn.12532

Blacker, D., & Endicott, J. (2008). Psychometric properties: Concepts of reliability and validity. In A. J. Rush, M. B. First, & D. Blacker (Eds.), *Handbook of psyciatric measures* (2nd ed., pp. 7–14). American Psyciatric Publishing, Inc.

Bland, A. J., Topping, A., & Wood, B. (2011). A concept analysis of simulation as a learning strategy in the education of undergraduate nursing students. *Nurse Education Today, 31*(7), 664–670. https://doi.org/10.1016/j.nedt.2010.10.013

Boeckxstaens, P., & De Graaf, P. (2011). Primary care and care for older persons: Position paper of the European Forum for Primary Care. *Quality in Primary Care, 19*(6), 369–389.

Bogossian, F. E., Cant, R. P., Ballard, E. L., Cooper, S. J., Levett-Jones, T. L., McKenna, L. G., Ng, L. C., & Seaton, P. C. (2019). Locating "gold standard" evidence for simulation as a substitute for clinical practice in prelicensure health professional education: A systematic review. *Journal of Clinical Nursing, 28* (21-22), 3759–3775. https://doi.org/10.1111/jocn.14965

Bonsaksen, T., Kottorp, A., Gay, C., Fagermoen, M. S., & Lerdal, A. (2013). Rasch analysis of the General Self-Efficacy Scale in a sample of persons with morbid obesity. *Health and Quality of Life Outcomes, 11*(202), 1-11. https://doi.org/10.1186/1477-7525-11-202

Bowerman, B. L., & O'Connel, R. T. (1990). *Linear statistical models: An applied approach* (2nd ed.). Cengage Learning, Inc.

Bradbury-Jones, C., Sambrook, S., & Irvine, F. (2011). Empowerment and being valued: A phenomenological study of nursing students' experiences of clinical practice. *Nurse Education Today, 31*(4), 368–372. https://doi.org/10.1016/j.nedt.2010.07.008

Bradshaw, C., Atkinson, S., & Doody, O. (2017). Employing a qualitative description approach in health care research. *Global Qualitative Nursing Research, 4*, 1–8. https://doi.org/10.1177/2333393617742282

Breymier, T. L., Rutherford-Hemming, T., Horsley, T. L., Atz, T., Smith, L. G., Badowski, D., & Connor, K. (2015). Substitution of clinical experience with simulation in prelicensure nursing programs: A national survey in the United States. *Clinical Simulation in Nursing, 11*(11), 472–478. https://doi.org/10.1016/j.ecns.2015.09.004

Brinkmann, S., & Kvale, S. (2015). *Det kvalitative forskningsintervju* (3rd ed.). Gyldendal Norsk Forlag AS

Browne, M., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage Publishing.

Bruvik, F. J. D., & Abrahamsen, J. F. (2017). Fra sykehus til sykehjem - hva samhandlingsreformen har ført til. *Sykepleien Forskning, 12*, e-60613. https://doi.org/10.4220/Sykepleienf.2017.60613

Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99-136). American Psychological Association Books.

Burns, E. R. (2010). 'Anatomizing' reversed: Use of examination questions that foster use of higher order learning skills by students. *Anatomical Sciences Education, 3*(6), 330–334. https://doi.org/10.1002/ase.187

Byrne, B. M. (1989). *Basic applications and programming for confirmatory factor analysis models*. Springer-Verlag.

Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: Systematic review. *Journal of Advanced Nursing, 66*(1), 3–15. https://doi.org/10.1111/j.1365-2648.2009.05240.x

Cant, R. P., & Cooper, S. J. (2017). Use of simulation-based learning in undergraduate nurse education: An umbrella systematic review. *Nurse Education Today, 49*, 63–71. https://doi.org/10.1016/j.nedt.2016.11.015

Cantrell, M. A., Franklin, A., Leighton, K., & Carlson, A. (2017). The evidence in simulation-based learning experiences in nursing education and practice: An umbrella review. *Clinical Simulation in Nursing, 13*(2), 71–77. https://doi.org/10.1016/j.ecns.2017.08.004

Carmines, E. G., & Mclver, J. P. (1981). Analyzing models with unobserved variables. In G. W. Bohrnstedt & E. F. Borgatta (Eds.), *Social measurement: Current issues* (pp. 65-115). Sage Publications, Inc.

Caruana, E. J., Roman, M., Hernández-Sánchez, J., & Solli, P. (2015). Longitudinal studies. *Journal of Thoracic Disease, 7*(11), E537–540. https://doi.org/10.3978/j.issn.2072-1439.2015.10.63

Caruana, S. (2015). Ethical considerations when carrying out research in one's own academic institution. *Symposia Melitensia, 10*, 61–71.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.

Crafford, I., Killan, C., Moore-Saayman, R., Dreyer, J., & Rossouw, M. (2019). Learning in simulation: Ready? Steady? GO! *Professional Nursing Today, 23*(1), 35–41. https://hdl.handle.net/10520/EJC-1517556811

Creswell, J. W. (2014). *Research design. Qualitative, quantitative and mixed methods approaches* (4th ed.). SAGE Publications, Inc.

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, quantitative & mixed methods approches* (5th ed.). SAGE Publications, Inc.

Curl, E. D., Smith, S., Chrisholm, L. A., McGee, L. A., & Das, K. (2016). Effectiveness of integrated simulation and clinical experiences compared to traditional clinical experiences for nursing students. *Nursing Education Perspectives, 37*(2), 72–77.

D'Souza, M. S., Arjunan, P., & Venkatesaperumal, R. (2017). High fidelity simulation in nursing education. *International Journal of Health Science and Research, 7*(7), 340–353.

Dellefield, M. E., Castle, N. G., McGilton, K. S., & Spilsbury, K. (2015). The relationship between registered nurses and nursing home quality: An integrative review (2008–2014). *Nurings Economic$, 33*(2), 95–108, 116.

Diehl, M., Semegon, A. B., & Schwarzer, R. (2006). Assessing attention control in goal pursuit: A component of dispositional self-regulation. *Journal of Personality Assessement, 86*(3), 306–317. https://doi.org/10.1207/s15327752jpa8603_06

Dinmohammadi, M., Jalali, A., & Peyrovi, H. (2016). Clinical learning experiences of Iranian student nurses: A qualitative study. *Nursing Practice Today, 3*(1), 31–39.

Doyle, L., Brady, A. M., & Byrne, G. (2016). An overview of mixed methods research - revisited. *Journal of Research in Nursing, 21*(8), 623–635. https://doi.org/10.1177/1744987116674257

Dreifuerst, K. T. (2009). The essentials of debriefing in simulation learning: A concept analysis. *Nursing Education Perspectives, 30*(2), 109–114.

Dreifuerst, K. T., Bradley, C. S., & Johnson, B. K. (2021). Debriefing: An essential componebt for learning in simulation pedagogy. In P. R. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (3rd ed., pp. 45-69). Wolters Kluwer.

Dunlap, J. C. (2005). Problem-based learning and self-efficacy: How a capstone course prepares students for a profession. *Educational Technology Research and Development, 53*(1), 65–83. https://doi.org/10.1007/BF02504858

Ehnfors, M., Ehnberg, A., & Torell-Ekstrand, I. (2015). *Nye VIPS-boken: Velvære, integritet, profylakse, sikkerhet* (K. M. Thorbjørnsen, Trans.; M. Forssum & A. K. Rotegård, Eds.). Cappelen Damm AS.

Eppich, W., & Cheng, A. (2015). Promoting Excellence and Reflective Learning in Simulation (PEARLS). *Simulation in Healthcare, 10* (2), 106–115. https://doi.org/doi: 10.1097/SIH.0000000000000072

Epstein, J., Miyuki, R., & Guillemin, F. (2015). A review of guidelines for cross-cultural adaption of questionnaires could not bring out consensus. *Journal of Clinical Epidemiology, 68* (4), 435–441.

Etherton-Beer, C., Venturato, L., & Horner, B. (2013). Organisational culture in residential aged care facilities: A cross-sectional observational study. *PLoS One, 8*(3), e58002. https://doi.org/10.1371/journal.pone.0058002

Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics, 5*(1), 1–4. https://doi.org/10.11648/j.ajtas.20160501.11

Field, A. (2018). *Discovering statistics using SPSS* (5th ed.). Sage Publications.

Finnbakk, E., Skovdahl, K., Wangensteen, S., & Fagerström, L. (2020). 'It's not for amateurs!'—Registered nurses' experiences of their clinical competence when caring for elderly patients. *International Journal of Human Caring, 24*(3), 184-195. https://doi.org/10.20467/HumanCaring-D-19-00044

Foronda, C., Liu, S. W., & Bauman, E. B. (2013). Evaluation of simulation in undergraduate nurse education: An integrative review. *Clinical Simulation in Nursing, 9*(10), E409–E416. https://doi.org/10.1016/j.ecns.2012.11.003

Founds, S. A., Zewe, G., & Scheuer, L. A. (2011). Development of high-fidelity simulated clinical experiences for baccalaureate nursing students. *Journal of Professional Nursing, 27*(1), 5–9. https://doi.org/10.1016/j.profnurs.2010.09.002

Fowler, J. (2008). Experiential learning and its facilitation. *Nurse Education Today, 29* (4), 427–433. https://doi.org/10.1016/j.nedt.2007.07.007

Frost, J. (2019). *Regression analysis. An intuitive guide for using and interpreting linear models*. Statistics by Jim Publishing.

Frost, J. (2020). *Hypothesis testing. An intuitive guide for making data driven decisions*. Statistics By Jim Publishing.

Furr, R. M., & Bacharach, V. R. (2008). *Psychometrics: An introduction*. SAGE Publications, Inc.

Gaba, D. M. (2007). The future vision of simulation in healthcare. *Simulation in Healthcare, 2*(2), 126–135. https://doi.org/10.1097/01.Sih.0000258411.38212.32

Ganley, B., & Linnard-Palmer, L. (2012). Academic safety during nursing simuation: Perceptions of nursing students and faculty. *Clinical Simulation in Nursing, 8*(2), 49–57. https://doi.org/10.1016/j.ecns.2010.06.004

Garson, G. D. (2013). *Factor analysis*. Statistical Associates Publishers.

Gates, M. G., Parr, M. B., & Hughen, J. E. (2012). Enhancing nursing knowledge using high-fidelity simulation. *Journal of Nursing Education, 51*(1), 9-15.

Glette, M. K., Røise, O., Kringeland, T., Churruca, K., Braithwaite, J., & Wiig, S. (2018). Nursing home leaders' and nurses' experiences of resources, staffing and competence levels and the relation to hospital readmissions – a case study. *BMC Health Services Research, 18*(955), 1-15. https://doi.org/10.1186/s12913-018-3769-3

Graneheim, U. H., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today, 24*(2), 105–112. https://doi.org/10.1016/j.nedt.2003.10.001

Guba, E. G. (1990). The alternative paradigm dialog. In E. G. Guba (Ed.), *The paradigm dialog* (pp. 17–27). SAGE Publications.

Guillaume, A., Harwood, C., Harwood, P., Montague, S., & Ruparelia, K. (2014). Immersive clinical simulation in undergraduate health care interprofessional education: Knowledge and perceptions. *Clinical Simulation in Nursing,10*(4), e205–e216. https://doi.org/10.1016/j.ecns.2013.12.006

Gurková, E., & Zeleníková, R. (2018). Nursing students' perceived stress, coping strategies, health and supervisory approaches in clinical practice: A Slovak and Czech perspective. *Nurse Education Today, 65*, 4–10. https://doi.org/10.1016/j.nedt.2018.02.023

Günay, U., & Kılınç, G. (2018). The transfer of theoretical knowledge to clinical practice by nursing students and the difficulties they experience: A qualitative study. *Nurse Education Today, 65*, 81–86. https://doi.org/10.1016/j.nedt.2018.02.031

Haddeland, K., Slettebø, Å., Carstens, P., & Fossum, M. (2018). Nursing students managing deteriorating patients: A systematic review and meta-analysis. *Clinical Simulation in Nursing, 21*, 1–15. https://doi.org/10.1016/j.ecns.2018.05.001

Haddeland, K., Slettebø, Å., Svensson, E., Tosterud, R. B., Wangensteen, S., & Fossum, M. (2021). The effects of using high-fidelity simulation in undergraduate nursing education: A multicenter randomized controlled trial with a process evaluation. *International Journal of Educational Research, 109*, 101813, 1-11. https://doi.org/10.1016/j.ijer.2021.101813

Hamstra, S. J., Brygdes, R., Hatala, R., Zendejas, B., & Cook, D. A. (2014). Reconsidering fidelity in simulation-based training. *Academic Medicine, 89*(3), 387–392. https://doi.org/10.1097/ACM.0000000000000130

Harder, N. (2015). Replace is not a four letter word. *Clinical Simulation in Nursing, 11*(10), 435–436. https://doi.org/https://doi.org/10.1016/j.ecns.2015.07.001.

Harrington, C., Choiniere, J., Goldman, M., Jacobsen, F. F., Lloyd, L., McGregor, M., Stamatopoulos, V., & Szebehely, M. (2012). Nursing home staffing standards and staffing levels in six countries. *Journal of Nursing Scholarship, 44*(1), 88–98.

Hayden, J., Smiley, R., Alexander, M., Kardong-Edgren, S., & Jeffries, P. (2014). The NCSBN National Simulation Study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation, 5*(2), S3–S40. https://doi.org/10.1016/S2155-8256(15)30062-4

Hayes, A. F., & Cai, L. (2007). Using heteroskedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods, 39*(4), 709–722. https://doi.org/10.3758/BF03192961

Holmlund, K., Lindgren, B., & Athlin, E. (2010). Group supervision for nursing students during their clinical placements: Its content and meaning. *Journal of Nursing Management, 18*(6), 678–688. https://doi.org/10.1111/j.1365-2834.2010.01157.x.

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hungerford, C., Blanchard, D., Bragg, S., Coates, A., & Kim, T. (2019). An international scoping exercise examining practice experience hours completed by nursing students. *Journla of Nursing Education, 58*(1), 33–41. https://doi.org/10.3928/01484834-20190103-06

Husebø, S. E., Friberg, F., Søreide, E., & Rystedt, H. (2012). Instructional problems in briefings: How to prepare nursing students for simulation-based cardiopulmonary resuscitation training. *Clinical Simulation in Nursing, 8*(7), e307–e318. https://doi.org/10.1016/j.ecns.2010.12.002

Husebø, S. E., Silvennoinen, M., Rosquist, E., & Masiello, I. (2018). Status of Nordic research on simulation-based learning in healthcare: An integrative review. *Advances in Simulation, 3*(12), 1-20. https://doi.org/10.1186/s41077-018-0071-8

Huston, C. L., Phillips, B., Jeffries, P. R., Todeo, C., Rich, J., Knecht, P., Sommer, S., & Lewis, M. P. (2018). The academic-practice gap: Strategies for an enduring problem. *Nursing Forum, 53*(1), 27–34. https://doi.org/ https://doi.org/10.1111/nuf.12216

INACSL. (2016a). INACSL standards of best practice: Simulation[SM] debriefing. *Clinical Simulation in Nursing, 12*, 21–25. https://doi.org/10.1016/j.ecns.2016.09.008

INACSL. (2016b). INACSL standards of best practice simulation[SM] Facilitation. *Clinical Simulation in Nursing, 12*, 16–20. https://doi.org/10.1016/j.ecns.2016.09.007

INACSL. (2016c). INACSL standards of best practice: Simulation[SM] simulation design. *Clinical Simulation in Nursing, 12*, 5–12. https://doi.org/ https://doi.org/10.1016/j.ecns.2016.09.005

Ironside, P. M., McNelis, A. M., & Ebright, P. (2014). Clinical education in nursing: Rethinking learning in practice settings. *Nursing Outlook, 62*(3), 185–191. https://doi.org/10.1016/j.outlook.2013.12.004

Jayasekara, R., Smith, C., Hall, C., Rankin, E., Smith, M., Visvanathan, V., & Friebe, T.-R. (2018). The effectiveness of clinical education models for undergraduate nursing programs: A systematic review. *Nurse*

Education in Practice, 29, 116–126. https://doi.org/doi: 10.1016/j.nepr.2017.12.006

Jeffries, P. R., Rodgers, B., Adamson, K.A. (2015). The NLN Jeffries Simulation Theory: Brief Narrative Description. In P.R. Jeffries (Ed.) *The NLN Jeffries Simulation Theory* (pp.39-43). National League for Nursing, Wolters Kluwer.

Jeffries, P. R., & Rizzolo, M. A. (2006). *Designing and implementing models for the innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study.* http://www.nln.org/docs/default-source/professional-development-programs/read-the-nln-laerdal-project-summary-report-pdf

Jeffries, P. R., & Rodgers, B. (2021). The NLN Jeffries simulation theory. In P. R. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (3rd ed., pp. 19-31). Wolters Kluwer.

Jeffries, P. R., & Rogers, K. J. (2012). Theorethical framework for simulation design. In P. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (2nd ed., pp.25-42). The National League of Nursing.

Jerusalem, M., & Schwarzer, R. (1992). Self-efficacy as a resource factor in stress appraisal processes. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 195–213) Hemisphere Publishing Corp.

Jonsén, E., Melender, H.-L., & Hilli, Y. (2013). Finnish and Swedish nursing students' experiences of their first clinical practice placement — A qualitative study. *Nurse Education Today, 33*(3), 297–302. https://doi.org/10.1016/j.nedt.2012.06.012

Kameg, K., Howard, V. M., Clochesy, J., Mitchell, A. M., & Suresky, J. M. (2010). The impact of high fidelity human simulation on self-efficacy of communication skills. *Issues in Mental Health Nursing, 31*(5), 315–323. https://doi.org/10.3109/01612840903420331

Kardong-Edgren, S. (2021). State of the science. In Jeffries.P.R. (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (3rd ed., pp. 1-19). Wolters Kluwer.

Keeping-Burke, L., McCloskey, R., Donovan, C., Yetman, L., & Gourdreu, A. (2020). Nursing students' experiences with clinical placement in residential aged care facilities: A systematic review of qualitative evidence. *JBI Evidence Synthesis, 18*(5), 986–1018. https://doi.org/10.11124/JBISRIR-D-19-00122

Kelly, M. A., Forber, J., Conlon, L., Roche, M., & Stasa, H. (2014). Empowering the registered nurses of tomorrow: Students' perspectives of a simulation experience for recognising and managing a deteriorating patient. *Nurse Education Today, 34*(5), 724–729. https://doi.org/10.1016/j.nedt.2013.08.014

Killett, A., Hyde, P., Burns, D., Gray, R., & Poland, F. (2013). How organizational factors interact to influence the quality of care of older people in the care home sector. *Journal of Health Services Research & Policy, 18*(1), 14–22. https://doi.org/10.1177/1355819613476016

Kirk, R. E. (2001). Promoting good statistical practices: Some suggestions. *Educational and Psychological Measurement, 61*(2), 213–218. https://doi.org/10.1177/00131640121971185

Kirkpatrick, D. L., & Kirkpatrick, J. D. (2006). *Evaluating training programs: The four levels* (3rd ed.). Berrett-Koehler Publishers.

Kitzinger, J. (1995). Introducing focus groups. *British Medical Journal, 311*(7000), 299–302. https://doi.org/10.1136/bmj.311.7000.299

Kolb, D. A. (2015). *Experiential learning. Experience as the source of learning and development* (2nd ed.). Pearson Education, Inc.

Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine, 15*(2), 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Korstjens, I., & Moser, A. (2017). Trustworthiness and publishing. *European Journal of General Practice, 24*(1), 120–124. https://doi.org/10.1080/13814788.2017.1375092

Krueger, R. A., & Casey, M. A. (2015). *Focus groups. A practical guide for applied research* (5th ed.). SAGE Publications, Inc.

Kusurkar, R. (2013). Critical synthesis package: General Self-Efficacy Scale (GSE). *The Journal of Teaching and Learning Resources*. https://doi.org/10.15766/mep_2374-8265.9576

La Cerra, C., Dante, A., Caponnetto, V., Franconi, I., Gaxhja, E., Petrucci, C., Alfes, C. M., & Lancia, L. (2019). Effects of high-fidelity simulation based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students: A systematic review and meta-analysis. *BMJ Open, 9*, e025306, 1-11. https://doi.org/10.1136/bmjopen-2018-025306

Labrague, L. J., McEnroe-Petitte, D., Bowling, A. M., Nwafor, C. E., & Tsaras, K. (2019). High-fidelity simulation and nursing students' anxiety and self-confidence: A systematic review. *Nursing Forum. An Independent Voice for Nursing, 54*(3), 358–368. https://doi.org/10.1111/nuf.12337

Larue, C., Peptin, J., & Allard, E. (2015). Simulation in preparation or substitution for clinical placement: A systematic review of the literature. *Journal of Nursing Education and Practice, 5*(9), 132-140. https://doi.org/10.5430/jnep.v5n9p132

Laugaland, K., Billett, S., Akerjordet, K., Frøiland, C., Grealish, L., & Aase, I. (2021). Enhancing student nurses' clinical education in aged care homes: A qualitative study of challenges perceived by faculty staff. *BMC Nursing, 20*(1), 1-12. https://doi.org/10.1186/s12912-021-00632-0

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods (Vols. 1–0)*. Sage Publications, Inc. https://doi.org/10.4135/9781412963947

Leighton, K. (2015). Development of the clinical learning environment comparison survey. *Clinical Simulation in Nursing, 11*(1), 44–51. https://doi.org/10.1016/j.ecns.2014.11.002

Leighton, K., Kardong-Edgren, S., McNelis, A. M., Foisy-Doll, C., & Sullo, E. (2021). Traditional clinical outcomes in prelicensure nursing education: An empty systematic review. *Journal of Nursing Education, 60*(3), 136–142. http://doi.org/10.3928/01484834-20210222-03

Lenhard, W., & Lenhard, A. (2016). *Calculation of effect sizes*. Psychometrica. https://www.psychometrica.de/effect_size.html

Levett-Jones, T., Lapkin, S., Hoffman, K., Arthur, C., & Roche, J. (2011). Examining the impact of high and medium fidelity simulation experiences on nursing students' knowledge acquisition. *Nurse Education in Practice, 11*(6), 380–383. http://doi.org/10.1016/j.nepr.2011.03.014

Li, J., Li, X., Gu, L., Zhang, R., Zhao, R., Cai, Q., Lu, Y., Wang, H., Meng, Q., & Wei, H. (2019). Effects of simulation-based deliberate practice on nursing students' communication, empathy, and self-efficacy.

Journal of Nursing Education, 58(12), 681–689. https://doi.org/10.3928/01484834-20191120-02

Liaw, S. Y., Chan, S. W., Chen, F. G., Hooi, S. C., & Siau, C. (2014). Comparison of virtual patient simulation with mannequin-based simulation for improving clinical performances in assessing and managing clinical deterioration: randomized controlled trial. *Journal of Medical Internet Research, 16*(9), e214. https://doi.org/10.2196/jmir.3322

Lindbæk, M., & Skovlund, E. (2002). Kontrollerte kliniske forsøk –jakten på sann effekt av behandling. *Tidsskriftet den norske legeforening, 27*(122), 2631–2635.

Lioce, L., Lopreiato, J., Downing, D., Chang, T. P., Robertson, J. M., Anderson, M., Diaz, D. A., Spain, A. E., & The Terminology and Concepts Working Group. (2020). *Healthcare simulation dictionary - Second edition* (L. Lioce, Ed.). Agency for Healthcare Research and Quality. http://www.ssih.org/dictionary

Lioce, L., Meakim, C. H., Fey, M. K., Chmil, J. V., Mariani, B., & Alinier, G. (2015). Standards of best practice: Simulation standard IX: Simulation design. *Clinical Simulation in Nursing, 11*(6), 309–315. https://doi.org/10.1016/j.ecns.2015.03.005

Littlejohn, S. W., & Foss, K. A. (2009). *Encyclopedia of communication theory* (Vol. 1). SAGE Publications.

Liu, J., Tang, W., Chen, G., Lu, Y., Feng, C., & Tu, X. M. (2016). Correlation and agreement: Overview and clarification of competing concepts and measures. *Shanghai Archives of Psychiatry, 28*(2), 115–120. https://doi.org/10.11919/j.issn.1002-0829.216045

Long, J. S., & Ervin, L. H. (2000). Using heteroscedasticity consistent standard errors in the linear regression model. *The American Statistician, 54*(3), 217–224. https://doi.org/10.2307/2685594

Luszczynska, A., Scholz, U., & Schwarzer, R. (2005). The general self-efficacy scale: Multicultural validation studies. *The Journal of Psychology, 139*(5), 439–457. https://doi.org/10.3200/JRLP.139.5.439-457

MacCallum, R. C. (2003). 2001 Presidential Address: Working with imperfect models. *Multivariate Behavioral Research, 38*(1), 113–139. https://doi.org/10.1207/S15327906MBR3801_5

Malterud, K. (2012a). *Fokusgrupper som forskningsmetode for medisin og helsefag*. Universitetsforlaget.

Malterud, K. (2012b). Systematic text condensation: A strategy for qualitative analysis. *Scandinavian Journal of Public Health, 40*(8), 795–805. https://doi.org/10.1177/1403494812465030

Malterud, K. (2013). *Kvalitative metoder i medisinsk forskning* (3rd ed.). Universitetsforlaget AS.

Mann, C. J. (2003). Observational research methods. Research design II: Cohort, cross sectional, and case-control studies. *Emergency Medicine Journal, 20*(1), 54–60. https://doi.org/10.1136/emj.20.1.54

Martella, R. C., Nelson, J. R., Morgan, R., & Marchand-Martella, N. E. (2013). *Understanding and interpreting educational research* (2nd ed.). Guilford Publications.

Matthew-Maich, N., Martin, L., Ackerman-Rainville, R., Hammond, C., Palma, A., Sheremet, D., & Stone, R. (2015). Student perceptions of effective nurse educators in clinical practice. *Nursing Standard, 29*(34), 45-58. https://doi.org/10.7748/ns.29.34.45.e9640

Mays, A. M., Saliba, D., Feldman, S., Smalbrugge, M., Hertogh, C., Booker, T. L., Fulbright, K. A., Hendriks, S. A., & Katz, P. R. (2018). Quality indicators of primary care provider engagement in nursing home care. *The Journal of Post-Acute and Long-Term Care Medicine, 19*(10), 824–832. https://doi.org/10.1016/j.jamda.2018.08.001

McCuistion, L. E., DiMaggio, K. V., Winton, M.B. & Yeager, J.J. (2020). *Pharmacology. A patient-centered nursing process approach* (10th ed.). Saunders.

McDermott, D. S. (2016). The prebriefing concept: A Deplphi study of CHSE experts. *Clinical Simulation in Nursing, 12*(6), 219–227. https://doi.org/10.1016/j.ecns.2016.02.001

McIntosh, A., Gidman, J., & Smith, D. (2014). Mentors' perceptions and experiences of supporting student nurses in practice. *International Journal of Nursing Practice, 20*(4), 360–365. https://doi.org/10.1111/ijn.12163

McPherson, K., Gibson, B. E., & Leplége, A. (2015). *Rethinking rehabilitation. Theory and practice.* CRC Press Taylor & Francis Group.

Mercer, J. (2007). The challenges of insider research in educational institutions: Wielding a double-edged sword and resolving delicate dilemmas. *Oxford Review of Education, 33*(1), 1–17. https://doi.org/10.1080/03054980601094651

Mills, J., & Brand, D. (2017). *Learning in practice for nursing students*. Red Globe Press.

Mills, J., West, C., Langtree, T., Usher, K., Henry, R., Chamberlain-Salaun, J., & Mason, M. (2014). 'Putting it together': Unfolding case studies and high-fidelity simulation in the first-year of an undergraduate nursing curriculum. *Nurse Education in Practice, 14*(1), 12–17. https://doi.org/10.1016/j.nepr.2013.06.003

Ministry of Education. (2020). *National regulations relating to a common curriculum for health and social care education*. https://www.regjeringen.no/contentassets/389bf8229a3244f0bc1c7835f842ab60/national-regulations-relating-to-a-common-curriculum-for-health-and-social-care-education.pdf

Ministry of Education and Research. (2019). *Regulation on national guidelines for nursing education. (Forskrift om nasjonal retningslinje for sykepleierutdanning)*. https://lovdata.no/dokument/LTI/forskrift/2019-03-15-412

Morell-Scott, N. (2018). Confidence and deeper learning: Simulated practice within pre-registration nurse education. *British Journal of Nursing, 27*(14), 827–830. https://doi.org/10.12968/bjon.2018.27.14.827

Morrell, N., & Ridgway, V. (2014). Are we preparing student nurses for final practice placement? *British Journal of Nursing, 23*(10), 518–523. https://doi.org/10.12968/bjon.2014.23.10.518

Morse, J.M. (2010). Procedures and practice of mixed method design. Maintaining control, rigor, and complexity. In Taskakkori, A., Teddie, C. (eds.) *Sage Handbook of Mixed Methods in Social & Behavioral Research* (2nd ed, pp. 339–352). Sage Publications Inc.

Moule, P., Wilford, A., Sales, R., Haycock, L., & Lockyer, L. (2006). *Can the use of simulation support pre-registration nursing students in familiarising themselves with clinical skills before consolidating them in practice?* Center for learning and workforce research. https://www.yumpu.com/en/document/read/42365398/can-the-use-of-simulation-support-pre-registration-nursing-students-

Muijeen, K., Kongvattananon, P., Somprasert, C. (2020). The key success factors in focus group discussions with the elderly for novice researchers: A review. *Journal of Health Research, 34*(4), 359–371. https://doi.org/10.1108/JHR-05-2019-0114

Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum sample size recommendations for conducting factor analyses. *International Journal of Testing, 5*(2), 159–168. https://doi.org/10.1207/s15327574ijt0502_4

Murphy, F., Rosser, M., Bevan, R., Warner, G., & Jordan, S. (2012). Nursing students' experiences and preferences regarding hospital and community placements. *Nurse Education in Practice, 12*(3), 170–175. https://doi.org/10.1016/j.nepr.2011.12.007

National Leauge of Nursing. (2020). *Descriptions of available instruments*. https://www.nln.org/education/teaching-resources/tools-and-instruments

Nordström, K. (2018). Caring for elder patients: Mutual vulnerabilities in professional ethics. *Nursing Ethics, 25*(8), 1004–1016. https://doi.org/ 10.1177/0969733016684548

Norman, L., Buerhaus, P. I., Donelan, K., McCloskey, B., & Dittus, R. (2005). Nursing students assess nursing education. *Journal of Professional Nursing, 21*(3), 150–158. https://doi.org/10.1016/j.profnurs.2005.04.003

O'Regan, S., Molloy, E., Watterson, L., & Nestel, D. (2016). Observer roles that optimise learning in healthcare simulation education: A systematic review. *Advances in Simulation, 1*(1), 4. https://doi.org/10.1186/s41077-015-0004-8

Ogilvie, S., Cragg, B., & Foulds, B. (2011). Perceptions of nursing students on the process and outcomes of a simulation experience. *Nurse Educator, 36*(2), 56–58. https://doi.org/ 10.1097/NNE.0b013e31820b4fd5

Pajares, F. (1996). Self-efficacy beliefs in academic settings. *Review of Educational Research, 66*(4), 543–578. https://doi.org/10.3102/00346543066004543

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research.

Administration and Policy in Menalt Health Services Research, 42(5), 533–544. https://doi.org/10.1007/s10488-013-0528-y

Paluck, E. L. (2010). The promising integration of qualitative methods and field experiments. *The Annals of the American Academy of Political and Social Science, 628*(1), 59–71. https://doi.org/10.1177/0002716209351510

Papathanasiou, I. V., Tsaras, K., & Sarafis, P. (2014). Views and perceptions of nursing students on their clinical learning environment: Teaching and learning. *Nurse Education Today, 34*(1), 57–60. https://doi.org/10.1016/j.nedt.2013.02.007

Park, M. S., Kang, K. J., Jang, S. J., Lee, J. Y., & Chang, S. J. (2018). Evaluating test-retest reliability in patient-reported outcome measures for older people: A systematic review. *International Journal of Nursing Studies, 79*, 58–69. https://doi.org/10.1016/j.ijnurstu.2017.11.003

Pasient- og bruker rettighetsloven § 1-3 (1999). Lov om pasient- og brukerrettigheter. Lovdata. https://lovdata.no/dokument/NL/lov/1999-07-02-63

Patton, M. Q. (2015). *Qualitative research & evaluation methods*. SAGE Publications, Inc.

Perry, C., Henderson, A., & Grealish, L. (2018). The behaviours of nurses that increase student accountability for learning in clinical practice: An integrative review. *Nurse Education Today, 65*, 177–186. https://doi.org/10.1016/j.nedt.2018.02.029

Pohlmann, J. T. (2004). Use and interpretation of factor analysis in the Journal of Educational Research: 1992–2002. *The Journal of Educational Research, 98*(1), 14–23. https://doi.org/10.3200/JOER.98.1.14-23

Polit, D. E., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Wolters Kluwer Health.

Pront, L., & McNeill, L. (2019). Nursing students' perceptions of a clinical learning assessment activity: 'Linking the puzzle pieces of theory to practice'. *Nurse Education in Practice, 36*, 85–90. https://doi.org/10.1016/j.nepr.2019.03.008

Racher, F. E., & Robinson, S. (2002). Are phenomenology and postpositivism strange bedfellows? *Western Journal of Nursing Research, 25*(5), 464–481.

Reierson, I. Å., Sandvik, L., Solli, H., Haukedal, T. A., & Husebø, S. E. (2020). Psychometric testing of the Norwegian version of the Simulation Design Scale, the Educational Practices Questionnaire and the Student Satisfaction and Self-Confidence in Learning Scale in nursing education. *International Journal of Nursing Studies Advances, 2*, 100012. https://doi.org/10.1016/j.ijnsa.2020.100012

Richardson, H., Goldsamt, L. A., Simmons, J., & Jeffries, P. R. (2014). Increasing faculty capacity: Findings from an evaluation of simulation clinical teaching. *Nursing Education Perspectives, 35*(6), 308–314. https://doi.org/10.5480/14-1384

Roberts, E., Kaak, V., & Rolley, J. (2019). Simulation to replace clinical hours in nursing: A meta-narrative review. *Clinical Simulation in Nursing, 37*, 5–13. https://doi.org/10.1016/j.ecns.2019.07.003

Roksvaag, K., & Texmon, I. (2012). *Arbeidsmarkedet for helse- og sosialpersonell fram mot år 2035*. Statistics Norway. https://www.ssb.no/arbeid-og-lonn/artikler-og-publikasjoner/arbeidsmarkedet-for-helse-og-sosialpersonell-fram-mot-aar-2035

Ross, J. G., Latz, E., Meakim, C. H., Arcamone, A., Furman, G., & Reynolds, K. (2022). Multiple-patient simulations and student outcomes in prelicensure nursing education: An integrative review. *Clinical Simulation in Nursing, 64*, 31–45. https://doi.org/10.1016/j.ecns.2021.11.007

Røysamb, E. (1997). Adolescent risk making: Behaviour patterns and the role of emotions and cognitions. *Department of Psychology, University of Oslo*.

Røysamb, E., Schwarzer, R., & Jerusalem, M. (1998). *Norwegian version of the general perceived self-efficacy scale.* https://userpage.fu-berlin.de/~health/norway.htm

Saied, H. (2017). The impact of simulation on pediatric nursing students' knowledge, self-efficacy, satisfaction, and confidence. *Journal of Education and Practice, 8*(11), 95–102.

Salim, A., Mackinnon, A., Christensen, H., & Griffiths, K. (2008). Comparison of data analysis strategies for intent-to-treat analysis in pre-test–post-test designs with substantial dropout rates. *Psychiatric Research, 160*(3), 335–345. https://doi.org/10.1016/J.PSYCHRES.2007.08.005

Sandelowski, M. (2000). Focus on research methods. Whatever happened to qualitative description? *Research in Nursing & Health, 23*(4), 334–340. https://doi.org/10.1002/1098-240X(200008)23:4<334::AID-NUR9>3.0.CO;2-G

Schaumberg, A. (2015). The matter of 'fidelity': Keep it simple or complex? *Best Practice & Research Clincal Anaesthesiology, 29*(1), 21–25. https://doi.org/10.1016/j.bpa.2015.01.005

Schermelleh-Engel, K., & Moosbrugger, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Reseach Online, 8*(2), 23–74.

Scholz, U., Doña, B. G., Sud, S., & Schwarzer, R. (2002). Is general self-efficacy a universial construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment, 18*(3), 242–251. https://doi.org/10.1027//1015-5759.18.3.242

Schwarzer, R., & Jerusalem, M. (1995). Generalized self-efficacy scale. In J. Weinman, S. Wright, & M. Johnston (Eds.), *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35–37). NFER-Nelson

Scully, D. (2017). Constructing multiple-choice items to measure higher-order thinking. *Practical Assessment, Research, and Evaluation, 22*(4), 1-13. https://doi.org/10.7275/swgt-rj52

Shadish, W., Cook, T., & Campbell, D. (2001). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin Company.

Sharif, F., & Masoumi, S. (2005). A qualitative study of nursing student experiences of clinical practice. *BMC Nursing, 4*(6), 6. https://doi.org/10.1186/1472-6955-4-6

Shek, D., & Yu, L. (2014). Confirmatory factor analysis using AMOS: A demonstration. *International Journal on Disability and Human Development, 13*(2), 191–204. https://doi.org/10.1515/ijdhd-2014-0305

Shin, S., Jin-Hva, P., & Jung-Hee, K. (2015). Effictiveness of patient simulation in nursing education: Meta-analysis. *Nurse Education Today, 35*(1), 176–182. https://doi.org/10.1016/j.nedt.2014.09.009

Shinnick, M. A., Woo, M. A., Horwich, T. B., & Steadman, R. (2011). Debriefing: The most important component in simulation? *Clinical Simulation in Nursing, 7*(3), 105–111. https://doi.org/10.1016/j.ecns.2010.11.005

Simms, L. J., Zelazny, K., Williams, T. F., & Bernstein, L. (2019). Does the number of response options matter? Psychometric perspectives using personality questionnaire data. *Psychological Assessment, 31*(4), 557–566. https://doi.org/10.1037/pas0000648

Skrable, L., & Fitzsimons, V. (2014). Simulation in associate degree nursing education: A literature review. *Teaching and Learning in Nursing, 9*(3), 120–125. https://doi.org/10.1016/j.teln.2014.03.001

Soccio, D. A. (2017). Effectiveness of mental health simulation in replacing traditional clinical hours in baccalaureate nursing education. *Journal of Psychosocial Nursing and Mental Health Services, 55*(11), 36–43. https://doi.org/10.3928/02793695-20170905-03

Solli, H., Haukedal, T. A., Husebø, S. E., & Reierson, I. Å. (2020). The art of balancing: The facilitator's role in briefing in simulation-based learning from the perspective of nursing students – a qualitative study. *BMC Nursing, 19*(99), 1-11. https://doi.org/10.1186/s12912-020-00493-z

Steinwachs, B. (1992). How to facilitate a debriefing. *Simulation and Gaming, 23*(2), 186–192. https://doi.org/10.1177/1046878192232006

Streiner, D. (2003). Starting at the beginning: An introduction to coefficient alpha and internal consistency. *Journal of Personality Assessment, 80*(1), 99–103.

Sulivan, N., Swoboda, S. M., Bremeyer, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: A study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing, 30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Sun, J. (2005). Assessing goodness of fit in confirmatory factor analysis. *Measurement and Evaluation in Counseling and Developement, 37*(4), 240–256. https://doi.org/10.1080/07481756.2005.11909764

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Allyn & Bacon.

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education, 45*(6), 204–211. https://doi.org/10.3928/01484834-20060601-04

Terwee, C. B., Mokkink, L. B., Knol, D. L., Ostelo, R. W. J. G., Bouter, L. M., & de Vet, H. C. W. (2012). Rating the methodological quality in systematic reviews of studies on measurement properties: A scoring system for the COSMIN checklist. *Quality of Life Research, 21*(4), 651–657. https://doi.org/10.1007/s11136-011-9960-1

The Norwegian Directorate of Health (2019) *Nasjonal handlingsplan for pasientsikkerhet og kvalitetsforbedring 2019–2023.* https://www.helsedirektoratet.no/veiledere/ledelse-og-kvalitetsforbedring-i-helse-og-omsorgstjenesten/Nasjonal%20handlingsplan%20for%20pasientsikkerhet%20og%20kvalitetsforbedring%202019-2023.pdf/_/attachment/inline/79c83e08-c6ef-4adc-a29a-4de1fc1fc0ef:94a

The Norwegian Association of Higher Education Institutions. (2016). *Kvalitet i praksisstudiene i helse- og sosialfaglig høyere utdanning: Praksisprosjektet.* https://www.regjeringen.no/contentassets/86921ebe6f4c45d9a2f67fda3e6eae08/praksisprosjektet-sluttrapport.pdf

Tosterud, R., Petzall, K., Hedelin, B., & Hall-Lord, M. L. (2014). Psychometric testing of the Norwegian version of the questionnaire, student satisfaction and self-confidence in learning, used in simulation. *Nurse Education in Practice, 14*(6), 704–708. https://doi.org/10.1016/j.nepr.2014.10.004

Trowler, P. (2011). *Researching your own institution* https://www.bera.ac.uk/publication/researching-your-own-institution-higher-education

Tønnessen, M., Leknes, S., & Syse, A. (2016). *Population projections 2016–2100: Main results*. https://www.ssb.no/en/befolkning/artikler-og-publikasjoner/_attachment/270675?ts=155962dec80

van Iersel, M., Latour, C. H., de Vos, R., Kirschner, P. A., & Scholte Op Reimer, W. J. (2016). Nursing students' perceptions of community care and other areas of nursing practice - A review of the literature.

International Journal of Nursing Studies, 61, 1–19. https://doi.org/10.1016/j.ijnurstu.2016.05.011

Vatnøy, T. K., Skinner, S. M., Karlsen, T.-I., & Dale, B. (2020). Nursing competence in municipal inpatient acute care in Norway: A crosssectional study. *BMC Nursing, 19*(70), 1-11. https://doi.org/10.1186/s12912-020-00463-5

Wang, W. L., Lee, H. L., & Fetzer, S. J. (2006). Challenges and strategies of instrument translation. *Western Journal of Nursing Research, 28*(3), 310–321. https://doi.org/10.1177/0193945905284712

Wangmo, T., Nordström, K., & Kressig, R. W. (2017). Preventing elder abuse and neglect in geriatric institutions: Solutions from nursing care providers. *Geriatric Nursing, 38*(5), 385–392. https://doi.org/10.1016/j.gerinurse.2016.12.016

WHO. (2016). *Multimorbidity: Technical series on safer primary care*. World Health Organization. https://www.who.int/publications/i/item/9789241511650

WHO. (2018). *Process of translation and adaption of instruments*. World Health Organization. http://www.who.int/substance_abuse/research_tools/translation/en/

WHO. (2021). *Patient safety*. World Health Organisation. https://www.euro.who.int/en/health-topics/Health-systems/patient-safety/patient-safety

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., & Erikson, P. (2005). Principles of good practice for the translation and cultural adaption process for patient-reported outcomes (PRO). Measures: Report of the ISPOR Task Force for Translation and Cultural Adaption. *Value in Health, 8*(2), 94–104.

Williams, M. (2000). Interpretivism and generalisation. *Sociology, 34*(2), 209–224.

Willis, G. B. (2005). *Cognitive interviewing: A tool for improving questionnaire design*. Sage Publications.

Yilmaz, F. T., Sabanciogullari, S., & Aldemir, K. (2015). The opinions of nursing students regarding the nursing process and their levels of proficiency in Turkey. *Journal of Caring Sciences, 4*(4), 265–275. https://doi.org/10.15171/jcs.2015.027

Zull, J. E. (2002). *The art of changing the brain*. Stylus Publishing, LLC.

Papers

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RESEARCH ARTICLE

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Elements in scenario-based simulation associated with nursing students' self-confidence and satisfaction: A cross-sectional study

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Abstract

Aim: To identify elements in scenario-based simulation associated with nursing students' satisfaction with the simulation activity and self-confidence in managing the simulated patient situation. The study will provide insight to improve the use of simulation as a learning strategy.

Design: A cross-sectional study.

Method: The Student Satisfaction and Self-Confidence in Learning scale was used as the outcome measure to identify associations with elements of the Simulation Design Scale and the Educational Practices Questionnaire scale after scenario-based simulation using patient simulators. First-year nursing students at a university college in Norway (N = 202) were invited to participate and (N = 187) responded to the questionnaires.

Results: The mean scores for self-confidence and satisfaction were 4.16 and 4.57, respectively. In the final multiple linear regression analysis, active learning was associated with satisfaction with the simulation activity, while clear objectives and active learning were associated with self-confidence in managing the simulated patient situation.

KEYWORDS
active learning, nursing education, self-confidence, simulation training, student satisfaction

1 | INTRODUCTION

Scenario-based simulation using a computerized full-body-size patient simulator facilitates the mimicry of real-life situations (Cato, 2012; Hicks, Coke, & Li, 2009; Shin, Jin-Hva, & Jung-Hee, 2015). The use of such simulators may enhance fidelity for many simulated scenarios by enabling the simulation of physiological symptoms for various health conditions as well as physiological reactions to student-provided care. Whether students feel that simulation experiences mimic real clinical practice is not a fixed property of the patient simulator, however, but also depends on effective simulation design and student engagement (Hamstra, Brygdes, Hatala, Zendejas, & Cook, 2014). Students may be engaged and immersed in the simulated patient scenario by working with the 'patient' as autonomous clinicians making their own decisions. In this way, students can undergo training in clinical decision-making and interventions, evaluate health interventions and observe and analyse patient problems (Cant & Cooper, 2010; Cato, 2012; Mills et al., 2014) in a learning environment designed to imitate real patient settings (Hamstra et al., 2014). Simulation is an educational approach that may facilitate student engagement and integrate complex practical and theoretical knowledge (Bland, Topping, & Wood, 2011). The evidence base for such simulations as a learning strategy in nursing education has primarily shown positive outcomes, including self-confidence and satisfaction, improved knowledge, critical thinking, general competency and clinical skills (Cant & Cooper, 2017; Foronda, Liu, & Bauman, 2013; Haddeland, Slettebø, Carstens, & Fossum, 2018; Merriman, Stayt, & Ricketts, 2014; Shin et al., 2015; Skrable & Fitzsimons, 2014).

2 | BACKGROUND

Elements of simulation-based education are described in the National League for Nursing (NLN) Jeffries simulation theory (Jeffries, Rodgers, & Adamson, 2015; Jeffries & Rogers, 2012) The theory provides systematic steps for designing and implementing best-practice simulation-based education, and it describes the following elements of the educational practices, simulation design and learner outcomes:

- *Educational practices*: feedback, collaboration, high expectations, active learning, time on tasks, student/faculty interaction and diverse learning experiences.
- *Simulation design*: fidelity, problem-solving, student support/debriefing and objectives of the simulation.
- *Learner outcomes*: learning, skill performance, critical thinking, learner satisfaction and self-confidence.

According to the NLN Jeffries simulation theory, educators should consider these elements in planning simulation experiences to achieve high-level outcomes (Jeffries et al., 2015; Jeffries & Rogers, 2012). The ultimate goal for simulation-based education is to achieve health outcomes for care recipients. However, to evaluate simulation-based education, a first step is to examine the students' self-confidence and satisfaction with the experience.

Instruments for measuring students' self-confidence and satisfaction and for measuring the presence of elements of the simulation experience that reflect the NLN Jeffries simulation theory have been developed (NLN, 2018). It is already an established opinion that students achieve high scores in self-confidence and satisfaction (Cant & Cooper, 2017; D'Souza, Arjunan, & Venkatesaperumal, 2017; Lapkin, Levett-Jones, Bellchambers, & Fernandez, 2010). While students report that they are generally satisfied with and achieve self-confidence from simulation experiences (Foronda et al., 2013; Haddeland et al., 2018; Merriman et al., 2014; Skrable & Fitzsimons, 2014; Tosterud, Hedelin, & Hall-Lord, 2013; Tosterud, Petzall, Hedelin, & Hall-Lord, 2014), researchers have paid comparatively little attention to identifying the elements in simulation that are associated with these positive outcomes. To our knowledge, only two studies have examined the associations between elements in scenario-based simulation and students' self-confidence and satisfaction as outcome measures (Smith & Barry, 2013; Smith & Roehrs, 2009). Smith and Roehrs (2009), who performed a simulation scenario involving an elderly patient with acute deterioration, found that two essential adult-learning principles—having a clear statement of objectives and having opportunities for problem-solving—were associated with high levels of student satisfaction and self-confidence after simulation. In Smith and Barry's (2013) simulation of a homecare patient situation, learning principles, such as support and opportunities for problem-solving, were found to be correlated with self-confidence and satisfaction. Based on the results from these studies, several key elements are necessary to achieve successful simulation sessions: (a) having well-defined and clear objectives for the simulation, (b) experiencing support during the simulation and (c) being provided with opportunities for problem-solving that are adjusted to the students' level of knowledge.

Although Blum, Borglund, and Parcells (2010) found self-confidence and competence to be poorly correlated, Lapkin et al. (2010) suggested that low levels of self-confidence can have a detrimental effect on learning outcomes. Students may become better equipped for learning by gaining increased experience and self-confidence (Najjar, Lyman, & Miehl, 2015; Yuan, Williams, Fang, & Ye, 2012). Levett-Jones et al. (2011) have also suggested that student satisfaction helps to build self-confidence, which in turn may help students to develop skills and acquire knowledge. Hence, to develop strategies to optimize students' learning outcomes, further studies are needed to identify which elements in simulation are related to student self-confidence and satisfaction.

The aim of this study was to identify elements in scenario-based simulation that are associated with nursing students' satisfaction with the simulation activity and their self-confidence in managing the simulated patient situation. The study will provide insight to nursing educators to improve the use of simulation as a learning strategy. The simulation was implemented as a mandatory supplement to first-year students' 6-week clinical practice in nursing homes and aimed to merge theoretical knowledge, practical experiences and skills in a simulated situation where a 'patient' experienced deterioration from a chronic disease.

3 | METHODS

3.1 | Study design, sample and setting

This cross-sectional, observational study involved first-year nursing students in the bachelor's degree programme in Norway, and rating scales were used for data collection. The reporting of the simulation session follows *Key Elements to Report for Simulation-Based Research* (Cheng et al., 2016). The students (N = 202) were invited to participate in the study, and 187 volunteered after attending a 3-hr simulation session held in the university college's skills laboratory. The students indicated their consent by anonymously filling out the questionnaire after the entire simulation session was completed.

At the time of the study, the students had completed their first clinical practice in nursing homes and had no former simulation experience. The level of fidelity in the scenario was considered as high due to the immersing of the students as autonomous clinicians making decisions and demonstrating their knowledge (Hamstra et al., 2014) and the use of clinical equipment and patient simulators (NursingAnne®; Laerdal™). The simulation and data collection were conducted in the spring of 2016, while data analysis was completed in 2018.

3.2 | Data collection

The respondents were asked to assess the degree to which they agreed with various statements by using a five-point Likert scale, where higher numbers indicated greater agreement. The questionnaires contained three instruments that a research team from the Norwegian University of Science and Technology in Gjøvik recently validated and translated into Norwegian: the Student Satisfaction and Self-Confidence in Learning (SSSCL) scale, the Simulation Design Scale (SDS) and the Educational Practices Questionnaire (EPQ) scale (NLN, 2018). After Tosterud et al. (2013), Tosterud et al. (2014)) conducted a forward and back translation, Cronbach's alpha showed values above .8 for all translated instruments. The three instruments consist of 11 subscales that reflect the elements in the NLN Jeffries simulation theory (NLN, 2018).

The SSSCL scale is a 13-item instrument that measures both students' self-confidence in managing the simulated patient situation (eight items) and their satisfaction with the simulation activity (five items). Responses were provided on a five-point Likert scale.

The SDS consists of 20 items, which include a five-point Likert scale and 'not applicable'. The SDS measures elements that are related to the simulation's design and to various adult-learning principles, including:

- *Clear objectives*: the presence and importance of having clear and well-defined objectives for the simulation session (five items).
- *Support*: the presence and importance of support and assistance from the facilitator during the simulation (four items).
- *Problem-solving*: the presence and importance of opportunities to independently solve problems that are adjusted to the students' level of knowledge (five items).
- *Feedback*: the presence and importance of constructive feedback that increases knowledge (four items).
- *Fidelity (realism)*: the presence and importance of a real-life situation with real-life factors in the simulation scenario (two items).

The EPQ scale consists of 16 items, which also include a five-point Likert scale and 'not applicable'. The instrument measures elements related to the simulation's educational practices, including:

- *Active learning*: the presence and importance of active participation and opportunities to discuss ideas and concepts (ten items).
- *Collaboration*: the presence and importance of opportunities to work together with others during the session (two items).
- *Diverse ways of learning*: the presence and importance of opportunities to learn in various ways (two items).
- *High expectations*: the presence and importance of communicated objectives, goals and expectations (two items).

The original English versions of the three instruments are available for public use from the National League for Nursing (NLN, 2018).

3.3 | The simulation session

The NLN Jeffries simulation theory (Jeffries et al., 2015; Jeffries & Rogers, 2012) was used as a framework for designing and implementing the simulation session. The complexity of the scenario was adjusted to the students' curriculum, earlier classroom lectures and skills training and closely linked to an actual situation in a nursing home. A patient situation that is considered challenging to the students was chosen: a nursing-home patient who experienced deterioration of a chronic obstructive pulmonary disease (COPD). The scenario required knowledge and skills in anatomy, physiology, pathophysiology, medication administration and nursing actions, as well as the ability to merge theoretical and practical knowledge to assess and act in accordance with the simulated patient's needs. The overall aim for the scenario was to apply the nursing process systematically while encountering a patient with COPD in deterioration (Figure 1).

The students were informed about objectives for the simulation session without disclosing the whole event or expected actions. They were told beforehand in a classroom lesson that they were expected to care for a nursing-home patient with COPD by making clinical observations, decisions, actions and evaluations based on their knowledge and skills, and they were encouraged to prepare themselves by reading relevant literature. The students were also informed about the patient's age, gender and medical treatment as well as basic concepts related to simulation, such as confidentiality, conduct and expectations.

The 10 university college teachers who participated as facilitators were trained facilitators with experience in simulation-based education and debriefing. Among the facilitators, six held formal facilitator education. The facilitators were given an instruction guide and rehearsed before the simulation to decrease the risk of variation in performance of the simulation sessions. The simulation sessions included groups of eight students and one facilitator. The facilitator was responsible for initial briefing, controlling the patient simulator with a control unit (Sim Pad®; Laerdal™) and facilitating the debriefing. Although making the simulators talk during the simulation was impossible because of a lack of proper simulation rooms, the acute patient situation that was chosen made it somewhat realistic that the patient had to concentrate on breathing rather than talking.

The simulation session consisted of a three-step process: (1) an initial briefing (10–15 min); (2) simulation of the patient situation (15–20 min); and (3) debriefing (45–60 min). The initial briefing provided the students with an overview of the simulation steps, a repetition of the objectives and the ability to familiarize themselves with the surroundings, the patient simulator and the technical equipment (Jeffries & Rogers, 2012). In step 2, four students at a time

Nursing home patient with chronic pulmonary disease deterioration

Overall objective: Being able to apply the nursing process systematically while encountering a patient with COPD in deterioration.

Situation presented for the students	Objectives presented for the students	Expected actions
Nursing home patient, female, 75 years old, sufferers from COPD, uses Ventoline 2 mg x 4 administered by inhalation. The patient is anxious. Her skin is warm and sweaty.	Perform relevant clinical observations and measure vital signs Identify the patient´s problems, needs and possible complications Make clinical decisions, prioritize actions based on vital sign assessments, knowledge and trained skills Evaluate effect of actions	Comfort the patient and support breathing by elevating the head of the bed Adapt communication to anxious patient with respiratory problems Perform respiratory and circulatory measurements and observations (BP, HR, resp.-count, skin quality etc.) Administrate inhalation according to the patient´s journal and guidelines Evaluate effect of actions by vital signs assessments Assess the severity of the patient´s condition Decide to call for medical assistance Follow hygienic principles while caring for the patient

FIGURE 1 The simulation scenario and objectives

participated as nurses in active, hands-on simulation, while the remaining four were observers. The facilitators were instructed not to intervene, as they normally would in a nursing-home environment, if students omitted specific types of care or made flawed clinical decisions. See Figure 1 for detailed description of the scenario and actions of nursing expected by students during the simulation. In step 3, the simulation was deconstructed and analysed in a structured debriefing that lasted for approximately 1 hr. After step 3, the whole session was run again with switched roles to allow all students to experience the role as nurses. The scenario remained unchanged. The active simulations were video recorded to enable the participants to observe and reflect on their actions during the debriefing. Recordings were deleted after the simulation sessions were completed.

The descriptive, analytic and application phase, described by Steinwachs (1992), was used as an approach to facilitate the debriefing. During the descriptive phase, the students were asked to describe what had happened in the situation, how they felt and what their principal challenges were. In the analytic phase, the students were encouraged to explore what they had done well and not so well, what decisions and actions they had made and why they had made these decisions. They were also challenged to analyse the situation theoretically and to explore parallels with real-world situations. During the application phase, the students were asked to reflect on how they could improve their nursing care and decision-making activities in future patient encounters as a result of their experiences and new understandings. The students were asked to fill out the questionnaires after the last debriefing session.

3.4 | Data analysis

Participants' mean age and gender distribution were estimated based on the university college's public student register of enrolled first-year students. Means and standard deviations (*SD*) were used to describe the dependent and independent variables. Multiple linear regression analyses were performed to examine the associations between elements in simulation design characteristics and educational practices and students' self-confidence and satisfaction. The study had nine predictors, and the sample size of 187 was assumed to be large enough for regression analysis (Field, 2005). The regression analyses were performed by forced entry, meaning that all predictors were entered simultaneously. The method was based on theoretical reasoning, as the chosen predictors were elements drawn from a well-known theoretical model (Field, 2005). Multicollinearity was taken into account when planning the multiple regression analyses and was tested through bivariate correlation analyses. The internal consistency of the scales was described by Cronbach's alpha values. Analysis was conducted using IBM SPSS Statistics, version 22.

3.5 | Research ethics

One of the researchers also served as a teacher to the participating students. We ensured that the students were in an independent relationship with the researcher and that the researcher had no responsibilities to evaluate or grade the participants. The anonymous and voluntary nature of the students' participation was emphasized, and the students were informed about the study both orally and by email. The questionnaire required no background information or other sensitive material from the individual participants. The Norwegian Centre for Research Data (NSD, from Norsk senter for forskningsdata) was contacted for advice on the need for written informed consent; the NSD concluded that filling out the questionnaire implied informed consent.

4 | RESULTS

The overall response rate was 92.6% (N = 187). According to the public student register of the university college, the mean age of the individuals enrolled as first-year students was 24.21 years (*SD* 2.96) and 10% were male. The mean SSSCL scale score was 4.32 (Table 1), and internal consistency for the scale was .783 (Cronbach's alpha).

The SDS and EPQ scores were 4.54 and 4.50, respectively. The students' mean score for the importance of both items was higher than 4 (Table 2). For all independent variables, the Cronbach's alpha values were above .7 (*simulation design characteristics*: .859 for the presence of elements and .912 for their importance; *educational practices*: .795 for the presence of elements and .859 for their importance).

The dependent variables (satisfaction and self-confidence) and independent variables (active learning, collaboration, diverse ways of learning, high expectations, clear objectives, support, problem-solving, feedback and fidelity) were modestly skewed towards the right but were considered normally distributed. Multicollinearity was not considered a problem, since the correlation coefficients between the independent variables were below .6 in bivariate correlation analyses. Since the chosen predictors were elements drawn from a well-known theoretical model, we performed the multivariate regression analyses by forced entry of all independent variables. In the multivariate regression analysis with *satisfaction* as the dependent variable, the independent variable active learning explained 35.3% of the variance (R^2 = .35, Adjusted R^2 = .35, F = 11.96, p < .001). Active learning was significantly associated with satisfaction (Table 3).

TABLE 1 Mean SSSCL scale scores (N = 187)

	Mean (N)	*SD*
Student satisfaction and self-confidence in learning (overall)	**4.32 (187)**	**0.34**
Satisfaction with their current learning	4.57 (187)	0.44
Self-confidence in their learning	4.16 (187)	0.39

The bold text and values are the overall SSSCL score.

The analysis was repeated with active learning as the only independent variable. The results showed that 27.8% (R^2 = .28) of the variance in satisfaction was explained by this element. In multivariate regression analysis with *self-confidence* as the dependent variable, 30.8% of the variance was explained by three of the independent variables (R^2 = .31, Adjusted R^2 = .31, F = 9.96 p < .001). Experiencing clear objectives, support and opportunities for active learning were significantly associated with self-confidence. The experience of having less support from facilitators resulted in higher self-confidence (Table 4).

The multivariate regression analysis was repeated, with clear objectives, support and active learning as the independent variables; the analysis showed that 28.6% (R^2 = .29) of the variance in self-confidence was explained by these elements. Active learning and clear objectives were positively associated with self-confidence, explaining 28.1% (R^2 = .29) of the variance, while the subscale support was not significantly associated with self-confidence in this part of the analysis.

5 | DISCUSSION

Most students felt self-confident and were satisfied with the simulation activity. We found that active learning is important to attain self-confidence and student satisfaction and learning objectives for the simulation were positively associated with self-confidence. The students' needs for support were negatively associated with self-confidence.

The positive evaluations regarding student satisfaction and self-confidence found in the present study are in line with the results of previous studies (Cant & Cooper, 2010, 2017; Haddeland et al., 2018; Smith & Barry, 2013; Wotton, Davis, Button, & Kelton, 2010). Student satisfaction is an important outcome in education, because it may enhance students' engagement and thereby facilitate learning and, ultimately, the nursing students' competency and the quality of care provided by them (Levett-Jones et al., 2011). Students' self-confidence and satisfaction are probably insufficient to assess or evaluate learning or the overall impact of simulation (Jeffries & Rogers, 2012), although having knowledge about elements that are associated with students' self-confidence and satisfaction may be essential in the development of effective and immersive scenario-based simulation in nursing education (Prion, 2008).

Our results indicate that the presence of active learning contributed to both student satisfaction with the simulation activity and self-confidence in managing the simulated patient situation. The relationship between active learning and satisfaction and self-confidence may be explained from the social constructivism perspective, according to which learning is constructed in environments where students can actively interact with others (Vygotsky, 1978). In simulation, active learning and collaboration are inherent features and students have the opportunity to actively engage by using their whole body, their cognitive assets and their psychological and interactional skills to help the 'patient'. Collaboration was not

TABLE 2 Mean score of students' responses to SDS and EPQ (N = 187)

	Presence of items		Importance of items	
	Mean (*N*)	*SD*	Mean (*N*)	*SD*
Simulation design characteristics (overall)	**4.54 (184)**	**0.38**	**4.58 (182)**	**0.42**
Clear objectives	4.44 (184)	0.53	4.51 (182)	0.52
Support	4.54 (184)	0.55	4.55 (180)	0.57
Problem-solving	4.39 (184)	0.55	4.50 (180)	0.53
Feedback/guided reflection	4.73 (183)	0.41	4.71 (180)	0.47
Fidelity (realism)	4.82 (183)	0.39	4.83 (178)	0.40
Educational practices questionnaire (overall)	**4.50 (185)**	**0.34**	**4.43 (180)**	**0.42**
Active learning	4.39 (184)	0.41	4.34 (177)	0.49
Collaboration	4.90 (184)	0.26	4.68 (179)	0.55
Diverse ways of learning	4.55 (184)	0.54	4.52 (178)	0.55
High expectations	4.58 (184)	0.60	4.54 (178)	0.60

The bold text and values are the overall SDS an EPQ scores.

TABLE 3 Multivariate regression: associations between independent variables and satisfaction (N = 187)

	Adjusted				Unadjusted
	Regression coefficient (*p*)	*SE*	Confidence interval		Regression coefficient (*p*)
Active learning	**.28 (<.001)**	**0.59**	0.13	0.49	.30 (<.001)
Collaboration	−.05 (.410)	0.09	−0.30	0.12	−.09 (.410)
Diverse ways of learning	.11 (.133)	0.11	−0.03	0.21	−.09 (.133)
High expectations	.03 (.741)	0.06	−0.09	0.13	.02 (.741)
Clear objectives	.08 (.319)	0.06	−0.07	0.21	.07 (.319)
Support	.12 (.130)	0.07	−0.03	0.23	.10 (.130)
Problem-solving	.08 (.360)	0.07	−0.08	0.21	.07 (.360)
Feedback	.07 (.348)	0.09	−0.09	0.25	.08 (.348)
Fidelity	.11 (.103)	0.08	−0.03	0.28	.13 (.103)

The statistically significant values are written bold ($p < .05$).

significantly associated with satisfaction and self-confidence in this study, but collaboration promotes learning by opportunities to work together to solve problems, mimicking what is actually done in real life (Jeffries, 2005).

The fidelity variable refers to how authentic or life-like the simulation experience is, but also on how the students are engaged in the situation (Hamstra et al., 2014). In the present study, we immersed the students by having them all actively perform hands-on simulation, collaborating as both nurses and observers, as recommended in other studies (Leigh, 2008; Thidemann & Söderhamn, 2013; Tosterud et al., 2013). To further immerse the students and promote elements of the NLN Jeffries simulation theory, such as providing diverse ways of learning and feedback, the facilitators were instructed to ensure that all the students also contributed actively during the debriefing step (Jeffries & Rogers, 2012). Although the feedback variable was not associated with students' satisfaction and self-confidence in our study, debriefing will most likely provide constructive feedback from fellow students and facilitators as described in previous studies (Levett-Jones & Lapkin, 2014). Active student engagement during the simulation and debriefing sessions also accommodate diverse ways of learning and allow students with varying backgrounds to benefit from the experience (Jeffries, 2005). Our emphasis on active learning when planning the simulation activity is supported by Adamson, Jeffries, and Rogers (2012) who state that educators who prioritize active engagement in every step of the simulation activity may at the same time enhance the presence of other elements in design and educational practices. This statement may account for why our results showed no statistically significant associations with several of the elements. Active learning may be an overreaching variable that is experienced as most essential for the students. Our results do not indicate that educators should pay less attention to other elements but rather that active learning should be

TABLE 4 Multivariate regression: associations between independent variables and self-confidence (N = 187)

	Adjusted				Unadjusted
	Regression coefficient (p)	*SE*	Confidence interval		Regression coefficient (p)
Active learning	**.30 (<.001)**	**0.08**	0.13	0.43	.28 (<.001)
Collaboration	.04 (.520)	0.09	0.12	0.24	.06 (.520)
Diverse ways of learning	.13 (.095)	0.05	−0.02	0.19	.09 (.095)
High expectations	.06 (.481)	0.05	−0.06	0.13	.03 (.481)
Clear objectives	**.29 (.001)**	**0.06**	0.09	0.33	.21 (.001)
Support	**−.18 (.038)**	**0.06**	−0.23	−0.01	−.12 (.038)
Problem-solving	.02 (.799)	0.06	−0.11	0.14	.02 (.799)
Feedback	.05 (.501)	0.08	−0.01	0.20	.05 (.501)
Fidelity	.09 (.222)	0.07	−0.05	0.22	.08 (.222)

The statistically significant values are written bold ($p < .05$).

properly addressed as part of all elements in the development and implementation of simulation activities.

We provided all first-year students equal opportunities for active learning during the simulation. This offer was highly demanding in terms of resources and time. For such reasons, it is challenging for educators to implement fully immersed simulations that emphasize student engagement without affecting other content of the curriculum. Faculties may try to solve resource-related issues by providing the active hands-on simulation for only a portion of the students, while assigning most of the students to be observers. Students who are only assigned the role of observer may disengage from the learning process, although at least one study has shown that being an active observer provides learning opportunities in each simulation step (Hober & Bonnel, 2014), Thidemann and Söderhamn (2013) found that students who were assigned the nurse's role in simulations were more self-confident and satisfied than students who were assigned other roles (such as physicians) or were merely observers.

On the other hand, high expectations of active student engagement and performance in simulation may promote anxiety among some students (Al-Ghareeb, Cooper, & McKenna, 2017; Jeffries & Rogers, 2012). Such anxiety has been identified as a universal experience of students who participate in simulations, but can be so overwhelming that it reduces self-confidence and inhibits cognitive processing and the ability to apply knowledge (Al-Ghareeb et al., 2017; Najjar et al., 2015; Nielsen & Harder, 2013). At the same time, a certain level of anxiety and reduced self-confidence may also lead to excellent performance and can enhance students' motivation to engage in simulations (Al-Ghareeb et al., 2017). Learning implies moving out of one's comfort zone, and in simulation activities, students are expected to perform while others watch their steps. The anxiety, tension and occasional frustration that students experience may be a necessary prerequisite for learning. Educators should still bear in mind that excessive levels of anxiety may negatively influence knowledge acquisition and diminish performance and they should place emphasis on creating an atmosphere where students feel safe (Al-Ghareeb et al., 2017; Dieckmann, Friis, Lippert, & Østergaard, 2012; Leigh, 2008; Nielsen & Harder, 2013). As our findings showed that active learning was associated with self-confidence and satisfaction, it is indicated that the anxiety level was not too high. Even though the active learning element was emphasized in the design of this simulation session, we also had the safety of the students in mind. However, the quantitative design of the present study makes it difficult to reveal whether single students have experienced the simulation session as negative in terms of anxiety level.

A major principle inherent in adult learning is to promote the students' understanding of their learning needs (Knowles, Holton, & Swanson, 1998). According to Lioce et al. (2015), students should know the objectives for the simulation activity without knowing all the challenges they will meet in the scenarios. In the NLN Jeffries simulation theory, it is described that the students' opportunities to solve problems should be adjusted to the student's level of knowledge (Jeffries & Rogers, 2012). However, it is highlighted by Lindsey and Berger (2009) that this adjustment should not be at the expense of the students' experience of challenge (Lindsey & Berger, 2009). Opportunities for problem-solving and clear objectives for the simulation session may allow the students to perform the simulation successfully, but problem-solving was not found to be associated with satisfaction and self-confidence in the present study (Lindsey & Berger, 2009; Wilson & Klein, 2012). However, the association between clear objectives and self-confidence was identified and is supported by several authors who emphasize the importance of developing clear and well-defined objectives for simulation sessions to enhance learners self-confidence (Jeffries & Rizzolo, 2006; Smith & Roehrs, 2009; Wilson & Klein, 2012). Self-confidence may affect students' ability to engage in critical reflection as well as their efforts and persistence when confronted with challenges in practice (Bandura, 1997). Dieckmann et al. (2012) have underlined the necessity of a shared understanding of the objectives of a simulation session, but specific performance objectives or scenario events should not be presented for the learners prior to the simulation (Lioce et al., 2015). If the scenario is 'given away' before it starts, the students' opportunities to learn and to recognize when they need to apply prior learning is decreased. Lioce et al. (2015) highlight that only those objectives that provide general information and context for the learner should be disclosed prior to the simulation. Thus, developing clear and well-defined objectives for the simulation (Jeffries et al., 2015; Jeffries & Rogers, 2012) does not necessarily mean that educators should make the specific performance objectives available for the students beforehand. Rather, the educators should guide the students towards reaching the specific objectives during the simulation session (Lioce et al., 2015). The results of the present study indicate that our efforts to inform and prepare the students about their 'need to know' were successful. However, it is difficult to know where the boundary between too much and too little information goes and this issue should be discussed by a team of educators prior to performance of simulation sessions.

We found that low scores on the support variable were associated with higher levels of self-confidence. One explanation for this situation may be that the students experienced that the objectives were expressed in such a way that a balance was created between independent and active participation and challenges. This explanation also indicates that educational practices and design elements are interwoven and that all elements should be addressed in the design of simulation sessions. Another explanation may be that the students' expectations of self-direction and responsibility for their own learning prior to the simulation session were high and that they may have experienced intervention of facilitators as disturbing (Jeffries & Rogers, 2012). Even though the facilitators were instructed not to intervene if the students omitted specific types of care or made poor clinical decisions during the simulation, it is difficult to rule out that facilitators interpret the instructions differently. According to Jeffries and Rogers (2012), assistance should not interfere with the students' problem-solving efforts because students may act more passively during learning situations (Knowles et al., 1998). The excessive offering of support may thus inhibit learning and affect the students' evaluation of that support.

6 | LIMITATIONS

A cross-sectional design was suitable for this study, as it did not aim to prove causality but to describe the associations between elements in the simulation session and the students' self-confidence and satisfaction. Because the questionnaire contained both outcome variables and independent variables, the presence of common method bias cannot be ruled out, although we do not believe that the use of more than one method would have altered the results.

The lack of control group in our study makes it difficult to decide whether the students' high levels of satisfaction and self-confidence were a result of the scenario-based simulation, the first-year students' novel experience with simulation, or their general self-confidence and satisfaction with their education. Conducting research in one's own organization can potentially raise issues of an imbalance of power between the inquirers and the participants (Creswell, 2014). The presence of faculty teachers during the simulation may have shaped the way the students answered the questionnaires. Due to the lack of diversity in terms of context and participants, one should be careful about generalizing the results of the present study. We did not obtain individual characteristics of the participants and were therefore unable to adjust for individual characteristics. We were only able to present the age and gender distribution of all students enrolled as first-year students in the student registry.

7 | CONCLUSIONS

The findings of the present study indicate that opportunities for active learning and conveying learning objectives for the simulation session should be emphasized in the development and implementation of simulation activities. Active learning may increase both student satisfaction with the learning activity and self-confidence in managing the simulated patient situation and educators should be particularly concerned with providing opportunities for active participation in the learning process. While educators should pay attention to all elements in the NLN Jeffries simulation theory to develop a successful simulation experience, we suggest that emphasizing active learning and objectives may have an essential impact on the other elements of educational practices and simulation design.

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CONFLICT OF INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

CO was responsible for the conception, design, analysis and interpretation of data and worked out the drafts and completed the submitted version of the manuscript. KH and CRT participated in the analyses and interpretation of the data and contributed to the manuscripts intellectual content and critical review. All authors have given their final approval for the submitted version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The NSD was contacted for advice on the need for written informed consent; the centre concluded that filling out the questionnaire was considered informed consent. The questionnaires did not have any identity numbers or codes.

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REFERENCES

Adamson, K. A., Jeffries, P. R., & Rogers, K. J. (2012). Evaluation: A critical step in simulation practice and research. In P. R. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (pp. 131–162). New York, NY: The National League of Nursing.

Al-Ghareeb, A. Z., Cooper, S. J., & McKenna, L. G. (2017). Anxiety and clinical performance in simulated setting in undergraduate health professionals education: An integrative review. *Clinical Simulation in Nursing*, *13*, 478–491. https://doi.org/10.1016/j.ecns.2017.05.015

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Worth.

Bland, A. J., Topping, A., & Wood, B. (2011). A concept analysis of simulation as a learning strategy in the education of undergraduate nursing students. *Nurse Education Today*, *31*(7), 664–670. https://doi.org/10.1016/j.nedt.2010.10.013

Blum, C. A., Borglund, S., & Parcells, D. (2010). High-fidelity nursing simulation: Impact on student self-confidence and clinical competence. *International Journal of Nursing Education Scholarship*, *7*(1), 1–16. https://doi.org/10.2202/1548-923X.2035

Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: Systematic review. *Journal of Advanced Nursing*, *66*(1), 3–15. https://doi.org/10.1111/j.1365-2648.2009.05240.x

Cant, R. P., & Cooper, S. J. (2017). Use of simulation-based learning in undergraduate nurse education: An umbrella systematic review. *Nurse Education Today*, *49*, 63–71. https://doi.org/10.1016/j.nedt.2016.11.015

Cato, M. (2012). Using simulation in nursing education. In P. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (pp. 1–12). New York, NY: The National League of Nursing.

Cheng, A., Kessler, D., Mackinnon, R., Chang, T. P., Nadkarni, V. M., Hunt, E. A., … Auerbach, M. (2016). Reporting guidelines for health care simulation research: Extensions to the CONSORT and STROBE statements. *BMC Advances in Simulation*, *1*, 25. https://doi.org/10.1186/s41077-016-0025-y

Creswell, J. W. (2014). *Research design. Qualitative, quantitative and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications Inc.

D'Souza, M. S., Arjunan, P., & Venkatesaperumal, R. (2017). High fidelity simulation in nursing education. *International Journal of Health Science and Research*, *7*(7), 340–353.

Dieckmann, P., Friis, S. M., Lippert, A., & Østergaard, D. (2012). Goals, success factors and barriers for simulation-based learning: A qualitative interview study in health care. *Simulation & Gaming*, *43*(5), 627–647. https://doi.org/10.1177/1046878112439649

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). London, UK: SAGE Publications.

Foronda, C., Liu, S. W., & Bauman, E. B. (2013). Evaluation of simulation in undergraduate nurse education: An integrative review. *Clinical Simulation in Nursing*, *9*(10), E409–E416. https://doi.org/10.1016/j.ecns.2012.11.003

Haddeland, K., Slettebø, Å., Carstens, P., & Fossum, M. (2018). Nursing students managing deteriorating patients: A systematic review and meta-analysis. *Clinical Simulation in Nursing*, *21*, 1–15. https://doi.org/10.1016/j.ecns.2018.05.001

Hamstra, S. J., Brygdes, R., Hatala, R., Zendejas, B., & Cook, D. A. (2014). Reconsidering fidelity in simulation-based training. *Academic Medicine*, *89*(3), 387–392. https://doi.org/10.1097/ACM.0000000000000130

Hicks, F., Coke, L., & Li, S. (2009). The effect of high-fidelity simulation on nursing students knowledge and performance: A pilot study. *National Council of State Boards of Nursing (NCSBN) research brief* (Vol. *40*). Chicago, IL: NCSBN.

Hober, C., & Bonnel, W. (2014). Student perceptions of the observer role in high-fidelity simulation. *Clinical Simulation in Nursing*, *10*(10), 507–514. https://doi.org/10.1016/j.ecns.2014.07.008

Jeffries, P. R. (2005). A framework for designing, implementing and evaluating simulations used as teaching strategies in nursing. *Nursing Education Perspectives*, *26*(2), 96–103.

Jeffries, P. R., & Rizzolo, M. A. (2006). *Designing and implementing models for the innovative use of simulation to teach nursing care of ill adults and children: A national, multi-site, multi-method study*. Retrieved from http://www.nln.org/docs/default-source/professional-development-programs/read-the-nln-laerdal-project-summary-report-pdf

Jeffries, P. R., Rodgers, B., & Adamson, K. (2015). NLN Jeffries simulation theory: Brief narrative description. *Nursing Education Perspectives*, *36*(5), 292–293.

Jeffries, P. R., & Rogers, K. J. (2012). Theoretical framework for simulation design. In P. Jeffries (Ed.), *Simulation in nursing education. From conceptualization to evaluation* (pp. 25–42). New York, NY: The National League of Nursing.

Knowles, M. S., Holton, I., & Swanson, R. A. (1998). *The adult learner: The definitive classic in adult education and human resource development*. Houston, TX: Gulf Publishing Company.

Lapkin, S., Levett-Jones, T., Bellchambers, H., & Fernandez, R. (2010). Effectiveness of patient simulation manikins in teaching clinical reasoning skills to undergraduate nursing students: A systematic review. *Clinical Simulation in Nursing*, *6*, 207–222. https://doi.org/10.1016/j.ecns.2010.05.005

Leigh, G. T. (2008). High-fidelity patient simulation and nursing students' self-efficacy: A review of the literature. *International Journal of Nursing Education Scholarship*, *5*(1), 1–17. Article 37. https://doi.org/10.2202/1548-923x.1613

Levett-Jones, T., & Lapkin, S. (2014). A systematic review of the effectiveness of simulation debriefing in health professional education. *Nurse Education Today*, *34*(6), 58–63. https://doi.org/10.1016/j.nedt.2011.01.004

Levett-Jones, T., McCoy, M., Lapkin, S., Noble, D., Hoffman, K., Dempsey, J., … Roche, J. (2011). The development and psychometric testing of the Satisfaction with Simulation Experience Scale. *Nurse Education Today*, *31*(7), 705–710. https://doi.org/10.1016/j.nedt.2011.01.004

Lindsey, L., & Berger, N. (2009). Experiential approach to instruction. In C. M. Reigeluth, & A. A. Carr-Chellman (Eds.), *Instructional-design theories and models. Volume III: Building a common knowledge base* (pp. 117–142). New York, NY and London, UK: Taylor and Francis Publishers.

Lioce, L., Meakim, C. H., Fey, M. K., Chmil, J. V., Mariani, B., & Alinier, G. (2015). Standards of best practice: Simulation standard IX: Simulation design. *Clinical Simulation in Nursing*, *11*, 309–315. https://doi.org/10.1016/j.ecns.2015.03.005

Merriman, C. D., Stayt, L. C., & Ricketts, B. (2014). Comparing the effectiveness of clinical simulation versus didactic methods to teach undergraduate adult nursing students to recognize and assess the deteriorating patient. *Clinical Simulation in Nursing*, *10*(3), E119–E127. https://doi.org/10.1016/j.ecns.2013.09.004

Mills, J., West, C., Langtree, T., Usher, K., Henry, R., Chamberlain-Salaun, J., & Mason, M. (2014). 'Putting it together': Unfolding case studies and high-fidelity simulation in the first-year of an undergraduate nursing curriculum. *Nurse Education in Practice*, *14*(1), 12–17. https://doi.org/10.1016/j.nepr.2013.06.003

Najjar, R. H., Lyman, B., & Miehl, N. (2015). Nursing students' experiences with high-fidelity simulation. *International Journal of Nursing Education Scholarship*, *12*(1), 394–400. https://doi.org/10.1515/ijnes-2015-0010

Nielsen, B., & Harder, N. (2013). Causes of student anxiety during simulation: What the literature says. *Clinical Simulation in Nursing*, *9*, 2507–2512. https://doi.org/10.1016/j.ecns.2013.03.003

NLN (2018). *Descriptions of available instruments*. Retrieved from http://www.nln.org/professional-development-programs/research/tools-and-instruments/descriptions-of-available-instruments

Prion, S. (2008). A practical framework for evaluating the impact of clinical simulation experiences in prelicensure nursing education. *Clinical Simulation in Nursing*, *4*(3), e69–e78. https://doi.org/10.1016/j.ecns.2008.08.002

Shin, S., Jin-Hva, P., & Jung-Hee, K. (2015). Effictiveness of patient simulation in nursing education: Meta-analysis. *Nurse Education Today*, *35*, 176–182. https://doi.org/10.1016/j.nedt.2014.09.009

Skrable, L., & Fitzsimons, V. (2014). Simulation in associate degree nursing education: A literature review. *Teaching and Learning in Nursing*, *9*(3), 120–125. https://doi.org/10.1016/j.teln.2014.03.001

Smith, S. J., & Barry, D. G. (2013). An innovative approach to preparing nursing students for care of the elderly in the home. *Geriatric Nursing*, *34*(1), 30–34. https://doi.org/10.1016/j.gerinurse.2012.07.001

Smith, S. J., & Roehrs, C. J. (2009). High-fidelity simulation: Factors correlated with nursing student satisfaction and self-confidence. *Nursing Education Perspectives*, *30*(2), 74–78.

Steinwachs, B. (1992). How to facilitate a debriefing. *Simulation and Gaming*, *23*(2), 186–192. https://doi.org/10.1177/1046878192232006

Thidemann, I. J., & Söderhamn, O. (2013). High-fidelity simulation among bachelor students in simulation groups and use of different roles. *Nurse Education Today*, *33*(12), 1599–1604. https://doi.org/10.1016/j.nedt.2012.12.004

Tosterud, R., Hedelin, B., & Hall-Lord, M. L. (2013). Nursing students' perceptions of high- and low-fidelity simulation used as learning methods. *Nurse Education in Practice*, *13*(4), 262–270. https://doi.org/10.1016/j.nepr.2013.02.002

Tosterud, R., Petzall, K., Hedelin, B., & Hall-Lord, M. L. (2014). Psychometric testing of the Norwegian version of the questionnaire, student satisfaction and self-confidence in learning, used in simulation. *Nurse Education in Practice*, *14*(6), 704–708. https://doi.org/10.1016/j.nepr.2014.10.004

Vygotsky, L. (1978). *Mind in society. The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wilson, R. D., & Klein, J. D. (2012). Implementation and evaluation of a nursing simulation: A design and development research study. *Journal of Applied Instructional Design*, *2*, 57–68.

Wotton, K., Davis, J., Button, D., & Kelton, M. (2010). Third-year undergraduate nursing student's perceptions of high-fidelity simulation. *Journal of Nursing Education*, *49*(11), 632–639. https://doi.org/10.3928/01484834-20100831-01

Yuan, H. B., Williams, B. A., Fang, J. B., & Ye, Q. H. (2012). A systematic review of selected evidence on improving knowledge and skills through high-fidelity simulation. *Nurse Education Today*, *32*, 294–298. https://doi.org/10.1016/j.nedt.2011.07.010

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Paper II

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Supplementing Clinical Practice in Nursing Homes With Simulation Training: A Qualitative Study of Nursing Students' Experiences

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Abstract

Introduction: Limited access to nurse supervisors, insufficient learning support and staff with high workloads are well documented in the research literature as barriers to nursing students´learning in clinical practice in nursing homes. Due to these barriers nursing students may benefit from additional learning support from nurse educators during their clinical practice period.

Objective: The study aimed to explore nursing students' experiences of supplementary simulation training as a tool to support learning during clinical practice in nursing homes.

Methods: A descriptive qualitative design was used. Twenty-seven first-year nursing students from a university college in Norway were interviewed after attending a seven-week practice period in nursing homes with supplementary simulation training. Three semi-structured focus group interviews were audio recorded, transcribed, and analysed using systematic text condensation.

Findings: Three categories of student experiences were identified: enhancing the reasoning behind care, transferring knowledge and experiences between the learning environments and enhancing the sense of mastery.

Conclusion: The supplementary simulation training seemed to complement clinical practice by consolidating the students' learning during the clinical practice period, enhance the students' motivation and sense of mastery, and consequently their efforts to seek out new challenges, explore and learn both in the clinical and the simulated environment.

Keywords

simulation training, clinical practice, nursing homes, nursing education, clinical learning, motivation, confidence, mastery, feedback, supervision

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Effective, adequate learning experiences in clinical practice are vital to preparing nursing students for their future responsibilities as nurses. To ensure optimal learning outcomes in clinical practice, nursing students need a supportive atmosphere, supervision and feedback (Jonsén et al., 2013; Sundler et al., 2014). In most countries, on-site nurse supervisors have the dominant role in supporting student́s learning in clinical practice

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(Arkan et al., 2018; Gates et al., 2012; Jayasekara et al., 2018). However, supervision of students is often a responsibility added to nurses' workload, and consequently, balancing patient care and student supervision may be challenging (McIntosh et al., 2014; Kristofferzon et al., 2013).

Because many clinical practice sites face nurse shortages and thus may have few nurse supervisors to accompany and support nursing students' learning, nurse educators are looking for innovative ways to provide the clinical education their students need (Breymier et al., 2015; Zapko et al., 2018). One educational strategy in nursing education is the use of simulation training with human patient simulators (HPS).

Background

The use of simulation training with HPS has increased as an educational strategy in nursing education programs (Davis et al., 2014). HPS are computerised mannequins that imitate patients' verbal and physiological reactions to care. Such simulations have the potential to integrate practical and theoretical knowledge, as well as to provide students with supervised learning situations (Jeffries, 2015). Although clinical experiences with actual patients form the most important component of clinical education, research support the use of simulation training as a teaching strategy in nursing education programs to enhance students' clinical expertise (Cant & Cooper, 2017; Zapko et al., 2018). Systematic reviews have found that simulation training may improve students' knowledge levels, clinical skills and general nursing competences (Cant & Cooper, 2017; Haddeland et al., 2018). Simulation training also seem to enhance self-efficacy and confidence, which are important prerequisites for further learning and competency building (Cant & Cooper, 2017; DSouza et al., 2017). Internationally, there is an ongoing debate whether or to what extent simulation training can replace clinical hours in nursing education (Bogossian et al., 2019; Sullivan et al., 2019), and in some countries this approach has gained acceptance (Gates et al., 2012). Some researchers have recommended simulation as a substitute for clinical hours among nursing students (Gates et al., 2012; Hayden et al., 2014; Soccio, 2017). However, research replacing clinical hours with simulation training report varied and sometimes conflicting results regarding students' clinical competency, critical thinking, knowledge acquisition, and self-confidence (Curl et al., 2016; Hayden et al., 2014; Larue et al., 2015).

In Norway, the bachelor's degree in Nursing is a 3-year bachelor program that follows the European Union (EU) directive under which 50% is dedicated to clinical practice supervised by on-site nurses (Zabalegui et al., 2006). Thus, replacing clinical hours with simulation training is not an option according to the EU directive. The nurse educators primarily act as contact persons in clinical practice and conduct mid-term and final assessments of students in collaboration with the students' clinical nurse supervisors. In nursing homes, nurses often constitute the smallest segment of the workforce, not all are specialized supervisors, and some lack experience and competency in supervision of students (Harrington et al., 2012; Jayasekara et al., 2018). Consequently, the on-site nurses often have limited capacity and sometimes limited competence to provide supervision and feedback on students' learning (Adamson et al., 2018). Due to the way the nursing education program in Norway is organized, the nurse educators' presence and function in clinical practice are limited. The lack of presence of nurse educators, limited communication between clinical staff and nurse educators, limited focus on the application of knowledge and critical thinking, and an inefficiency of student time spent in the clinical setting has been highlighted in studies as barriers to learning among students in clinical practice (Jonsén et al., 2013; Morrell & Ridgway, 2014; Sullivan et al., 2019).

Given the clinical resource constraints, nursing students may benefit from additional learning support from nurse educators during clinical practice, for example by simulation training (Killam & Heerschap, 2013; Morrell & Ridgway, 2014). Studies found that students experienced enhanced confidence before doing nursing procedures in real patient situations, felt more prepared and gained confidence for their subsequent practice placement after attending simulation training (Crafford et al., 2019, Ogilvie et al., 2011). In addition to enhanced confidence, Morell-Scott (2018) found that students experienced simulation training as a learning tool that aided deeper learning by linking theory and practice. Simulation training offered students opportunities to reflect on own performance with peers and teachers. However, studies also report that simulation training may lead to negative student experiences such as anxiety and uncomfortable feelings related to being watched by others (Morell-Scott, 2018; Nielsen & Harder, 2013).

Although studies have explored student' experiences with simulation training, there is a lack of knowledge about experiences with supplementary simulation training during clinical practice in nursing homes to enhance learning. Only one previous study by Khalaila (2014) has investigated simulation training during practice in nursing homes. The study used a pretest–post-test design and found that students' self-reported caring ability and self-confidence rose, while the level of anxiety decreased after clinical practice with simulation (Khalaila, 2014). The study's lack of a control group, however, makes it difficult to decide whether this was a result of the

Table 1. Participants' Characteristics.

Sample groups	Group 1 March 2017	Group 2 March 2018	Group 3 May 2018	Total
Participants	10	9	8	27
Female participants	10	9	7	26
Male participants	0	0	1	1
Age <21	3	3	5	11
Age 21–25	4	1	3	8
Age 26–30	2	3	0	5
Age >30	1	2	0	3
Former work experience in health care related services	6	5	0	11

supplementary simulation training or from actually caring for patients in the clinical setting. To the best of our knowledge, no qualitative studies have been published to describe the students' experiences with the combination of the two learning environments simultaneously without replacing clinical hours. Therefore, the aim of the study was to explore nursing students' experiences of supplementary simulation training as a tool to support learning during clinical practice in nursing homes.

Methods

Design

This study employed a qualitative descriptive design using focus group. Such design is suitable when the aim is to generate rich descriptions and gain inside knowledge about a phenomenon from those who have the experience (Bradshaw et al., 2017). Focus groups were chosen because the interactive process of sharing and comparing understandings and views in a group, and engage in discussions generated by other group members, may yield more and other insights than individual interviews (Kitzinger, 1995; Krueger & Casey, 2015). Furthermore, the researcher takes a peripheral role moderating discussion between the participants. This could enable students to explore the issues of importance to them in their own vocabulary, generating own questions and pursuing own priorities (Kitzinger, 1995). The reporting of the study was guided by the Consolidated Criteria for Reporting Qualitative Studies (COREQ).

Setting and Participants

The study was conducted at a Norwegian university college offering bachelor's degree in nursing. A purposeful random sampling strategy was chosen (Patton, 2015). In the spring of 2017 and 2018, a total of 350 first-year students received both written and oral information about the study. Thirty students were drawn randomly from the 71 students who reported their interest to participate in the study to the first author, while the remaining 41 students were excluded from the study. After signing informed consent forms, three students withdrew because they left the education program, leaving a total of 27 participants assigned to three groups. None of the participants had any prior experience with simulation training with HPS and attended their first clinical practice placement in their nursing education program. Participant characteristics are presented in Table 1.

Simulation and Scenarios

The participants performed three 3-hour scenario-based simulation training sessions during their continuous seven-week of compulsory clinical practice in a nursing home in the second semester of their education program. The first session was conducted in week two of the clinical practice, while the final two sessions were conducted in week three and five.

The simulation training was designed by the first author in collaboration with two teachers at the university college, both familiar with the students' curriculum. Standards of best practice and the National League for Nursing (NLN)/Jeffries simulation theory guided the design and implementation of the simulation training (INACSL, 2016; Jeffries, 2015). The NLN/Jeffries Simulation theory is a mid-range theory that provides a theoretical foundation and a framework with systematic steps for developing and implementing quality simulation experiences (Jeffries, 2015).

The three scenarios covered content in the first-year students' curriculum such as areas within respiration, circulation, elimination, and drug handling. The scenarios were complex and challenging but closely linked to the students' prior lectures and real-life clinical situations. The fidelity level of the scenarios was considered to be high due to the technical equipment, use of patient simulators (NursingAnne®; Laerdal™) and students' involvement as autonomous clinicians. The scenarios' overall aim was for the students to systematically

Table 2. Scenarios and Objectives of the Simulations.

Scenarios	Situation presented for the students	Objectives presented for the students
Day 1: Nursing home patient with chronic pulmonary disease deterioration	Nursing home patient, female, 75 years old, sufferers from COPD, uses Ventoline 2 mg × 4 administered by inhalation. The patient is anxious. Her skin is warm and sweaty.	– Perform relevant clinical observations and measure vital signs – Identify the patient's problems, needs and possible complications – Make clinical decisions, prioritize actions based on vital sign assessments, knowledge and trained skills – Evaluate effect of actions and make decisions for further actions
Day 2: Nursing home patient with delirium caused by urinary retention	Nursing home patient, male, 89 years old with a mild degree of dementia, and a chronic urinary retention. Permanent catheter, and a urine sample for bacteriological cultivation are ordinated. The patient's behaviour has changed, with a deteriorating confusion. The patient has been given Stesolid 2 mg without effect.	
Day 3: Administration of medications to nursing home patient with left ventricular heart failure	Nursing home patient, male, 75 years old, sufferers from a left ventricular heart failure. The patient uses heart medications, and is scheduled for his intramuscular injection with B12 depot 1 mg. The patient is not cooperating, seems to struggle with his breath while lying down. He does not want his medication.	

apply the nursing process during patient encounters. Before each simulation training commenced, the students were informed of the objectives and the patients' basic details as presented in Table 2.

The first step of the simulation sessions (30 minutes) involved a briefing that offered an overview of the surroundings and equipment and reiterated the objectives. In the second step (30–40 minutes), three or four students participated as nurses in an active simulation, while the remaining students in the group were active observers. In the third step (90+ minutes), the students deconstructed and analysed the scenarios in a teacher facilitated debriefing. The Promoting Excellence and Reflective Learning in Simulation framework (PEARLS) was used to guide the debriefing (Eppich & Cheng, 2015). The PEARLS is a framework that outlines four distinctive phases of debriefing; the reaction, the description, the analysis and the summary phase, and provides guidance on their implementation (Eppich & Cheng, 2015).

The first author acted as facilitator, while an operator served as the patients' voice and co-facilitated the debriefing. Both were trained and experienced facilitators.

Data Collection

Focus group interviews (60–75 minutes) were conducted with the three groups of the participants at the end of their clinical practice in March 2017 and March and May 2018. The first author acted as a moderator, along with an assistant moderator. It was taken into account that the moderators, especially the first author as both facilitator and moderator, held superior roles to the participants. We ensured that the students were in an independent relationship with the moderators who had no responsibilities to evaluate or grade the participants. The moderator emphasized asking open-ended questions and held back her own opinions to let the participants be the experts on the topic. To encourage open, honest sharing of experiences, the participants were assured that shared information would be treated confidentially and would not affect any student evaluations.

To initiate dialogue and focus the discussion, the semi-structured interview guide covered aspects related to the participants' experiences of clinical practice with supplementary simulation training, their learning in these two environments and their perceptions of the learning outcomes. To validate the participants' statements, the moderator asked questions such as 'What do you mean when you say…'. The interviews were audio-recorded and transcribed verbatim by the first author.

Data Analysis

The data material was analysed inductively using systematic text condensation to emphasise the participants' descriptions and perspectives (Malterud, 2012). In the first step, the transcripts were read several times through

Table 3. Example of the Analytical Process.

Category (selected): *Enhancing the sense of mastery* Meaning units (selected)	Subgroups	Condensate
The simulations enhance your confidence because the fact that you actually have a lot of knowledge, gets confirmed. (Student 1, Group 3)	Getting knowledge confirmation	Knowledge confirmation in the simulations enhance your confidence
After the simulations you feel more confident in the way you think, and that your knowledge is correct. (Student 7, Group 3)	Getting knowledge confirmation	Simulations make you more confident in the way you think and your knowledge
Due to the simulations, I know more about what's normal about a patient's condition and what's not. I can more easily spot a change in the patient and if the patient is experiencing a deterioration. I also know a bit more of how to act, because I know what's common with a disease and what that could indicate a deterioration of the patient condition. (Student 1, Group 3)	Ability to contribute and act	I know more about what's normal and not in patients´ conditions and can spot changes and signs of deteriorations more easily
Due to the simulations, I got a sense of mastery. I feel that I have a lot more to offer if I meet a similar situation in real life because I have been practicing how to react and act in difficult patient situations in the simulations. (Student 6, Group 3)	Ability to contribute and act	I got a sense of mastery and have more to offer in real life situations

the lens of the study aim to get an overall impression of them and to identify the preliminary themes. In the second step, the transcripts were read line by line to identify the meaning units and mark them with codes related to the preliminary themes. The codes were used to organise the related meaning units into code groups. In the third step, the meaning units in each code group were sorted into subgroups. The meaning units within every subgroup were then reduced into a condensate maintaining the original terminology used by the participants. In the fourth step, the content of each code group was summarised into categories to generalise descriptions and examine the descriptions against the empirical data. An example of these analytical steps is presented in Table 3.

Research Ethics

The study received approval from the Norwegian Social Science Data Services (ref. number 51842 and 57344). Participation was based on written informed consent and performed in accordance with the 2013 revised version of the Declaration of Helsinki. None of the participating teachers had any connections with the nursing homes studied.

Findings

Three categories of student experiences were identified in the data analysis: enhancing the reasoning behind care, transferring knowledge and experiences between the learning environments and enhancing the sense of mastery.

Enhancing the Reasoning Behind Care

The students reported that the supplementary simulation training provided time for collective reflections during their clinical practice period, enabling them to complement each other's knowledge and explore theoretical explanations of nursing care. In the nursing homes, the students struggled to balance 'being at work' while meeting their need to study and reflect on care reasoning. Some felt that they were simply used as extra workers and that spending time to explore theory was not appreciated:

> I feel like the staff think that I'm trying to get away from, for example, emptying the dishwasher if I'm trying to update myself by reading. (Student 1, Group 2)

Furthermore, the students experienced that group reflections were given a low priority due to high workloads and daily routines. Many students worked mostly on their own and had no one they could reflect or reason with. The students said that supervision of practical skills was prioritised more than reflections on patient care and reasoning behind care. Consequently, questions that arose while caring for the patients remained superficially answered:

> I miss having someone in the nursing home to actually explain in depth why and how things are

> related. Instead, they just answer that the patient has kidney failure, so that's why we do this. (Student 1, Group 3)

Many students felt that they could discuss issues in the simulation training they did not dare to address in the nursing homes due to a fear of revealing their insufficient knowledge or creating an unfortunate impression of themselves. The simulation environment was experienced as safe because the students got well acquainted with each other and the simulation teachers. Furthermore, the students experienced that the teachers accepted their thoughts and feelings and challenged them to think by themselves, ask questions and share their perspectives. They expressed that they did not feel a pressure to perform well but could concentrate on learning together and were allowed to make mistakes without being judged. However, some students said that they had wished for more feedback from the teachers on their potential mistakes in order to learn from them. On the other hand, students reported that the teachers' perspective and additional explanations as professional nursed helped them gain new, broader understandings of nursing responsibilities and care. One student explained:

> In the simulation sessions, you can discuss things in depth that you may not have the time to do in practice, and you can get other perspectives. You may not always get a blueprint answer, but you can get perspectives from teachers with a lot of experience and knowledge you don't yet have yourself. (Student 7, Group 2)

All the students agreed that no simulator could replace interactions with complex, unique human beings. Nevertheless, the students expressed that the collective reflections in the simulations helped them to focus on understanding the individual needs of the patients and to provide a more holistic patient-centred care while practicing at the nursing homes.

Transferring Knowledge and Experiences Between the Learning Environments

In contrast to working mostly alone in the nursing homes, the students valued meeting their fellow students in a joint learning atmosphere during the simulation training. In addition to be given an opportunity to share knowledge and to support each other, they experienced the scenarios as recognisable and relevant, enabling them to transfer knowledge and experiences between the two learning environments. The students expressed that the way they were trained to approach their patients in the simulation training, helped them to see new learning opportunities while caring for their patients in the nursing home. The students reported that daily routines in the nursing home, such as helping patients with their personal hygiene, were more actively used to perform clinical observations and to map the patients' condition rather than just performing the task:

> The simulations have helped me focus on what kinds of observations I should perform in the nursing home, what kind of vital measurements and observations I need to do when caring for my patients. (Student 1, Group 3)

The students also found that the simulation training enabled them to use their knowledge more actively to understand and assess their patients' symptoms during care situations. However, the students experienced that they best learned and developed interpersonal and communication skills in interactions with real patients. Furthermore, the students considered interactions with real patients to be an important prerequisite for active engagement and learning in the simulation sessions, and important to transfer knowledge and skills between simulated and clinical experiences. One student explained it this way:

> I have a patient who has chronic obstructive lung disease, so the first simulation was very exciting for me—I learned so much! It was very easy to transfer that simulation day to my patient, and it helped me to understand how to handle him. (Student 1, Group 2)

The students highlighted that there were differences in their access to training in skills such as catheterisations, injections and blood-pressure measurements in the nursing homes. Some students felt that they were not trusted to perform such procedures, while others had placements in nursing home wards with limited need for such procedures. The students expressed that the simulation training provided supplementary experiences that contributed to more equal learning possibilities and learning outcomes during the practice period. One student stated:

> At "my" nursing home, the nurses often are those who perform the measurements on the patients, in the simulation training I get to do it myself. (Student 5, group 1)

Enhancing the Sense of Mastery

The students expressed fear of harming patients. Many reported that they had achieved relevant knowledge and skills in nursing school, but differences, for example, in explanations, assessments and patient care from the nursing home supervisors and the staff sometimes led to confusion. The students found that the feedback from their teachers and peers during the simulation training reassured them and increased their feelings of confidence and mastery. Through the simulation training the students discovered that they had more knowledge than they initially thought they had which was described as encouraging and motivating. One student stated:

> If we didn't have the simulations in between the nursing home practice, we would have been thinking that we don't know much. Instead we are thinking: We know a lot! (Student 4, group 2).

Several students expressed that due to the simulation training, they had more to offer and could contribute to and act in real-life situations. In addition, the students perceived that the simulation training reduced their fear of experiencing acute patient deteriorations:

> To have the courage to enter a situation and dare to see what I can contribute with (...) the simulations have certainly helped me get to know that I actually can. (Student 6, Group 3)

The students expressed that the simulation training enhanced their skills in conducting clinical observations and assessing various patient situations in the nursing homes. Some felt that their enhanced knowledge and skills to recognize changes and assess patient situations were limited to the patient conditions that they had experienced in the simulations. Nevertheless, the students experienced that their enhanced skills and confirmed knowledge motivated them and gave them courage to actively challenge themselves and expand their learning both in the simulations and the nursing homes. Furthermore, students experienced that they increased their learning by asking more questions of their nurse supervisors at the nursing homes. One student stated:

> It feels good to have knowledge and [to] ask questions [and to] somehow dig a little deeper and gain more knowledge while being in the nursing home as you have already got knowledge in simulation. (Student 5, Group 3)

Discussion

This study suggests that the supplementary simulation training during clinical practice in nursing homes may have enhanced the students' ability to reason and reflect on practice, their opportunities to socialise and learn with their peers, raised their confidence and mastery in practice, and encouraged their active exploration of learning opportunities during their clinical practice.

Research suggests that nursing students value some scope to work independently in clinical practice but also need direction and support in bedside nursing (Ford et al., 2016; Holmlund et al., 2010). In line with previous research (Adamson et al., 2018; Algoso & Peters, 2012; Sundler et al., 2014), our students reported that they had limited influence on their own learning in the nursing homes, and that the nurse supervisors had little time to commit to the student supervision. Such experiences may have led the students to behave in certain ways, and they experienced little or no autonomy. According to Ryan and Deci (2000), autonomy must be supported to enhance students' motivation and thus their efforts to learn. However, autonomy is not synonymous with self-direction and independence of others in the learning process. Little (1991) describes autonomy as a capacity for detachment, critical reflection, decision-making, and independent action, and that this capacity may be promoted in interaction with peers and teachers. An autonomy-promoting learning environment focus on the needs of the learner, encourage learner involvement and challenges the learner (Niemiec & Ryan, 2009, Little, 1991). The simulation teachers were entirely committed to the students' learning, and the students experienced being encouraged to ask questions, challenge others, take on challenges and share their perspectives, thoughts and feelings—all components of teaching strategies supportive of autonomy (Kristofferzon et al., 2013; Niemiec & Ryan, 2009; Reeve, 2009). The simulation training may have complemented clinical practice by balancing the students' need to be challenged and their need for supervision and support. This learning support may have contributed to enhancing the students' sense of autonomy and, thus, their motivation and efforts to learn in both environments (Niemiec & Ryan, 2009).

A need to feel competent may drive students to only take on challenges and tasks they think that they can grasp and master (Levett-Jones et al., 2009; Niemiec & Ryan, 2009). Learning, as phenomenon, demands the courage to move out of one's comfort zone. The feeling of competence is a sense of confidence and effectiveness in one's action, not an attained skill or capability (Deci & Ryan, 2002). When students are introduced to difficult and demanding tasks or asked challenging questions, supervisors need to recognise students' need to feel competent and to provide appropriate support and feedback (Arkan et al., 2018; McCloughen et al., 2020; Niemiec & Ryan, 2009). The students in the current study reported that the simulation training was crucial for them to develop knowledge and confidence in practice. They verbalized that the simulation training gave them a chance to analyse and synthesize nursing approaches to the care of complex patient needs. The safe, supportive atmosphere in the simulation environment may have enhanced the students' feelings of competence by exposing them to challenging experiences, questions and tasks without the risk of harming patients or being evaluated negatively, allowing them to test and expand their capacities.

Nursing students entering clinical practice expect to learn necessary skills and practical applications of theory (Holmlund et al., 2010). However, in line with previous research (Adamson et al., 2018; Algoso & Peters, 2012; Arkan et al., 2018), some of the study participants encountered unclear supervision and a lack of integration of theory and practice in the nursing homes. Unclear supervision may impact the students´confidence in own knowledge and capabilities (Adamson et al., 2018; Killam & Heerschap, 2013). In the present study, the simulation training seems to have enhanced students´ opportunities to reason and reflect on practice and receive feedback on learning progress both from peers and teachers. The findings indicate that the supplementary simulation training may have provided additional feedback needed to enhance confidence and consciousness of own knowledge and capabilities, which may have motivated the students to more actively seek out new challenges (Deci & Ryan, 2008).

In line with Baglin and Rugg (2010), the students expressed concerns that they might not have been able to develop best practice approaches to care as they did not receive adequate supervision and worked mostly alone in the nursing homes. Experiencing belongingness towards others in a caring, secure way, has been described as one of the needs that has to be met for autonomous motivation to flourish (Ryan & Deci, 2000). In practice, belonging involves a feeling of being connected to a group of clinical nurses and having professional and personal values aligned with that larger clinical group (Baglin & Rugg, 2010; Levett-Jones et al., 2009). Intersubjectivity, or shared understanding, therefore, may be vital to students' learning motivation and progress. In the present study, the students experienced the simulations as a safe haven where their peers and experienced teachers learned together through engagement, role modelling and intersubjectivity. The teachers were experienced nurses and served as important role models who guided the students to gain knowledge and insights, they could utilise in the nursing homes. The safe laboratory setting of the simulation environment and the teachers' pedagogical education and experience may have contributed to creating a non-threatening social atmosphere that provided guidance and constructive critiques (Kern et al., 2014; Killam et al., 2013).

Access to nurse role models may enhance students' sense of belonging, their confidence and their feelings of competence (Donaldson & Carter, 2005; Ford et al., 2016). Conversely, a lack of role models may foster unsafe clinical practices (Killam et al., 2013) and feelings of being an outsider (Jonsén et al., 2013; Kern et al., 2014). Our findings support the concept of belonging as a need influencing the students' learning, motivation and confidence (Grobecker, 2016; McCloughen et al., 2020). In addition, the findings indicate that the supplementary simulation training may have enhanced students´ability to handle experiences of limited supervision and feelings of being alone at the nursing homes by adding to their sense of social integration.

Strengths and Limitations

We conducted focus group interviews with three groups of students who had received simulation training as a supplement during clinical practice. The three focus group interviews were considered to provide sufficient information power (Malterud et al., 2016). The participants were recruited from only one urban university college, so some experiences and nuances might not have been identified. Transferability was enhanced by reporting the context of the simulation training, description of the sample, the research process and rich descriptions of the results.

The first author's dual role as facilitator and moderator may have influenced the data, and we may not rule out that this might have made the participants reluctant to share negative experiences (Creswell, 2014). Nevertheless, the first authors involvement and familiarity with the simulation training, context and educational practice, though, may also have strengthened the study in design of the simulations, development of the interview guide and as moderator in focus group interviews (Mercer, 2007). Throughout the research process, we reflected upon own roles to be aware of how they could affect the study. It was clearly stressed to the participants that they were promised full confidentiality and that grades or evaluations would not be not be affected by what they shared. The participants were active, spoke openly and shared positive and negative experiences regarding both learning environments during the interviews.

The analysis was an iterative process. All the authors read the transcripts, and the first author analysed the data, while the other authors asked critical questions during each step of the analysis. This investigator triangulation enhanced the credibility and reflexivity (Krueger & Casey, 2015). The authors' diverse pedagogical and research expertise also enhanced competing interpretations during the analysis and interpretation of the findings.

The amount of supplementary simulation training in this study may seem brief, a total of 9 hours. However, research have suggested a 2:1 clinical to simulation ratio due to the intensity and efficiency of the simulation setting compared to the clinical setting (Breymier et al., 2015; Curl et al., 2016; Sullivan et al., 2019).

Implications for Practice

The study provides useful information for educators in their efforts to develop and improve clinical practice placement models in nursing homes. Incorporated academic and practice focused simulation training as learning support during clinical practice may mitigate students´ learning challenges while practicing in nursing homes. The findings may also be useful for clinical supervisors to optimize students´clinical learning experience during clinical practice placements. Nurse educators and clinical supervisors should be aware of unexperienced nursing students need for support, confirmation and collective reflections as this may enhance students´ confidence to actively take on challenges and learn while practising. Nursing students need to be challenged under supervision to develop and utilize knowledge and expand their capabilities, as this is essential for promoting professional development and patient care.

Conclusions

This study suggests that supplementing clinical practice in nursing homes with simulation training may mitigate some of the learning challenges students may report while practicing in nursing homes. The simulation training seemed to complement clinical practice by consolidating the students' learning, enhance the students' motivation and sense of mastery, and consequently their efforts to seek out new challenges, explore and learn both in the clinical and the simulated environment.

Future studies with experimental designs should examine effects on areas such as knowledge acquisition and self-efficacy when supplementing clinical practice in nursing homes with simulation training. We also suggest that future studies explore the nurse supervisors´ experiences to ascertain if simulation training as learning support during clinical practice demonstrate improved nursing skills and patient outcomes.

Authors' Note

The study was approved by the Norwegian Social Science Data Services (ref. number 51842 and 57344). Participation was based on written, informed consent.

Authors' Contributions

Camilla Olaussen has been responsible for design, data collection, analyses and interpretation of data, and has worked out the drafts and completion of the submitted version of the manuscript. Co-authors have contributed with comments and ideas during the process, analyses and interpretation of the data and revision of the manuscript. All co-authors have given their final approval of the version submitted.

Declaration of Conflicting Interests

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References

Adamson, E., King, L., Foy, L., McLeod, M., Traynor, J., Watson, W., & Gray, M. (2018). Feedback in clinical practice: Enhancing the students experience through action research. *Nurse Education in Practice*, *31*, 48–53. https://doi.org/10.1016/j.nepr.2018.04.012

Algoso, M., & Peters, K. (2012). The experiences of undergraduate assistants in nursing (AIN). *Nurse Education Today*, *32*(3), 197–202. https://doi.org/10.1016/j.nedt.2011.08.002

Arkan, B., Ordin, Y., & Yılmaz, D. (2018). Undergraduate nursing student's experience related to their clinical learning environment and factors affecting to their clinical learning process. *Nurse Education in Practice*, *29*, 127–132. https://doi.org/10.1016/j.nepr.2017.12.005

Baglin, M. R., & Rugg, S. (2010). Student nurses' experiences of community-based practice placement learning: A qualitative exploration. *Nurse Education in Practice*, *10*(3), 144–152. https://doi.org/10.1016/j.nepr. 2009.05.008

Bogossian, F. E., Cant, R. P., Ballard, E. L., Cooper, S. J., Levett-Jones, T. L., McKenna, L. G., Ng, L. C., & Seaton, P. C. (2019). Locating "gold standard" evidence for simulation as a substitute for clinical practice in prelicensure health professional education: A systematic review. *Journal of Clinical Nursing*, *28*(21–22), 3759–3775. https://doi.org/10.1111/jocn.14965

Bradshaw, C., Atkinson, S., & Doody, O. (2017). Employing a qualitative description approach in health care research. *Global Qualitative Nursing Research*, *4*, 233339361774228. https://doi.org/10.1177/2333393617742282

Breymier, T. L., Rutherford-Hemming, T., Horsley, T. L., Atz, T., Smith, L. G., Badowski, D., & Connor, K. (2015). Substitution of clinical experience with simulation in prelicensure nursing programs: A national survey in the United States. *Clinical Simulation in Nursing*, *11*(11), 472–478. https://doi.org/10.1016/j.ecns.2015.09.004

Cant, R. P., & Cooper, S. J. (2017). Use of simulation-based learning in undergraduate nurse education: An umbrella systematic review. *Nurse Education Today*, *49*, 63–71. https://doi.org/10.1016/j.nedt.2016.11.015

Crafford, I., Killan, C., Moore-Saayman, R., Dreyer, J., & Rossouw, M. (2019). Learning in simulation:

Ready? Steady? GO!. *Professional Nursing Today*, *23*(1), 35–41.
Creswell, J. W. (2014). *Research design. Qualitative, quantitative and mixed methods approaches* (4th ed.). SAGE Publications.
Curl, E. D., Smith, S., Ann Chisholm, L., McGee, L. A., & Das, K. (2016). Effectiveness of integrated simulation and clinical experiences compared to traditional clinical experiences for nursing students. *Nursing Education Perspectives*, *37*(2), 72–77. https://doi.org/10.5480/15-1647
D'Souza, M. S., Arjunan, P., & Venkatesaperumal, R. (2017). High fidelity simulation in nursing education. *International Journal of Health Science and Research*, *7*(7), 340–353.
Davis, A. H., Kimble, L. P., & Gunby, S. S. (2014). Nursing faculty use of high-fidelity human patient simulation in undergraduate nursing education: A mixed-methods study. *The Journal of Nursing Education*, *53*(3), 142–150. https://doi.org/10.3928/01484834-20140219-02
Deci, E. L., & Ryan, R. M. (2002). *Handbook of self-determination research*. University of Rochester Press.
Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macro theory of human motivation, development, and health. *Canadian Psychology/Psychologie Canadienne*, *49*(3), 182–185. https://doi.org/10.1037/a0012801
Donaldson, J., & Carter, D. (2005). The value of role modelling: Perceptions of undergraduate and diploma nursing (adult) students. *Nurse Education in Practice*, *5*(6), 353–359. https://doi.org/10.1016/j.nepr.2005.05.006
Eppich, W., & Cheng, A. (2015). Promoting excellence and reflective learning in simulation (PEARLS): Development and rationale for a blended approach to health care simulation debriefing. *Simulation in Healthcare: Journal of the Society for Simulation in Healthcare*, *10*(2), 106–115. https://doi.org/10.1097/SIH.0000000000000072
Ford, K., Courtney-Pratt, H., Marlow, A., Cooper, J., Williams, D., & Mason, R. (2016). Quality clinical placements: The perspectives of undergraduate nursing students and their supervising nurses. *Nurse Education Today*, *37*, 97–102. https://doi.org/10.1016/j.nedt.2015.11.013
Gates, M. G., Parr, M. B., & Hughen, J. E. (2012). Enhancing nursing knowledge using high-fidelity simulation. *The Journal of Nursing Education*, *51*(1), 9–15. https://doi.org/10.3928/01484834-20111116-01
Grobecker, P. A. (2016). A sense of belonging and perceived stress among baccalaureate nursing students in clinical placements. *Nurse Education Today*, *36*, 178–183. https://doi.org/10.1016/j.nedt.2015.09.015
Haddeland, K., Slettebø, Å., Carstens, P., & Fossum, M. (2018). Nursing students managing deteriorating patients: A systematic review and meta-analysis. *Clinical Simulation in Nursing*, *21*, 1–15. https://doi.org/10.1016/j.ecns.2018.05.001
Harrington, C., Choiniere, J., Goldmann, M., Jacobsen, F. F., Lloyd, L., McGregor, M., Stamatopoulos, V., & Szebehely, M. (2012). Nursing home staffing standards and staffing levels in six countries. *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing*, *44*(1), 88–98. https://doi.org/10.1111/j.1547-5069.2011.01430.x
Hayden, J., Smiley, R., Alexander, M., Kardong-Edgren, S., & Jeffries, P. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation*, *5*(2), S3–S40. https://doi.org/10.1016/S2155-8256(15)30062-4
Holmlund, K., Lindgren, B., & Athlin, E. (2010). Group supervision for nursing students during their clinical placements: Its content and meaning. *Journal of Nursing Management*, *18*(6), 678–688. https://doi.org/10.1111/j.1365-2834.2010.01157.x
INACSL. (2016). INACSL standards of best practice: SimulationSM simulation design. *Clinical Simulation in Nursing*, *12*, 5–12. https://doi.org/10.1016/j.ecns.2016.09.005
Jayasekara, R., Smith, C., Hall, C., Rankin, E., Smith, M., Visvanathan, V., & Friebe, T.-R. (2018). The effectiveness of clinical education models for undergraduate nursing programs: A systematic review. *Nurse Education in Practice*, *29*, 116–126. https://doi.org/10.1016/j.nepr.2017.12.006
Jeffries, P. R. (2015). *The NLN Jeffries simulation theory*. Wolters Kluwer.
Jonsén, E., Melender, H.-L., & Hilli, Y. (2013). Finnish and Swedish nursing students' experiences of their first clinical practice placement—A qualitative study. *Nurse Education Today*, *33*(3), 297–302. https://doi.org/10.1016/j.nedt.2012.06.012
Khalaila, R. (2014). Simulation in nursing education: an evaluation of students' outcomes at their first clinical practice combined with simulations. *Nurse Education Today, 34*(2), 252–258. https://doi.org/10.1016/j.nedt.2013.08.015
Kern, A., Montgomery, P., Mossey, S., & Bailey, P. (2014). Undergraduate nursing students' belongingness in clinical learning environments: Constructivist grounded theory. *Journal of Nursing Education and Practice*, *4*(3), 133–142. https://doi.org/10.5430/jnep.v4n3p133
Killam, L. A., & Heerschap, C. (2013). Challenges to student learning in the clinical setting: A qualitative descriptive study. *Nurse Education Today*, *33*(6), 684–691. https://doi.org/10.1016/j.nedt.2012.10.008
Killam, L. A., Mossey, S., Montgomery, P., & Timmermans, K. E. (2013). First year nursing students' viewpoints about compromised clinical safety. *Nurse Education Today*, *33*(5), 475–480. https://doi.org/10.1016/j.nedt.2012.05.010
Kitzinger, J. (1995). Introducing focus groups. *BMJ*, *311*(7000), 299–302.
Kristofferzon, M.-L., Mårtensson, G., Mamhidir, A.-G., & Löfmark, A. (2013). Nursing students' perceptions of clinical supervision: The contributions of preceptors, head preceptors and clinical lecturers. *Nurse Education Today*, *33*(10), 1252–1257. https://doi.org/10.1016/j.nedt.2012.08.017
Krueger, R. A., & Casey, M. A. (2015). *Focus groups: A practical guide for applied research (5th ed.)*. SAGE Publications.
Larue, C., Pepin, J., & Allard, É. (2015). Simulation in preparation or substitution for clinical placement: A systematic review of the literature. *Journal of Nursing*

Education and Practice, *5*(9). https://doi.org/10.5430/jnep.v5n9p132

Levett-Jones, T., Lathlean, J., Higgins, I., & McMillan, M. (2009). Staff-student relationships and their impact on nursing students' belongingness and learning. *Journal of Advanced Nursing*, *65*(2), 316–324. https://doi.org/10.1111/j.1365-2648.2008.04865.x

Little, D. (1991). *Learner autonomy: Definitions, issues and problems*. Authentic Language Learning Resources Ltd.

Malterud, K. (2012). Systematic text condensation: A strategy for qualitative analysis. *Scandinavian Journal of Public Health*, *40*(8), 795–805. https://doi.org/10.3109/02813430903226548

Malterud, K., Siersma, V.D., & Guassora, A.D. (2016). Sample size in qualitative interview studies: guided information power. *Qualitative Health Research, 26*(13), 1753–1760. https://doi,org/10.1177/1049732315617444

Mårtensson, G., Engström, M., Mamhidir, A.-G., & Kristofferzon, M.-L. (2013). What are the structural conditions of importance to preceptors' performance? *Nurse Education Today*, *33*(5), 444–449. https://doi.org/10.1016/j.nedt.2012.04.015

McCloughen, A., Levy, D., Johnson, A., Nguyen, H., & McKenzie, H. (2020). Nursing student's socialisation to emotion management during early clinical placement experiences: A qualitative study. *Journal of Clinical Nursing*, *29*(13-14), 2508–2520. https://doi.org/10.1111/jocn.15270

McIntosh, A., Gidman, J., & Smith, D. (2014). Mentors' perceptions and experiences of supporting student nurses in practice. *International Journal of Nursing Practice*, *20*(4), 360–365. https://doi.org/10.1111/ijn.12163

Mercer, J. (2007). The challenges of insider research in educational institutions: Wielding a double-edged sword and resolving delicate dilemmas. *Oxford Review of Education*, *33*(1), 1–17. https://doi.org/10.1080/03054980601094651

Morell-Scott, N. (2018). Confidence and deeper learning: Simulated practice within pre-registration nurse education. *British Journal of Nursing*, *27*(14), 827–830. https://doi.org/10.12968/bjon.2018.27.14.827

Morrell, N., & Ridgway, V. (2014). Are we preparing student nurses for final practice placement? *British Journal of Nursing (Mark Allen Publishing)*, *23*(10), 518–523. https://doi.org/10.12968/bjon.2014.23.10.518

Nielsen, B., & Harder, N. (2013). Causes of student anxiety during simulation: What the literature says. *Clinical Simulation in Nursing*, *9*(11), e507–2512. https://doi.org/10.1016/j.ecns.2013.03.003

Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom applying self-determination theory to educational practice. *Theory and Research in Education*, *7*(2), 133–144. https://doi.org/10.1177/1477878509104318

Ogilvie, S., Cragg, B., & Foulds, B. (2011). Perceptions of nursing students on the process and outcomes of a simulation experience. *Nurse Educator*, *36*(2), 56–58. https://doi.org/10.1097/NNE.0b013e31820b4fd5

Patton, M. Q. (2015). *Qualitative research & evaluation methods*. SAGE Publications.

Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist*, *44*(3), 159–175. https://doi.org/10.1080/00461520903028990

Ryan, R. M., & Deci, E. L. (2000). Self-Determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist*, *55*(1), 68–78. https://doi.org/10.1037110003-066X.55.1.68

Soccio, D. A. (2017). Effectiveness of mental health simulation in replacing traditional clinical hours in baccalaureate nursing education. *Journal of Psychosocial Nursing and Mental Health Services*, *55*(11), 36–43. https://doi.org/10.3928/02793695-20170905-03

Sullivan, N., Swoboda, S. M., Breymier, T., Lucas, L., Sarasnick, J., Rutherford-Hemming, T., Budhathoki, C., & Kardong-Edgren, S. (S.). (2019). Emerging evidence toward a 2:1 clinical to simulation ratio: a study comparing the traditional clinical and simulation settings. *Clinical Simulation in Nursing*, *30*, 34–41. https://doi.org/10.1016/j.ecns.2019.03.003

Sundler, A. J., Björk, M., Bisholt, B., Ohlsson, U., Engström, A. K., & Gustafsson, M. (2014). Student nurses' experiences of the clinical learning environment in relation to the organization of supervision: A questionnaire survey. *Nurse Education Today*, *34*(4), 661–666. https://doi.org/10.1016/j.nedt.2013.06.023

Zabalegui, A., Macia, L., Márquez, J., Ricomá, R., Nuin, C., Mariscal, I., Pedraz, A., Germán, C., & Moncho, J. (2006). Changes in nursing education in the European Union. *Journal of Nursing Scholarship: An Official Publication of Sigma Theta Tau International Honor Society of Nursing*, *38*(2), 114–118. https://doi.org/10.1111/j.1547-5069.2006.00087.x

Zapko, K. A., Ferranto, M. L., Blasiman, R., & Shelestak, D. (2018). Evaluating best educational practices, student satisfaction, and self-confidence in simulation: A descriptive study. *Nurse Education Today*, *60*, 28–34. https://doi.org/10.1016/j.nedt.2017.09.006

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RESEARCH ARTICLE

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Psychometric properties of the Norwegian version of the clinical learning environment comparison survey

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Abstract

Aim: To translate The Clinical Learning Environment Comparison Survey (CLECS) into Norwegian and to evaluate the psychometric properties of the Norwegian version.

Design: A cross-sectional survey including a longitudinal component.

Methods: The CLECS was translated into Norwegian following the World Health Organization guidelines, including forward translation, expert panel, back-translation, pre-testing and cognitive interviewing. Nursing students at a Norwegian university college were invited to participate in the study (psychometrical testing) based on informed consent. Reliability and validity of the translated version of CLECS were investigated using a confirmatory factor analysis (CFA), Cronbach's alpha and test–retest analysis.

Results: A total of 122 nursing students completed the questionnaire and Cronbach alphas for the CLECS subscales ranged from 0.69 to 0.89. CFA goodness-of-fit indices (χ^2/df = 1.409, CFI = 0.915, RMSEA = 0.058) showed acceptable model fit. Test–retest ICC ranged from 0.55 to 0.75, except for two subscales with values below 0.5

KEYWORDS
clinical education, learning needs, nursing education, psychometrics, simulation, translation

1 | INTRODUCTION

It is well known that nursing students may experience challenges related to learning in clinical practice placements, such as lack of qualified supervision, limited clinical time and limited access to adequate learning experiences (Arkan et al., 2018; Morrell & Ridgway, 2014; Richardson et al., 2014). To ensure an adequate clinical nursing education, the use of patient simulation as a learning strategy has increased considerably worldwide (Breymier et al., 2015; Gates et al., 2012; Hayden et al., 2014). Patient simulation may ensure that nursing students receive high-quality and complex learning situations, something that cannot be guaranteed in the traditional clinical practice placements (Gates et al., 2012). Moreover, systematic reviews have found that simulation training may improve students' knowledge levels, clinical skills and general nursing competences (Cant & Cooper, 2017; Haddeland et al., 2018) and some researchers have also recommended simulation as a substitute for clinical hours among nursing students (Gates et al., 2012; Hayden et al., 2014; Soccio, 2017). To evaluate the clinical and simulated practice so that both strategies can be optimally combined in nursing education programmes, valid evaluation tools are needed (Gu et al., 2018).

1.1 | Background

The Clinical Learning Environment Comparison Survey (CLECS) was primarily developed to provide empirical data to guide the use of patient simulation in nursing education as an alternative to clinical practice for nursing students (Leighton, 2015).

According to Leighton (2015), the CLECS may be a valuable instrument for course evaluation, programme evaluation and assessment of student learning in nursing education. The instrument addresses how students perceive that learning needs are met in the clinical versus the simulated environment by rating each environment side by side on 27 items related to clinical learning. In CLECS, students are asked about their experiences with communication, the nursing process, sense of holism, critical thinking, self-efficacy and teaching–learning dyad. Data about such issues are important for nursing educators to evaluate whether teaching strategies both in the clinical and in the simulated environment are effective. The CLECS has previously been used in a national randomized controlled study in the US, where 666 nursing students completed the instrument at the end of each clinical course and again at the end of the programme to rate how well each environment met the students' learning needs (Hayden et al., 2014). The identification of unmet learning needs of students should drive changes in how nursing educators manage those learning environments, thereby having an impact on the learning outcomes (Leighton, 2015).

To be used in another language and culture, the instrument needs to undergo translation and psychometrical evaluation. One previous Chinese study has assessed the psychometric properties of the CLECS in another language and context than the original. The CLECS (Chinese version) showed satisfactory reliability and validity among Chinese undergraduate nursing students (Gu et al., 2018). Equivalence between the original and translated versions is crucial to ensure that conclusions drawn from the use of a translated instrument are based on differences and similarities between cultures on the phenomenon being measured and not on errors in translation (Wang et al., 2006). Hence, systematic and precise translation and contextual evaluation are required to ensure internationally comparable results (Gudmundsson, 2009).

The present study was driven by the increasing use of patient simulation in Norwegian nursing education and the need for valid tools to guide educators in their work to develop simulation experiences that may compensate for learning needs that are not properly met in the clinical environment. Therefore, the aim of this study was to translate the Clinical Learning Environment Comparison Survey (CLECS) into Norwegian and to evaluate its psychometric properties.

2 | METHODS

2.1 | Design

The research design is a cross-sectional survey including a longitudinal component.

2.2 | CLECS

CLECS was developed and validated by Leighton (2015) and consists of 27 items, distributed on six subscales as presented in Table 1. For each of the items, level of agreement is scored using a four-point Likert scale: 1 = "Not met," 2 = "Partially met," 3 = "Met"; to 4 = "Well met," in addition to the alternative "Not applicable." For each item, the students set a score for both the traditional clinical environment and the simulated environment and allow evaluation of each environment score separately and comparison to be made between the environment scores (Leighton, 2015).

There is no established method to score the CLECS. In the present study, respondent subscale scores were calculated by summing the respondent's answers to the items included in the subscale and dividing that sum by his/her number of answers on the subscale. Higher scores indicate that learning needs are met, and lower scores indicate that learning needs are not met.

2.3 | Translation procedure

Permission to translate, validate and use the CLECS was obtained from the developer by email communication with the first author (CO). The translation process followed the guidelines from The World Health Organization (WHO, 2018), including forward translation, use of an expert panel, back-translation, pre-testing and cognitive interviewing.

2.3.1 | Forward translation

The forward translation was made independently by two translators, both registered nurses and nursing teachers, familiar with the terminology of the area covered by the CLECS (Wild et al., 2005). The translators' mother tongue was Norwegian, and both were fluent in English.

2.3.2 | Expert panel

An expert panel was established to identify and resolve inadequate expressions and concepts of the translations between the original version of the CLECS and the forward translations (WHO, 2018). The panel consisted of five members: the two original translators and three experienced nursing teachers, all registered nurses, familiar with the terminology of the area covered by the CLECS. Two were experienced within instrument development and instrument translation. In case of disagreement between the two translated versions, the expert panel resolved the discrepancies seeking agreement and reconciled the translations into a single forward translation.

TABLE 1 The hypothesized factor model and corresponding items in CLECS (Leighton, 2015)

Survey subscales	Survey items
Communication (4 items)	1. Preparing to care for patient 2. Communicating with interdisciplinary team 3. Interacting with patient 4. Providing information and support to patient's family
Nursing Process (6 items)	5. Understanding rationale for patient's treatment plan 6. Understanding patient's pathophysiology 7. Identifying patient's problems 8. Implementing care plan 9. Prioritizing care 10. Performing appropriate assessment
Holism (6 items)	11. Assessing outcomes of the care provided 12. Identifying short- and long-term nursing goals 13. Discussing patient's psychosocial needs 14. Discussing patient's developmental needs 15. Discussing patient's spiritual needs 16. Discussing patient's cultural needs
Critical Thinking (2 items)	17. Anticipating and recognizing changes in patient's condition 18. Taking appropriate action when patient's condition changes
Self-Efficacy (4 items)	19. Reacting calmly to changes in my patient's condition 20. Knowing what to do if I make an error in my care 21. Being confident in my decisions 22. Feeling confident in my nursing abilities
Teaching–Learning Dyad (5 items)	23. Having my instructor available to me 24. Feeling challenged and stimulated 25. Receiving immediate feedback on performance 26. Feeling supported by instructor and peers when making care related decisions 27. Improving my critical thinking skills with experience

2.3.3 | Back-translation

The back-translation was made by a professional translator and native speaker of English. The back-translator had no former knowledge of the CLECS and did not see the source version before or during the back-translation (Wild et al., 2005). Following back-translation, the translated version was sent to the developer together with the original CLECS. In one item (item 14: Discussing the patients developmental needs), the two versions differed in conceptual meaning. Based on feedback from the developer, the wording in item 14 was subsequently changed by the expert panel.

2.3.4 | Pre-testing and cognitive interviewing

Nine nursing students in the second year of their bachelor education were invited by the first author (CO) to pre-test the Norwegian version of the CLECS in an email. Six students accepted the invitation, pre-tested the instrument and attended a focus group interview. Beforehand, the students had been exposed to both clinical practice and simulation training environments in their educational programme of nursing. The pre-test of the CLECS took approximately 15 min to complete.

An experienced interviewer (SAS) conducted the interview, while the first author (CO) took notes. The students were asked to evaluate the structure of the CLECS (Norwegian version) such as the order of questions and response options, layout and length. They were asked to evaluate the meaning of the questions, the wording and whether the directions for completing the test was clear (Willis, 2005). For each item, students were asked what they thought the items were asking for, how they would rephrase the items in their own words and what came to their mind when they heard a particular phrase or term. Finally, when alternative expressions existed for an item, the students were asked to choose which alternative conformed better to their usual language. The students found the translated CLECS easy to understand and did not consider alternative expressions better than those suggested.

2.4 | Psychometric testing of the CLECS (Norwegian version)

Data for the psychometric testing of the CLECS (Norwegian version) were collected during the spring and fall of 2019 at a university college in Norway that provide bachelor education in nursing. A convenience sampling method was used. The study population was all first-year nursing students (139) in their second semester of the education programme that had at least one patient simulation experience as suggested in the original CLECS (Leighton, 2015). The students had also finished a 7-week mandatory clinical practice period in nursing homes. The students were informed orally and by email about the study beforehand. The volunteers signed a written informed consent before answering a paper version of the CLECS distributed at the university college's simulation centre.

The retest of the CLECS was distributed electronically after 14 days to respondents who had accepted to participate in the retest. The time span of 14 days was chosen to avoid conflicts with other student activities/assignments.

2.5 | Ethical considerations

The Norwegian Social Science Data Services approved the study (ref. number 956321). Participation to the test and retest was based on written informed consent and performed in accordance with the 2013 revised version of the Declaration of Helsinki.

2.6 | Statistical analyses

2.6.1 | Confirmatory factor analysis: internal construct validity

The CLECS developer specified a six-factor model, as presented in Table 1 (Leighton, 2015). We performed a confirmatory factor analysis (CFA) to investigate whether the pre-hypothesized factor model fitted our observed data. The fit of the hypothesized model was assessed by these goodness-of-fit indices: the chi-square/*df* ratio, the p, the Comparative Fit Index (CFI), the root mean square error of approximation (RMSEA) and the p_{close}.

Acceptable goodness-of-fit values indicate internal construct validity of the model. Carmines and McIver (1981) consider chi-square/*df* ratios of 2–3 as acceptable, whereas Byrne (1989) will not accept ratios above 2. The *p*-values should exceed .05 (Browne & Cudeck, 1993). CFI values range from 0 to 1 and should be at least 0.90: larger values indicate better fit (Bryant & Yarnold, 1995). A root mean square error of approximation (RMSEA) not exceeding 0.08 indicates adequate model fit and below 0.05 close fit (Browne & Cudeck, 1993). As the RMSEA value is a sample-based estimate, larger RMSEA values may hide an acceptable model fit. A non-significant p_{close} value says that the RMSEA does not exceed the 0.05 RMSEA limit, which indicates acceptable model fit—and a p_{close} value of above .10 indicates good fit (Schermelleh-Engel & Moosbrugger, 2003).

2.6.2 | Internal consistency

Internal consistency was assessed by Cronbach alphas, and values exceeding 0.7 were classified as good (Streiner, 2003). We also determined whether all items were contributing to the scales they were assumed to belong to by computing the Cronbach alpha value if the item was deleted. Additionally, we checked that all items were more highly correlated with the factor they were assumed to belong to (CITC) than with any other factor.

2.6.3 | Test–retest reliability

Test–retest reliability was assessed by the intraclass correlation coefficient (ICC). ICC estimates with 95% confident intervals were calculated based on a single rater measurement, absolute-agreement, 2-way mixed-effects model. The ICC varies from 0 to 1, where 1 is equivalent to perfect reliability. ICC values less than 0.5 are indicative of poor test–retest reliability, values between 0.5 and 0.75 indicate moderate reliability, values between 0.75 and 0.9 indicate good reliability, and values greater than 0.90 indicate excellent reliability (Koo & Li, 2016).

While CFA was performed using AMOS Graphics (an IBM SPSS module), all other analyses were performed using IBM SPSS Statistics version 26 (IBM). The psychometric analyses were based on data from the clinical environment.

3 | RESULTS

Of 139 students invited to participate, 122 (87.7%) returned the instrument at the baseline. The mean age of the 122 respondents at baseline was 23.6 years (*SD* 4.8), and 102 (83.6%) were female. Of the 89 students who had agreed to participate in the retest, 40 (45%) returned the instrument at follow-up. The mean age of the 40 retest respondents was 23.9 years (*SD* 5.1), and 32 (80%) were female. The response interval for the retest ranged from 2 to 8 weeks.

Completing the instrument at the baseline took 10 to 15 min. Answers were moderately skewed towards the “fully agree” end of the scale, but a full range of responses was observed. Missing at item level (not including the “Not applicable” alternative) was on average 1.4% (range of 0 to 4.1%), counting both the clinical and the simulated environment. A high frequency of “Not applicable” answers from the simulated environment made the data from the simulated environment insufficient for psychometric testing. For the simulated environment data, the “Not applicable” alternative was chosen 235 times, while for the practice environment data it was chosen 26 times.

3.1 | Internal consistency

Cronbach alphas for each clinical environment subscale are presented in Table 2. The exclusion of any item from its own subscale would not noticeably increase the α-values. Almost all items in the clinical environment (97%) were more strongly correlated with the

TABLE 2 Mean score and Cronbach's alpha by subscale (*N* = 122)

Subscale/factor	Mean score (*N*)	*SD*	Min–Max	Cronbach´s Alpha
Communication	3.21 (121)	0.54	1.25–4.00	0.69
Nursing Process	3.09 (121)	0.67	1.17–4.00	0.89
Holism	2.72 (121)	0.64	1.00–4.00	0.81
Critical Thinking	3.23 (122)	0.68	1.00–4.00	0.76
Self-Efficacy	2.95 (122)	0.64	1.50–4.00	0.83
Teaching–Learning Dyad	3.03 (121)	0.68	1.40–4.00	0.83

Abbreviation: *SD*, Standard deviation.

subscale under which the hypothesized CFA model subsumed them. The exceptions were item 1: Preparing to care for patient, which was more strongly correlated with the Nursing Process, item 11: Assessing outcomes of the care provided, which was more strongly correlated with the Nursing process and Critical thinking and item 12: Identifying short- and long-term nursing goals, which was more strongly correlated with the Nursing process.

3.2 | Test–retest reliability

For four of the six subscales in the clinical environment test–retest, ICC exceeded 0.5 as shown in Table 3. For two of the subscales, Communication and Critical Thinking, test–retest ICC were below 0.5. Test–retest ICC calculated at item level in Communication for item 1: Preparing to care for patient and item 2: Communicating with interdisciplinary team, were especially low, respectively 0.38 and 0.35. When item 1, or item 2, was removed from the subscale, the ICC estimate increased to 0.67. For Critical Thinking, two items (item 17: Anticipating and recognizing changes in patient's condition and item 18: Taking appropriate action when patient's condition changes) were low 0.37 and 0.40, respectively.

3.3 | Construct validity: goodness-of-fit values for the confirmatory factor analysis model

The factor structure model of the CLECS (Norwegian version) is presented in Figure 1. The content of the items is presented in Table 1. The model was developed with a randomly selected 50% of the data set from the clinical environment and was confirmed by being tested on the entire clinical environment data set (Pohlmann, 2004).

Goodness-of-fit indices for the factor structure model are shown in Table 4.

4 | DISCUSSION

The Norwegian version of CLECS showed good acceptability, acceptable construct validity and a good internal consistency. While most subscales displayed moderate to good test–retest reliability, problematic reliability was observed in the subscales Communication and Critical thinking.

In the original CLECS, the lowest Cronbach alpha score for all the subscales was 0.73 (Leighton, 2015). In the present study, the relatively high Cronbach alphas for all hypothesized subscales, except for the Communication subscale, demonstrated internal consistency. The exclusion of any item from its own subscale did not significantly increase the α-value. Moreover, the fact that almost all items were more strongly correlated with their own subscale than with any of the other subscales confirms that responses were grouped in the way hypothesized by our model.

Leighton (2015) evaluated test–retest reliability in the original CLECS by Pearson's correlation coefficient r, while in the current study, test–retest reliability was assessed by ICC. The advantage of the latter approach is that ICC will not only discover within-subject change in scores but also a possible collective change in scores among respondents in a group over time. While Leighton (2015) only found two subscales (Holism and Teaching–learning dyad) in the

TABLE 3 Test–retest of the CLECS (Norwegian version) in patients with complete data sets at both times of measurement

Test–retest, intraclass correlation coefficient by subscale (*N* = 40)						
					95% CI	
Subscales	Baseline Mean (*SD*)	Retest Mean (*SD*)	Mean difference (95% CI)	ICC	Lower	Upper
Communication	3.28 (0.48)	3.10 (0.60)	0.18 (−0.01–0.37)	0.41	0.12	0.63
Nursing Process	3.05 (0.68)	3.00 (0.64)	0.05 (−12–0.22)	0.68	0.47	0.82
Holism	2.78 (0.62)	2.86 (0.66)	−0.82 (−0.23–0.07)	0.72	0.54	0.84
Critical Thinking	3.36 (0.66)	3.21 (0.67)	0.15 (−0.09–0.40)	0.42	0.11	0.65
Self-Efficacy	3.06 (0.73)	2.93 (0.66)	0.13 (−0.09–0.35)	0.55	0.28	0.74
Teaching–Learning Dyad	3.04 (0.71)	3.01 (0.85)	0.03 (−0.15–0.22)	0.75	0.57	0.93

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient. Calculated on a single rater measurement, absolute-agreement, 2-way mixed-effects model.

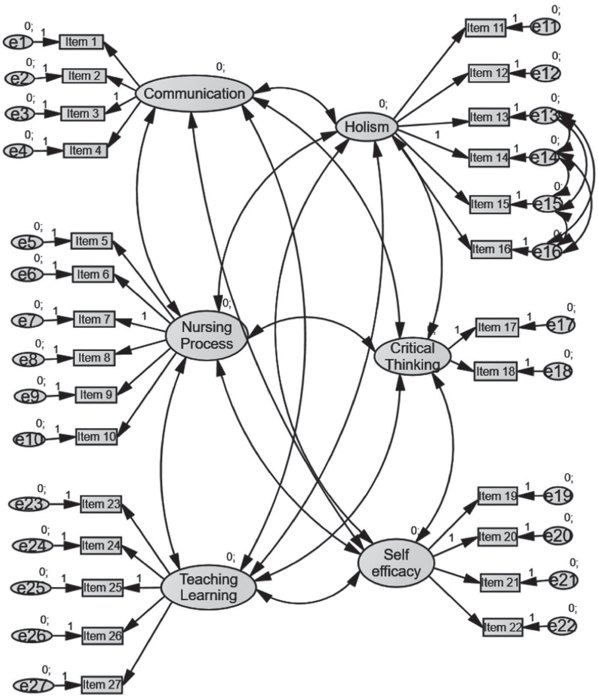

FIGURE 1 Factor structure model for the CLECS (Norwegian version) ($N = 122$)

original CLECS with values above 0.5 indicating a moderate test–retest reliability, three subscales in the present study indicated a moderate reliability (Nursing Process, Holism and Self-Efficacy) and one (Teaching–Learning dyad) indicated good test–retest reliability (Koo & Li, 2016).

Two subscales (Communication and Critical Thinking) had values indicating poor test–retest reliability (<0.5). The low correlations in these subscales were caused by four items (item 1: Preparing to care for patient and 2: Communicating with interdisciplinary team in Communication, item 17: Anticipating and recognizing changes in patient's condition and 18: Taking appropriate action when patient's condition changes in Critical Thinking). Low test–retest

TABLE 4 Goodness-of-fit indices ($N = 122$)

χ^2	Df	χ^2/df	p	CFI	RMSEA	p_{close}
427.03	303	1.409	<.001	0.915	0.058	.150

Abbreviations: CFI, the Comparative Fit Index; *df*, degrees of freedom; *p*, *p* value; RMSEA, the root mean square error of approximation; χ^2, the chi-square; χ^2/df, the chi-square to *df* ratio.

correlations may be caused by instrument instability such as problematic words, topics or expressions (Blacker & Endicott, 2008; Furr & Bacharach, 2008). As Norwegian nursing education is heavily influenced by US textbooks and research articles, it was not difficult to find Norwegian words and expressions that captured the CLECS original meaning in the translation process. The group of second-year students that evaluated the CLECS (Norwegian version) confirmed the importance and relevance of the topics and wording, suggesting that the CLECS may be used in a Norwegian context. However, it may have been easier to detect potential problems in the translated version using individual interviews instead of a focus group interview (Gjersing et al., 2010). Furthermore, the differences in responses may be due to the sample´s characteristics (Blacker & Endicott, 2008; Furr & Bacharach, 2008). The second-year students may have been more familiar with nursing terminology and nursing care than the first-year respondents used in the psychometric testing. The low test–retest correlations may have reflected an uncertainty on how to interpret and evaluate some of the CLECS's rather complex topics due to an early stage in the nurse education programme.

Test–retest reliability estimates will also depend on test–retest intervals, test conditions and true change in the variables of interest (Blacker & Endicott, 2008; Furr & Bacharach, 2008). The time interval between the tests must be short enough to ensure a minimal, or no change in the individual, but long enough to avoid the risk of recall bias (Blacker & Endicott, 2008). Several retest results in this study were returned after longer retest intervals and time may have bleached these respondents' recollection and attenuated their evaluation of their experiences. An assumption in test–retest reliability is also that the error variance of the first measurement is equal to the error variance in the second measurement—which requires identical test conditions. We were not able to create two identical testing situations, and thus, we could not control for extraneous variables such as noise or distractions, which can affect responses in random ways and mask the differences among the respondents' true scores (Furr & Bacharach, 2008). The unequal test conditions made it impossible to determine whether differences in scores from test to retest were due to "true" differences or to "chance" errors. In future studies of CLECS (Norwegian version), the test–retest reliability in the subscales Communication and Critical Thinking should be further evaluated.

The construct validity of the CLECS (Norwegian version), as judged by the goodness-of-fit indicators from CFA, can be considered acceptable. In the original CLECS, CFA was used to test and revise subscale compositions (Leighton, 2015), resulting in the hypothesized factor structure model used in this study. We did not re-define the hypothesized model. However, one minor adjustment was done; we linked the error terms of items 13 to 16 as these questions all contained the possibly ambiguous word "diskutere" (discuss). In each item, the word "discuss" may be have been read as "myself thinking it through in my head" or as "I talked it over with some other person." As all four items carry the same interpretational uncertainty, their error terms may be related. One goodness-of-fit indicator that speaks against the fit of the model is the χ^2's *p*-value of less than .001. However, the χ^2-*df* ratio was well below the limit recommended by Byrne (1989). The p_{close} and the RMSEA both met the criteria suggested by Browne and Cudeck (1993).

The results of this study show that the CLECS has potential as an instrument for assessment of student learning in the Norwegian nursing education. An important step in improving nursing students' clinical education is to understand how learning needs are met by the two methods of learning. The CLECS could be integrated in Norwegian nursing education for course and programme evaluations. CLECS findings may also be used to guide nursing educators in their work to develop and refine simulation experiences that may compensate for students learning challenges in clinical practice (Gu et al., 2018; Leighton, 2015).

Until now, no valid instrument that provides educators the direction on how to ensure an optimal combination of clinical and simulated experiences has been available in Norway. In this first Norwegian translation and testing of the CLECS, the internal reliability and goodness-of-fit results are based on observed data from the clinical environment. We were unable to evaluate reliability and the factor structure model for the simulation environment because many respondents lacked sufficient simulation experience and therefore too often ticked the "Not applicable" alternative in subscale items that did not match the content in their simulation experiences. Although the suggested minimum number of simulation experiences for the CLECS is set to one, the instrument subscales may be more suited for respondents with a broader simulation experience.

The internal consistency and construct validity tests were performed on a relatively small sample of 122 respondents. There is near universal agreement that factor analyses are inappropriate when sample sizes are below 50 (Garson, 2013). The suggested minimum size for conducting factor analysis differ in absolute numbers from 100 to over 1,000 and, in relative terms, from 3 to 20 times the number of variables (Mundfrom et al., 2005). Bryant and Yarnold (1995) suggest that the subjects-to-variables ratio should be no lower than 5. This criterion would have required 135 respondents, which was aimed for, but not quite reached, in this study: our subjects-to-variables ratio was 4.5:1. The original CLECS has no established scoring method, leaving the decision on how to score the instrument to the user, which may make it difficult to compare CLECS results nationally and internationally.

5 | CONCLUSION

The CLECS (Norwegian version) has potential as a useful instrument to measure nursing students' perceptions of how well their learning needs are met. The hypothesized six-factor model had acceptable construct validity, good internal consistency and most subscales displayed moderate to good test–retest reliability. However, low test–retest values in two of the subscales revealed a need to further investigate these aspects. Also, future research should confirm the factor structure on data from the simulated environment—and preferably with data collected from respondents with a broader simulation experience.

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CONFLICT OF INTEREST

None.

AUTHOR CONTRIBUTIONS

CO was responsible for the conception, design, analysis, and evaluation of the results and worked out the drafts and completed the submitted version of the manuscript. LPJ, CRT, DH IA and SAS contributed to conception and design in addition to participate in the analyses and evaluation of the results and contributed to the manuscripts intellectual content and critical review. All authors have given their final approval for the submitted version.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The Norwegian Social Science Data Services approved the study (ref. number 956321). Participation to the test and retest was based on written informed consent.

DATA AVAILABILITY STATEMENT

Data not available due to ethical restrictions.

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REFERENCES

Arkan, B., Ordin, Y., & Yllmaz, D. (2018). Undergraduate nursing student´s experience related to their clinical learning environment and factors affecting to their clinical learning process. *Nurse Education in Practice*, *29*, 127–132. https://doi.org/10.1016/j.nepr.2017.12.005

Blacker, D., & Endicott, J. (2008). Psychometric properties: Concepts of reliability and validity. In A. J. Rush, M. B. First, & D. Blacker (Eds.), *Handbook of Psychiatric Measures* (2nd ed., pp. 7–14). American Psychiatric Publishing Inc.

Breymier, T. L., Rutherford-Hemming, T., Horsley, T. L., Atz, T., Smith, L. G., Badowski, D., & Connor, K. (2015). Substitution of clinical experience with simulation in prelicensure nursing programs: A national survey in the United States. *Clinical Simulation in Nursing*, *11*(11), 472–478. https://doi.org/10.1016/j.ecns.2015.09.004

Browne, M., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen, & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage.

Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm, & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (p. 373). American Psychological Association Books.

Byrne, B. M. (1989). *Basic applications and programming for confirmatory factor analysis models*. Springer-Verlag.

Cant, R. P., & Cooper, S. J. (2017). Use of simulation-based learning in undergraduate nurse education: An umbrella systematic review. *Nurse Education Today*, *49*, 63–71. https://doi.org/10.1016/j.nedt.2016.11.015

Carmines, E. G., & McIver, J. P. (1981). Analyzing models with unobserved variables. In G. W. Bohrnstedt, & E. F. Borgatta (Eds.), *Social measurement: Current issues*. Sage.

Furr, R. M., & Bacharach, V. R. (2008). *Psychometrics: An introduction* (1st ed.). SAGE Publications Inc.

Garson, G. D. (2013). *Factor analysis*. Statistical Associates Publishers.

Gates, M. G., Parr, M. B., & Hughen, J. E. (2012). Enhancing nursing knowledge using high-fidelity simulation. *Journal of Nursing Education*, *51*(1), 9–15. https://doi.org/10.3928/01484834-20111116-01

Gjersing, L., Caplehorn, J. R. M., & Clausen, T. (2010). Cross-cultural adaption of research instruments: Language, setting, time and statistical considerations. *BMC Medical Research Methodology*, *10*(13), 10. https://doi.org/10.1186/1471-2288-10-13

Gu, Y.-H., Xiong, L., Bai, J.-B., Hu, J., & Tan, X.-D. (2018). Chinese version of the clinical learning environment comparison survey: Assessment of reliability and validity. *Nurse Education Today*, *71*, 121–128. https://doi.org/10.1016/j.nedt.2018.09.026

Gudmundsson, E. (2009). Guidelines for translating and adapting psychological instruments. *Nordic Psychology*, *61*(2), 29–45. https://doi.org/10.1027/1901-2276.61.2.29

Haddeland, K., Slettebø, Å., Carstens, P., & Fossum, M. (2018). Nursing students managing deteriorating patients: A systematic review and meta-analysis. *Clinical Simulation in Nursing*, *21*, 1–15. https://doi.org/10.1016/j.ecns.2018.05.001

Hayden, J., Smiley, R., Alexander, M., Kardong-Edgren, S., & Jeffries, P. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation*, *5*(2), S3–S40. https://doi.org/10.1016/S2155-8256(15)30062-4

Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, *15*, 155–163. https://doi.org/10.1016/j.jcm.2016.02.012

Leighton, K. (2015). Development of the clinical learning environment comparison survey. *Clinical Simulation in Nursing*, *11*(1), 44–51. https://doi.org/10.1016/j.ecns.2014.11.002

Morrell, N., & Ridgway, V. (2014). Are we preparing student nurses for final practice placement? *British Journal of Nursing*, *23*(10), 518–523. https://doi.org/10.12968/bjon.2014.23.10.518

Mundfrom, D. J., Shaw, D. G., & Ke, T. L. (2005). Minimum sample size recommendations for conducting factor analyses. *International Journal of Testing*, *5*(2), 159–168. https://doi.org/10.1207/s15327574ijt0502_4

Pohlmann, J. T. (2004). Use and interpretation of factor analysis in the journal of educational research: 1992–2002. *The Journal of Educational Research*, *98*(1), 14–23. https://doi.org/10.3200/JOER.98.1.14-23

Richardson, H., Goldsamt, L. A., Simmons, J., & Jeffries, P. R. (2014). Increasing faculty capacity: Findings from an evaluation of simulation clinical teaching. *Nursing Education Perspectives*, *35*(6), 308–314. https://doi.org/10.5480/14-1384

Schermelleh-Engel, K., & Moosbrugger, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online*, *8*(2), 23–74.

Soccio, D. A. (2017). Effectiveness of mental health simulation in replacing traditional clinical hours in baccalaureate nursing education. *Journal of Psychosocial Nursing and Mental Health Services*, *55*(11), 36–43. https://doi.org/10.3928/02793695-20170905-03

Wang, W. L., Lee, H. L., & Fetzer, S. J. (2006). Challenges and Strategies of Instrument Translation. *Western Journal of Nursing Research*, *28*(3), 310–321. https://doi.org/10.1177/0193945905284712

WHO (2018). *Process of translation and adaption of instruments*. http://www.who.int/substance_abuse/research_tools/translation/en/

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., & Erikson, P. (2005). Principles of good practice for the translation and cultural adaption process for patient-reported outcomes (PRO). Measures: Report of the ISPOR task force for translation and cultural adaption. *Value in Health*, *8*(2), 94–104. https://doi.org/10.1111/j.1524-4733.2005.04054.x

Willis, G. B. (2005). *Cognitive interviewing: A tool for improving questionnaire design*. Sage Publications.

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Paper IV

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Integrating simulation training during clinical practice in nursing homes: an experimental study of nursing students' knowledge acquisition, self-efficacy and learning needs

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Abstract

Background: Limited access to supervision, feedback and quality learning experiences pose challenges to learning in the clinical setting for first-year nursing students who are beginning their clinical experiences. Prior studies have indicated that simulation training, as a partial replacement of clinical practice hours, may improve learning. However, there has been little research on simulation training integrated as a partial replacement during first-year students' clinical practice in nursing homes. The primary aim of this study was to examine first-year nursing students' knowledge acquisition and self-efficacy in integrating a partial replacement of clinical hours in nursing homes with simulation training. Its secondary aim was to examine perceptions of how learning needs were met in the simulated environment compared with the clinical environment.

Design: The primary aim was addressed using an experimental design that included pre- and post-tests. The secondary aim was investigated using a descriptive survey-based comparison.

Methods: First-year students at a Norwegian university college ($n = 116$) were asked to participate. Those who agreed ($n = 103$) were randomly assigned to the intervention group ($n = 52$) or the control group ($n = 51$). A knowledge test, the General Self-efficacy Scale and the Clinical Learning Environment Comparison Survey were used to measure students' outcomes and perceptions. The data were analysed using independent samples *t*-tests, chi-square tests and paired samples *t*-tests.

Results: Knowledge scores from pre- to post-tests were significantly higher in the intervention group than in the control group with a medium to large effect size ($p < 0.01$, *Hedges' g* = 0.6). No significant differences in self-efficacy were identified. Significant differences ($p < 0.05$) were observed between the simulated and the clinical environment with regard to meeting learning needs; effect sizes ranged from small and medium to large (Cohen's d from 0.3 to 1.0).

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Conclusion: Integrating the partial replacement of clinical hours in nursing homes with simulation training for first-year nursing students was positively associated with knowledge acquisition and meeting learning needs. These findings are promising with regard to simulation as a viable partial replacement for traditional clinical practice in nursing homes to improve learning.

Keywords: Clinical learning, Knowledge, Nursing education, Nursing homes, Self-efficacy, Simulation training

Background

The Norwegian Coordination Reform, which was introduced in January 2012 [1], has resulted in the transferral of patients suffering serious, complex and treatment-intensive conditions to nursing homes, thus placing extensive demands on staffing and competence [2]. In addition, nursing homes often struggle with nurse shortages due to recruitment difficulties and high turnover [3, 4]. Nursing education programmes are essential in meeting increasingly complex care needs and demands, recruiting and retaining nurses in bedside positions and ensuring future patient safety and quality in nursing homes [5].

Supervised experiences with patients in real clinical settings are an important part of nursing students' clinical education [6, 7]. According to the traditional Norwegian clinical education model for first-year nursing students, all hours of clinical practice are conducted in nursing homes and supervised by onsite registered nurses [8]. Nursing students need feedback, guidance and support to acquire the knowledge of managing challenging learning situations in clinical practice and to build competency for self-efficacy and safe patient care [9, 10]. However, students' access to supervision, feedback and quality learning experiences is not always optimal [11, 12]. In nursing homes, the limited number of registered nurses that serve as supervisors can pose a significant challenge to the learning of first-year students who are just beginning their clinical experiences [13–15]. Prior studies have indicated that integrating simulation training as a partial replacement of clinical practice hours may improve learning [16, 17].

When used as preparation for clinical practice, studies have reported that simulation training has positive effects on student outcomes such as knowledge, decision-making, self-confidence and self-efficacy [18–20]. In an umbrella systematic review, Cant and Cooper [19] found that simulation training statistically improved self-efficacy in pre- and post-test studies, and in experimental designs self-efficacy was superior to that of other teaching methods. Further they found that many reviews agreed on outcomes of knowledge, although no overall quantitative effect was derived [19]. In a randomized controlled trial comparing students' knowledge and self-confidence scores before and after attending simulation training, Haddeland et al. [20] identified significantly greater improvement in the intervention group compared with the control group. A systematic review and meta-analysis on the effectiveness of simulation training based on life-threatening clinical condition scenarios found no significant effect on students' self-confidence and self-efficacy but demonstrated that simulation training is superior to other teaching methods in improving knowledge and performance [21]. However, there are few previous studies on the partial replacement of clinical hours by simulation training among first-year students in nursing homes. The National Council of State Board Nursing's (NCSBN) National Simulation Study was a two-year longitudinal, randomised controlled study in which clinical hours were replaced by 25 and 50% simulation training in two intervention groups, respectively. These intervention groups were then compared with a control group that had up to a 10% replacement. No statistically significant differences between the groups were found [22]. However, the NCSBN study showed a possible advantage of partial replacement for the development of clinical competency in the medical-surgical and community health areas, but a potential disadvantage in the perinatal, paediatric, and mental health areas [22, 23]. Curl et al. [24] used a quasi-experimental design and found that students who replaced 50% of clinical practice in obstetrics, paediatrics and mental health had similar or better results with regard to knowledge than those who had undergone traditional clinical practice. A systematic review found that replacing clinical hours by simulation training had no significant impact on student outcomes, such as knowledge acquisition and self-confidence, compared with traditional clinical practice [23]. A meta-narrative review by Roberts et al. [25] found no significant differences in student outcomes but highlighted that the lack of clearly stated number of hours of simulation versus number of clinical hours meant the generalisability of research findings was difficult.

Roberts et al. [25] reported the need for continued research to determine the possible advantages or disadvantages of simulation training as a partial replacement for clinical hours. Davis et al. [26] emphasised that it is essential to determine the optimal combination of simulation and clinical hours. Larue et al. [23] called for studies to examine various simulation–clinical combinations, depending on the clinical context to which students are exposed. Simulation training as a partial replacement during clinical practice in nursing homes for first-year students is a combination of simulation and clinical training that has not yet been well studied.

In the current study, we examined knowledge acquisition and self-efficacy among first-year nursing students who received a 10.7% partial replacement of clinical hours in nursing homes with simulation training (the intervention group) and first-year nursing students who received the traditional Norwegian education model with clinical studies limited to nursing homes (the control group). As a secondary aim, we examined how well learning needs were met in the clinical environment compared with the simulated environment among the students in the intervention group.

Methods

Design

The primary aim was addressed using an experimental design that included pre- and post-test comparisons of students' knowledge and self-efficacy in the intervention group (the combination of simulation–clinical training) versus the control group (only clinical training). The secondary aim was addressed using a descriptive survey-based comparison in the intervention group.

Participants and setting

The study was conducted at a Norwegian university college that provides nursing education at the bachelor level. One class of first-year nursing students ($N=116$) who were enrolled in the second semester of their bachelor education during the spring of 2020 were asked to participate. Those who agreed ($n=103$) were randomly assigned to either the intervention group ($n=52$) or the control group ($n=51$). Randomisation was performed by the university administration staff using the random *between* function in Microsoft Excel to avoid selection bias. Three students from the control group left the education programme before the initial pre-test, which resulted in a control group of 48 students and a total of 100 participants. Before the practice placement period commenced, the university administration staff ensured that the students in the intervention group were placed in nursing homes that were different from those assigned to the control group. None of the 13 nursing homes involved offered simulation training for students during the practice period.

The control group: "traditional clinical practice"

The control group attended a seven-week practice period of 224 h in nursing homes, which is hereafter referred to as "traditional clinical practice".

The intervention group: "clinical practice with simulation as partial replacement"

The intervention group attended a seven-week practice period of 224 h in nursing homes, of which 24 h (10.7%) were replaced by simulation training on three separate days during the practice period, which is hereafter referred to as "clinical practice with simulation as partial replacement".

Description of the intervention: clinical practice with simulation as partial replacement

The simulation training was scheduled in weeks 2, 4 and 6 of the seven-week practice period. The INACSL Standards of Best Practice: Simulation© and the National League for Nursing/Jeffries simulation theory, which provide systematic steps for designing quality simulation experiences, guided the design of the simulation training [27, 28]. The scenarios used in the simulation training were designed to resemble situations that students were likely to encounter in their nursing home practice. To enhance the level of fidelity in the scenarios, high technology full-body mannequins (NursingAnne®; Laerdal™) with vital signs that reflected the patient's diagnosis were used, the patient's environment was designed to replicate a nursing home, and the students could immerse themselves in the simulation experiences as autonomous clinicians making their own decisions and demonstrating their knowledge [27, 29, 30]. The patient scenarios are presented in Table 1.

Previous research has suggested a 2:1 clinical-to-simulation ratio (i.e., two clinical hours count as 1 h of simulation training) because of the intensity and efficiency of simulation training compared with the clinical setting [11, 16, 24]. Because of the resources available in this study, the university administration gave permission to replace 3 days (24 h, 10.7%) of the 28 days (224 h) in "traditional clinical practice". Each day was replaced by the following: i) time for students to prepare for the simulation training individually by reading preparation materials before the simulation training commenced (1 h); ii) the simulation training which included three steps: initial briefing, the active simulation, and debriefing (3 h with a 2:1 simulation ratio = 6 h); and iii) time for the students to write individual reflection notes after the simulation training was completed (1 h). Preparation materials with information about logistics, meeting times, specific scenarios, and learning objectives were provided before each simulation training and were accessible by students in their learning management systems.

The intervention group attended the simulation training in six groups of eight to ten students each. Each simulation training started in step 1, the initial briefing

Table 1 Scenarios and objectives of the simulations in clinical practice with simulation as partial replacement

Scenarios:	Situation presented for the students:	Objectives presented for the students:
1.Nursing home patient with chronic pulmonary disease deterioration	Nursing home patient, female, 75 years old, sufferers from chronicle obstructive pulmonary disease (COPD), uses salbutamol 2 mg × 4 administered by inhalation. The patient is anxious. Her skin is warm and sweaty.	Perform relevant clinical observations and measure vital signs Identify the patient's problems, needs and possible complications Make clinical decisions, prioritize actions based on vital sign assessments, knowledge and trained skills Evaluate effect of actions Contact, inform and collaborate with physician
2. Nursing home patient dementia, developing delirium caused by urinary retention	Nursing home patient, male, 89 years old with a mild degree of dementia, and a chronic urinary retention. Permanent catheter, and a urine sample for bacteriological cultivation are ordinated. The patient's behaviour has changed, with a deteriorating confusion. The patient has been given Stesolid 2 mg without effect.	
3. Administration of medications to nursing home patient with left ventricular heart failure	Nursing home patient, male, 75 years old, sufferers from a left ventricular heart failure. The patient uses heart medications, and is scheduled for his intramuscular injection with B12 depot 1 mg. The patient is not cooperating, seems to struggle with his breath while lying down. He does not want his medication.	

(30–45 min), that offered an overview of the environment, objectives and technical equipment [31]. In step 2, three to four students participated as nurses in active simulations (30–40 min), while the other students held the role of active observers. The students switched roles during the simulation training days, which allowed all students to practice as nurses. In step 3, the scenarios were deconstructed and analysed in a facilitated debriefing that lasted a minimum of 90 min. The Promoting Excellence and Reflective Learning in Simulation (PEARLS) framework was used to guide the debriefing in four distinctive phases: the reaction, the description, the analysis and the summary phase [32]. Two experienced facilitators employed at the university college (i.e., the fifth author and an additional teacher) conducted the briefing, the active simulation and the debriefing, while the simulation operators regulated the technical features of the simulator and presented the patients' voices.

Data collection

To achieve the primary aim, data were collected using a multiple-choice knowledge test and the General Self-efficacy Scale (GSE). The Clinical Learning Environment Comparison Survey (CLECS) was used to achieve the secondary aim. The participants completed all questionnaires electronically.

Data collection: primary aim

The data collected at different time points related to the primary aim are presented in Table 2. Pre- and post-tests were completed 1 week prior to and 1 week following the clinical practice, respectively.

Knowledge test The knowledge test was specifically designed for the present study, as no appropriate tests were identified in the literature. The multiple-choice test contained 30 questions on the areas of respiration, circulation, elimination and drug handling. The test was developed based on the students' curriculum and expected learning outcomes during clinical practice in the nursing homes. Four response alternatives in addition to "I don't know" were given. Only correct answers were given one point, and higher scores were indicative of better learning outcomes (scores ranged from 0 to 30 points). The facilitators in the simulation training were blinded to the content of the knowledge test to reduce method bias that could affect the intervention group's test outcomes.

A panel of experts comprising four teachers responsible for first-year education courses was consulted to ensure the content validity of the test [33]. In addition, the test was administrated to four second-year nursing students who were asked to evaluate the structure, meaning of the questions, wording and test instructions [34]. The last step was to pilot the final test version in a group of 15 s-year nursing students to detect potential flaws and weaknesses and to estimate a provisional standard deviation (SD) for the power analysis.

The GSE (Norwegian version) The GSE is a 10-item psychometric scale that is designed to assess optimistic self-beliefs to cope with difficult demands. The scale has been translated into Norwegian and validated [35]. The GSE uses a four-point scale that measures the respondents' agreement with the statements (1 = Not at all true, 2 = Hardly true, 3 = Moderately true, 4 = Exactly true), with a score from 10 to 40 points. A high score represents a more optimistic assessment of general self-efficacy.

Data collection: secondary aim

CLECS (Norwegian version) The CLECS was administered to the intervention group to examine the students' perceptions of how well learning needs were met in the simulated versus the clinical environment 1 week following the clinical practice period. The CLECS is specifically designed for this purpose, and it has been psychometrically tested in Norwegian [36, 37]. Items are scored using a four-point Likert scale: 1 = "Not met", 2 = "Partially met", 3 = "Met", 4 = "Well met", in addition to "not applicable". For each item, the students selected a score for both the clinical and the simulated environment [37]. The results were provided as mean scores for the clinical environment and for the simulated environment in

Table 2 Data collection for the primary aim of the study

Participants Spring 2020	Pre-test Before the practice period in January 2020	The practice period of 7 weeks	Post-test After the practice period in March 2020
Intervention group	Knowledge test General Self-Efficacy Scale	Clinical practice with simulation (simulation performed in week 2, 4 and 6	Knowledge test General Self-Efficacy Scale
Control group	Knowledge test General Self-Efficacy Scale	Traditional clinical practice	Knowledge test General Self-Efficacy Scale

six subscales: Communication (four items); Nursing Process (six items); Holism (six items); Critical Thinking (two items); Self-Efficacy (four items); and the Teaching–Learning Dyad (five items).

Variables

The variables used to address the primary aim of the study were the pre- and post-knowledge and self-efficacy mean scores from both groups. The variables used to address the secondary aim of the study were the intervention group's mean scores on the six subscales in the CLECS for both the clinical environment and the simulated environment.

Data analyses

A power analysis with a provisional SD of 3.9 estimated from the pilot testing of the knowledge test showed that a sample size of 27 students in each group was sufficient to identify a difference in improvement of 3 points, with a maximum risk of a type 1 error of 5% ($p < 0.05$) and a strength of 80%. Descriptive statistics are presented as means and SD for continuous variables and as frequencies and proportions for the categorical variables. Differences in demographic variables, self-efficacy and knowledge scores between the groups were analysed using independent sample t-tests (two-tailed) and chi-square tests. Differences in self-efficacy and knowledge scores within the groups and differences in how well learning needs were met in the clinical environment compared with the simulated environment were detected by paired sample t-tests (two-tailed). Hedges' g was used to calculate the effect sizes for the independent sample t-tests (by dividing the mean difference between the groups by the pooled SD with weights for the sample sizes). Cohen's d was used for the paired sample t-tests (by dividing mean differences by the SD of the difference). Cohen's [38] operational definitions of small (= 0.2), medium (= 0.5) and large effects (= 0.8) were used.

The significance level was set at 5%, $p < 0.05$. IBM SPSS Statistics version 26 (IBM, Armonk, NY, USA) was used to conduct the analyses.

Ethical considerations

The study was approved by the Norwegian Social Science Data Services (ref. 875,320) and performed in accordance with the 2013 revised version of the Declaration of Helsinki. Participation was voluntary and based on written informed consent. It had no consequences for the students' educational progression. Students could withdraw at any point during the study.

Results

None of the study participants had prior experience in simulation training. The pre-test was completed by 97 of 100 (97%) students, of whom 52 were assigned to the intervention group (53.6%) and 45 were assigned to the control group (46.3%). There were no significant differences in demographic variables, baseline knowledge or self-efficacy scores between the groups (data not shown). The post-test was completed by 88 of these 97 students (90.7%), whereas 50 students were in the intervention group (57%) and 38 students were in the control group (43%). There were no statistically significant differences in the demographic variables, baseline knowledge or self-efficacy scores between the control group ($n = 38$) and the intervention group ($n = 50$) for those who completed both the pre- and post-tests (Table 3).

The dropout rate for the control group was 20.8, and 3.8% for the intervention group.

Table 3 Demographic variables and pre-test results of study participants who completed both pre- and post-tests knowledge and self-efficacy

	Control $n = 38$	**Intervention $n = 50$**	***p***
Age: mean (SD)	22.9 (4.4)	23.3 (5.7)	0.7
Female: $n = (\%)$	32 (84.2)	45.0 (90.0)	0.4
Years working in health care as nursing assistants or healthcare assistants: mean (SD)	1.4 (2.1)	2.0 (2.1)	0.2
Former higher education in other professions or areas: $n = (\%)$:			
1. No former higher education	30 (78.9)	43 (86.0)	0.4
2. Former bachelor/master's degree	8 (21.1)	7 (14.0)	
Pre-test knowledge	11.8 (3.9)	13.2 (4.1)	0.1
Pre-test self-efficacy	29.1 (3.8)	28.2 (4.6)	0.3

n number of participants, *SD* standard deviation, *p* *p*-value

Table 4 Comparisons of pre- and post-test scores within the control and intervention groups and mean improvement comparisons between the groups

Control $n = 38$							Intervention $n = 50$						Mean improvement comparison between groups[a]	
	Pre-test	Post-test	Mean diff.	95% CI		*p*	Pre-test	Post-test	Mean diff.	95% CI		*p*	*p*	g_{Hedges}
				Lower	Upper					Lower	Upper			
Knowledge (Mean (SD))	11.8 (3.9)	14.0 (4.1)	2.2 (3.5)	1.0	3.3	0.001	13.2 (4.1)	17.6 (3.6)	4.4 (3.8)	3.3	5.5	< 0.001	< 0.01	0.6
Self-efficacy (Mean (SD))	29.1 (3.8)	30.3 (3.5)	1.2 (4.0)	−0.1	2.5	0.08	28.2 (4.6)	28.9 (3.9)	0.7 (3.8)	−0.4	1.8	0.2	0.6	0.1

SD standard deviation, *Mean diff* mean difference between pre- and posttest, *CI* confidence interval, *p* *p*-value; g_{Hedges} effect size

[a] Comparisons of mean difference from pre- to post- tests between the control and intervention groups

Knowledge and self-efficacy

Differences in knowledge scores from pre- to post-test within the control group and the intervention group were statistically significant, while differences in self-efficacy scores from pre- to post-test within the groups were not (Table 4). There were statistically significant differences in the post-test knowledge scores between the intervention group and the control group (mean difference 3.6, 95% Cl 2.1–5.0, $p < 0.01$, Hedges' g = 0.9). However, no statistically significant differences in post-test self-efficacy scores were observed between the groups (mean difference 1.4, 95% Cl −0.9 – 3.0, $p = 0.1$, Hedges' g = 0.1).

The mean improvement in knowledge scores from the pre-test to the post-test was higher in the intervention group than in the control group (Table 4). The difference in mean improvement between the groups was statistically significant (mean difference 2.2, 95% Cl 0.6–3.8) with a medium to large effect size (Table 4). No statistically significant difference in mean self-efficacy improvement between the pre-test and the post-test were observed in the control versus the intervention group (mean difference 0.5, 95% Cl −1.2 – 2.1). A small effect size was also observed (Table 4).

Perceptions of how learning needs were met in the intervention group

Mean scores in the intervention group on how learning needs were met were significantly higher in the simulated learning environment than in the clinical environment on all six subscales of the CLECS. On three subscales (Nursing Process, Self-Efficacy and Teaching–Learning Dyad), the effect sizes were medium to large, while small effect sizes were observed in the remaining subscales (Table 5).

Discussion

In this study, we demonstrated that first-year nursing students had higher knowledge acquisition when traditional clinical practice in nursing homes was partially replaced by simulation training. The effect size value indicated the practical significance (i.e., a difference large enough to be meaningful in real life) of this result [38]. However, we observed no significant difference in levels of general self-efficacy. The first-year students scored the simulated environment higher on meeting their learning needs compared with the clinical environment. The effect size values of this result indicated practical significance in the areas of Nursing Process, Self-Efficacy and Teaching–Learning Dyad [38].

Supportive guidance in linking theory to practice is vital in learning how to provide quality nursing care for patients [39]. However, the theoretical component of the nursing curriculum can be overwhelming for students [40]. Students in nursing home practice placements have reported little time for reflection and care reasoning with their supervisors [12, 41]. The supervision tends to be task-oriented and related to routine care, and transferable knowledge is not always recognised by students [42, 43]. Ironside et al. [10] found that students frequently missed cues indicating that the patient situations were more complex than merely completing assigned tasks. The current study found a significant positive difference in knowledge acquisition from clinical practice with simulation training as a partial replacement compared with traditional clinical practice in nursing homes. Supervision by teachers and the time available for reflection in the simulation training may have enhanced the students' understanding of complex concepts and promoted the self-identification of gaps in knowledge, thus motivating students to further learning [42, 44]. Based on the design of the current study, we could not rule out that the requirement of preparing for the simulation training may have affected the results. However, nursing students are expected to be exposed to as well as process knowledge in preparing for clinical experiences in both traditional and simulated environments [45].

Although the factor of self-efficacy is widely believed to increase knowledge [46], we observed no significant difference in levels of general self-efficacy between the two groups. Shinnick and Woo [47] found no correlation between self-efficacy and knowledge in simulation training, nor was self-efficacy a predictor of "good" knowledge scores. In the current study, the general self-efficacy scores in both groups may have been related to the high grades required to be enrolled at the university college where the study was conducted. Prior success in school-related tasks may have contributed to the students' already optimistic sense of general self-efficacy [48]. Moreover, the GSE may not have been sensitive or detailed enough to best reveal students' levels of self-efficacy in managing the care of nursing home patients. An interesting finding in the current study was that the intervention group rated the simulation environment to meet learning needs related to self-efficacy significantly higher than the clinical environment. The reason for this result may have been that the self-efficacy statements in the CLECS pointed more directly to self-beliefs related to patient care compared with the general statements in the GSE. However, prior studies that have examined the impact of simulation training on general self-efficacy using the GSE have reported significant differences in general self-efficacy in the fields of psychiatric nursing, community healthcare nursing, communication and paediatrics [49–51].

An important step in improving nursing students' clinical education by a partial replacement of clinical hours by simulation training is to understand how learning needs

Table 5 The intervention group's ($n=50$) reports of how well learning needs were met in the clinical practice environment versus the simulated environment

Variables	Simulated environment	Clinical environment					
	Mean [SD]	Mean [SD]	Mean diff. (SD)	95% CI		*P*	d_{Cohen}
				Lower	Upper		
Communication (4 items)	3.4 (0.5)	3.1 (0.6)	0.3 (0.7)	0.1	0.5	<.01	0.4
Nursing Process (6 items)	3.7 (0.3)	3.0 (0.6)	0.7 (0.7)	0.5	0.9	<.001	1.0
Holism (6 items)	3.0 (0.6)	2.8 (0.7)	0.2 (0.7)	0.0	0.4	.04	0.3
Critical Thinking (2 items)	3.6 (0.6)	3.3 (0.7)	0.3 (0.8)	0.1	0.5	<.01	0.4
Self-Efficacy (4 items)	3.4 (0.6)	3.0 (0.7)	0.4 (0.5)	0.2	0.5	<.001	0.7
Teaching–Learning Dyad (5 items)	3.8 (0.3)	3.1 (0.7)	0.8 (0.7)	0.6	1.0	<.001	0.9

SD standard deviation, *Mean diff* mean difference between clinical and simulated environment, *CI* confidence interval, *p* *p*-value, d_{Cohen} effect size

are met by the two methods. In the current study, the learning needs were rated to be better met in the simulated environment. The CLECS covers different aspects of students' learning needs from the time they receive a patient through the evaluation of patient care [37]. We observed that the subscales Teaching–Learning Dyad and Nursing Process had the highest mean differences between the two learning environments. The Teaching–Learning Dyad was defined by Leighton [37] as the interactive relationship between supervisor/teacher and student in which both have shared responsibility for the learning outcomes, while Nursing Process was described as a systematic patient care approach that involves assessment, nursing diagnosis, planning, implementation and evaluation. It has been reported that students in clinical practice placements may experience a disconnection between the taught versus the observed nursing role, and that they may feel that they are left on their own to learn by trial and failure [12, 40]. An explanation for the difference related to the Teaching–Learning subscale may be that in simulation training, support and feedback from and collaboration with the teacher are inherent features [27]. Furthermore, the current study incorporated academic- and practice-focused simulation training that focused on nursing observations, assessments and evaluation of care, which may have enhanced students' understanding of the nursing process as a structured approach to care, thereby influencing the scores.

Implications for practice

The unmet learning needs of students should drive changes in traditional practice placement models [15, 37]. Our results provide evidence related to knowledge acquisition and meeting learning needs, which may justify the partial replacement of clinical hours in nursing homes by simulation training for first-year nursing students. In planning partial replacements of clinical hours, educators may be guided by tools such as the CLECS in their work to design simulation training that may compensate for learning needs that are not properly met in the clinical environment and thereby potentially negatively affect learning outcomes [36]. However, the number of clinical practice hours required in nursing education programmes is set by the relevant governing bodies; for example, the European Union directive specifies that 50% of the nursing education programme must be dedicated to clinical practice placements [52]. Thus, the replacement of clinical hours may demand changes in official clinical requirements. As partial replacement, simulation training also has resource implications [22]. In addition to a considerable amount of faculty time, scheduling issues and the availability of simulation facilities are challenges faced by educators in implementing simulation training as a partial replacement for traditional clinical practice [53].

Strengths and limitations of the study

In the present study, differences in knowledge acquisition were measured by a multiple-choice test. Questions have been raised about the appropriateness of using multiple choice as a method of assessing the effectiveness of simulation experiences, as multiple-choice questions tend to assess lower levels of cognitive processing [54]. A multiple-choice test may not be the best tool to evaluate the potential higher order thinking benefits of clinical education. In the present study, we could not control for the participants' different experiences in clinical practice, nor could we control the distribution of participants between private and municipal nursing homes, which could potentially have influenced the results.

The loss of participants to follow up was higher in the control group than in the intervention group. The control group participants might have felt less obligated to complete the study because they did not receive anything beyond the traditional clinical practice. Nevertheless, no statistically significant differences in demographics and pre-test scores between the groups that completed both pre- and post-tests were observed. Although the sample size was adequate to support the findings of this study, it could also be viewed as a limitation. The results were derived from a limited sample drawn from a single nursing education institution. Expanding the study to include other nursing education institutions would allow for the greater generalisability of the findings.

Conclusion

The results of the present study showed that the partial replacement of hours of clinical practice in nursing homes by simulation training was positively associated with knowledge acquisition and meeting the learning needs of first-year nursing students. These findings are promising regarding simulation training as a viable partial replacement of traditional clinical practice in nursing homes to improve learning. Our findings may help educators to develop future clinical practice models as well as to inspire further necessary research on integrating simulation training as part of clinical practice placements.

Abbreviations

NCSBN: The National Council of State Board Nursing; INACSL: International Nursing Association for Clinical Simulation and Learning; GSE: The General Self-Efficacy Scale; CLECS: The Clinical Learning Environment Comparison Survey; PEARLS: Promoting Excellence and Reflective Learning in Simulation.

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Authors' contributions

CO was responsible for the conception and design of the study and the analysis and interpretation of the data. CO also worked on the draughts of the manuscript and completed the submitted version of the manuscript. SAS, LPJJ, IA, HVS and CRT contributed comments and ideas during the process, helping to analyse and interpret the data, as well as to revise the manuscript. SAS, LPJJ, IA, HVS and CRT provided their final approval of the submitted version of the manuscript. All the authors read and approved the final manuscript.

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Availability of data and materials

The datasets analysed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the Norwegian Social Science Data Services (ref. 875320) and is exempted from ethical approval from the Norwegian Regional Committees for Medical and Health Research Ethics since no health information or patient data is registered. Participation was based on written informed consent.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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References

1. Report No.47 to the Storting. The coordination reform: proper treatment - at the right place at the right time. Report No 47 to the Storting. Norwegian Ministry of Health and Care Services. Available from: https://www.regjeringen.no/contentassets/d4f0e16ad32e4bbd8d8ab5c21445a5dc/en-gb/pdfs/stm200820090047000en_pdfs.pdf. 2008-2009.
2. Ringard Å, Sagan A, Saunes IS, Lindahl AK. Norway: health system review. Health System Transit. 2013;15(8):1–162 World health organization. Regional Office for Europe Available from: https://apps.who.int/iris/bitstream/handle/10665/331786/HiT-22-1-2020-eng.pdf?sequence=1&isAllowed=y.
3. Etherton-Beer C, Venturato L, Horner B. Organisational culture in residential aged care facilities: a cross-sectional observational study. PLoS One. 2013;8(3):e58002. https://doi.org/10.1371/journal.pone.0058002.
4. Killett A, Hyde P, Burns D, Gray R, Poland F. How organizational factors interact to influence the quality of care of older people in the care home sector. J Health Serv Res Policy. 2013;18(1 Suppl):14–22. https://doi.org/10.1177/1355819613476016.
5. World Health Organization. Education and training: Technical Series on Safer Primary Care. Geneva: Licence: CC BY-NC-SA 3.0 IGO; 2016. Available from: http://apps.who.int/iris/bitstream/handle/10665/252271/9789241511605-eng.pdf;jsessionid=FD0CFCA93653C2B89C551E5A4E68E8BA?sequence=1
6. Ministry of Education. National regulations relating to a common curriculum for health and social care education. 2020. Available from: https://www.regjeringen.no/contentassets/389bf8229a3244f0bc1c7835f842ab60/national-regulations-relating-to-a-common-curriculum-for-health-and-social-care-education.pdf.
7. Ministry of Education and Research. Regulation on national guidelines for nursing education. (National curriculum regulations for Norwegian nursing education). Available from: https://lovdata.no/dokument/LTI/forskrift/2019-03-15-4122019.
8. Richardson H, Goldsamt LA, Simmons J, Jeffries PR. Increasing faculty capacity: findings from an evaluation of simulation clinical teaching. Nurs Educ Perspect. 2014;35(6):308–14. https://doi.org/10.5480/14-1384.
9. Gibbons C. Stress, coping and burn-out in nursing students. Int J Nurs Stud. 2010;47(10):1299–309. https://doi.org/10.1016/j.ijnurstu.2010.02.015.
10. Ironside PM, McNelis AM, Ebright P. Clinical education in nursing: rethinking learning in practice settings. Nurs Outlook. 2014;62:185–91. https://doi.org/10.1016/j.outlook.2013.12.004.
11. Sulivan N, Swoboda SM, Bremeyer T, Lucas L, Sarasnick J, Rutherford-Hemming T, et al. Emerging evidence toward a 2:1 clinical to simulation ratio: a study comparing the traditional clinical and simulation settings. Clin Simul Nurs. 2019;30:34–41. https://doi.org/10.1016/j.ecns.2019.03.003.
12. Arkan B, Ordin Y, Yllmaz D. Undergraduate nursing student's experience related to their clinical learning environment and factors affecting to their clinical learning process. Nurse Educ Pract. 2018;29:127–32. https://doi.org/10.1016/j.nepr.2017.12.005.
13. McIntosh A, Gidman J, Smith D. Mentors' perceptions and experiences of supporting student nurses in practice. Int J Nurs Pract. 2014;20:360–5. https://doi.org/10.1111/ijn.

14. Vatnøy TK, Skinner SM, Karlsen T-I, Dale B. Nursing competence in municipal inpatient acute care in Norway: a cross-sectional study. BMC Nurs. 2020;19(70). https://doi.org/10.1186/s12912-020-00463-5.
15. Laugaland K, Billett S, Akerjordet K, Frøiland C, Grealish L, Aase I. Enhancing student nurses' clinical education in aged care homes: a qualitative study of challenges perceived by faculty staff. BMC Nurs. 2021;20(1):111. https://doi.org/10.1186/s12912-021-00632-0.
16. Breymier TL, Rutherford-Hemming T, Horsley TL, Atz T, Smith LG, Badowski D, et al. Substitution of clinical experience with simulation in pre-licensure nursing programs: a national survey in the United States. Clin Simul Nurs. 2015;11(11):472–8. https://doi.org/10.1016/j.ecns.2015.09.004.
17. Zapko KA, Ferranto ML, Blasiman R, Shelestak D. Evaluating best educational practices, student satisfaction, and self-confidence in simulation: a descriptive study. Nurse Educ Today. 2018;60:28–34. https://doi.org/10.1016/j.nedt.2017.09.006.
18. D' Souza MS, Arjunan P, Venkatesaperumal R. High fidelity simulation in nursing education. Int J Health Sci Res. 2017;7(7):340–53.
19. Cant RP, Cooper SJ. Use of simulation-based learning in undergraduate nurse education: an umbrella systematic review. Nurse Educ Today. 2017;49:63–71. https://doi.org/10.1016/j.nedt.2016.11.015.
20. Haddeland K, Slettebø Å, Carstens P, Fossum M. Nursing students managing deteriorating patients: a systematic review and meta-analysis. Clin Simul Nurs. 2018;21:1–15. https://doi.org/10.1016/j.ecns.2018.05.001.
21. La Cerra C, Dante A, Caponnetto V, Franconi I, Gaxhja E, Petrucci C, et al. Effects of high-fidelity simulation based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students: a systematic review and meta-analysis. BMJ Open. 2019;9(2):e025306. https://doi.org/10.1136/bmjopen-2018-025306.
22. Hayden J, Smiley R, Alexander M, Kardong-Edgren S, Jeffries P. The NCSBN national simulation study: a longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. J Nurs Regul. 2014;5(2):S3–S40. https://doi.org/10.1016/S2155-8256(15)30062-4.
23. Larue C, Peptin J, Allard E. Simulation in preparation or substitution for clinical placement: a systematic review of the literature. J Nurs Educ Pract. 2015;5(9). https://doi.org/10.5430/jnep.v5n9p132.
24. Curl ED, Smith S, Chrisholm LA, McGee LA, Das K. Effectiveness of integrated simulation and clinical experiences compared to traditional clinical experiences for nursing students. Nurs Educ Perspect. 2016;37(2):72–7. https://doi.org/10.5480/15-1647.
25. Roberts E, Kaak V, Rolley J. Simulation to replace clinical hours in nursing: a meta-narrative review. Clin Simul Nurs. 2019;37:5–13. https://doi.org/10.1016/j.ecns.2019.07.003.
26. Davis AH, Kimble LP, Gunby SS. Nursing faculty use of high-fidelity human patient simulation in undergraduate nursing education: a mixed-methods study. J Nurs Educ. 2014;53(3):142–50. https://doi.org/10.3928/01484834-20140219-02.
27. Jeffries PR, The NLN. Jeffries simulation theory. US: National League for Nursing, Wolters Kluwer; 2015.
28. INACSL. INACSL standards of best practice: simulation SM simulation design. Clin Simul Nurs. 2016;12:5–12. https://doi.org/10.1016/j.ecns.2016.09.005.
29. Hamstra SJ, Brygdes R, Hatala R, Zendejas B, Cook DA. Reconsidering fidelity in simulation-based training. Acad Med. 2014;89(3):387–92. https://doi.org/10.1097/ACM.0000000000000130.
30. Huston CL, Phillips B, Jeffries PR, Todeo C, Rich J, Knecht P, et al. The academic-practice gap: strategies for an enduring problem. Nurs Forum. 2018;53(1):27–34. https://doi.org/10.1111/nuf.12216.
31. Jeffries PR, Rogers KJ. Theoretical framework for simulation design. In: Jeffries P, editor. Simulation in nursing education. From conceptualization to evaluation. New York: The National League of Nursing; 2012.
32. Eppich W, Cheng A. Promoting excellence and reflective learning in simulation (PEARLS). Simul Healthc. 2015;10:106–15. https://doi.org/10.1097/SIH.0000000000000072.
33. Polit DE, Beck CT. Nursing research: generating and assessing evidence for nursing practice. 10th ed. Philadelphia: Wolters Kluwer Health; 2017. p. 784.
34. Willis GB. Cognitive interviewing: a tool for improving questionnaire design. Thousand Oaks: Sage Publications; 2005.
35. Røysamb E, Schwarzer R, Jerusalem M. Norwegian version of the general perceived self-efficacy scale Available from: https://userpage.fu-berlin.de/~health/norway.htm.
36. Olaussen C, Jelsness-Jørgensen LP, Tvedt CR, Hofoss D, Aase I, Steindal S. Psychometric properties of the Norwegian version of the clinical learning environment comparison survey. Nursing Open. 2021;8(3):1254–61. https://doi.org/10.1002/nop2.742.
37. Leighton K. Development of the clinical learning environment comparison survey. Clin Simul Nurs. 2015;11(1):44–51. https://doi.org/10.1016/j.ecns.2014.11.002.
38. Cohen J. Statistical power analysis for the behavioural sciences. 2nd ed. New York: Routledge; 1988. p. 400.
39. Morgan R. Using clinical skills laboratories to promote theory–practice integration during first practice placement: an Irish perspective. J Clin Nurs. 2006;15(22):155–61. https://doi.org/10.1111/j.1365-2702.2006.01237.x.
40. Norman L, Buerhaus PI, Donelan K, McCloskey B, Dittus R. Nursing students assess nursing education. J Prof Nurs. 2005;21(3):150–8. https://doi.org/10.1016/j.profnurs.2005.04.003.
41. Olaussen C, Aase I, Jelsness-Jørgensen LP, Tvedt CR, Steindal S. Supplementing clinical practice in nursing homes with simulation training: a qualitative study of nursing students' experiences. SAGE Open Nurs. 2020;6:1–11. https://doi.org/10.1177/2377960820981786.
42. Pront L, McNeill L. Nursing students' perceptions of a clinical learning assessment activity: 'linking the puzzle pieces of theory to practice'. Nurse Educ Pract. 2019;36:85–90. https://doi.org/10.1016/j.nepr.2019.03.008.
43. Papathanasiou IV, Tsaras K, Sarafis P. Views and perceptions of nursing students on their clinical learning environment: teaching and learning. Nurse Educ Today. 2014;34(1):57–60. https://doi.org/10.1016/j.nedt.2013.02.007.
44. Schaumberg A. The matter of 'fidelity': keep it simple or complex? Best Pract Res Clin Anaesthesiol. 2015;29(1):21–5. https://doi.org/10.1016/j.bpa.2015.01.005.
45. Gates MG, Parr MB, Hughen JE. Enhancing nursing knowledge using high-fidelity simulation. J Nurs Educ. 2012;51(1). https://doi.org/10.3928/01484834-20111116-01.
46. Shinnick MA, Evangelista LS. Predictors of knowledge gains using simulation in the education of prelicensure nursing students. J Prof Nurs. 2012;28(1):41–7. https://doi.org/10.1016/j.profnurs.2011.06.006.
47. Shinnick MA, Woo MA. Does nursing student self-efficacy correlate with knowledge when using human patient simulation? Clin Simul Nurs. 2014;10:71–9. https://doi.org/10.1016/j.ecns.2013.07.006.
48. Bandura A. Self-efficacy: the exercise of control. Worth: W.H. Freeman & Co Ltd; 1997.
49. Kameg K, Howard VM, Clochesy J, Mitchell AM, Suresky JM. The impact of high -fidelity human simulation on self-efficacy of communication skills. Issues Ment Health Nurs. 2010;31(5):315–23. https://doi.org/10.3109/01612840903420331.
50. Li J, Li X, Gu L, Zhang R, Zhao R, Cai Q, et al. Effects of simulation-based deliberate practice on nursing students' communication, empathy, and self-efficacy. J Nurs Educ. 2019;58(12):681–9. https://doi.org/10.3928/01484834-20191120-02.
51. Saied H. The impact of simulation on pediatric nursing students' knowledge, self-efficacy, satisfaction, and confidence. J Educ Pract. 2017;8:95–102.
52. Zabalegui A, Macia L, Márquez J, Ricomá R, Nuin C, Mariscal I, et al. Changes in nursing education in the European Union. J Nurs Scholarsh. 2006;38(2):114–8. https://doi.org/10.1111/j.1547-5069.2006.00087.x.
53. Al-Ghareeb AZ, Cooper SJ. Barriers and enablers to the use of high-fidelity patient simulation manikins in nurse education: an integrative review. Nurse Educ Today. 2016;36:281–6. https://doi.org/10.1016/j.nedt.2015.08.005.
54. Levett-Jones T, Lapkin S, Hoffman K, Arthur C, Roche J. Examining the impact of high and medium fidelity simulation experiences on nursing students' knowledge acquisition. Nurse Educ Pract. 2011;11(6):380–3. https://doi.org/10.1016/j.nepr.

Publisher's Note

Appendices

Appendix 1 – Learning outcomes in nursing homes

Expected learning outcomes in nursing homes (selected):

- Practice nursing in an evidence-based and appropriate manner for patients who cannot take care of any or some of their basic needs
- Identify ethically problematic situations in the clinical field
- Apply principles of hygiene and handle medical devices appropriately
- Master fundamental communication skills adapted to different patient situations
- Handle medications in accordance with regulations and guidelines under the supervision of a nurse
- Reflect on their own and others' nursing practices from a professional perspective
- Reflect on their own ability to practice appropriate nursing

Learning situations in nursing homes (selected):

Personal hygiene/personal body care:	Actively use care of the body to observe signs of disease and failure in terms of basic needs and consider measures in this context.
The need for elimination of urine and faeces:	Observe, record, and assess the odour, colour, amount, appearance, and frequency of urine Observe, record, and assess signs of urinary incontinence and urinary tract infections and provide nursing to patients who have these conditions If necessary, perform insertion of a urinary catheter under the guidance of a nurse
Respiratory and circulatory needs:	Observe, assess, and document the patient's circulation Observe, assess, and document signs of disease in the respiratory and circulatory organ systems Count, assess, and document pulse rate Measure, assess, and document blood pressure Count, assess, and document respiratory rate Observe skin, recognise oedemas, and document them Know the department's procedures in emergency situations and be able to call for help
Communication:	Train in communicating with different patients

	Train in communicating with patients in different contexts and situations Adapt communication to the individual and to the context in which the communication takes place Reflect on the effects of one's own communication on patients and their families as well as on colleagues
Proper management of medications:	Become familiar with the preparation of medications, for example, by filling pill organisers (dosette boxes) Become familiar with documentation procedures in connection with management of medications Transfer medications to pill organisers and administer them to patients under the supervision of a nurse Become familiar with documentation procedures in connection with management of medications Transfer medications to pill organisers and administer them to patients under the supervision of a nurse Manage subcutaneous and intramuscular injections, inhalations, and eye drops

Appendix 2 –The NLN questionnaire –Paper I

Spørreskjema om studenttilfredshet og selvtillit i læring (Student Satisfaction and Self-Confidence in Learning)

Instruks: Denne spørreundersøkelsen inneholder en rekke utsagn om dine personlige holdninger til veiledningen du fikk mens simuleringen pågikk. Hvert punkt representerer et utsagn om din holdning i forhold til læring og visshet om at du ville få den veiledningen du trengte. Det finnes ingen riktige eller feil svar. Du vil sannsynligvis være enig i noen av utsagnene og uenige i andre. Vis dine egne personlige tanker om hvert utsagn ved å markere de tallene som best beskriver dine holdninger eller det du mener. Vær ærlig og beskriv holdningene dine som de er, ikke hvordan du gjerne vil at de skal være. Undersøkelsen er anonym. Resultatene blir fremstilt som gruppe, ikke individuelt.
Bruk følgende skala når du besvarer:
1 – Svært uenig i utsagnet
2 – Uenig i utsagnet
3 – Usikker – er verken enig eller uenig i utsagnet
4 – Enig i utsagnet
5 – Svært enig i utsagnet

Tilfredshet med denne læringssituasjonen	SU	U	US	E	SE
1. Undervisningsmetodene brukt i denne simuleringen var nyttige og effektive.	O 1	O 2	O 3	O 4	O 5
2. Simuleringen ga meg varierte aktiviteter og lærestoff for å fremme min læring i forhold til pensumet i sykepleie og sykdomslære.	O 1	O 2	O 3	O 4	O 5
3. Jeg likte måten læreren min gjennomførte simuleringen på.	O 1	O 2	O 3	O 4	O 5
4. Undervisningsmaterialet som ble brukt i denne simuleringen var motiverende og hjalp meg til å lære.	O 1	O 2	O 3	O 4	O 5
5. Læreren (e) min(e) gjennomførte simuleringen på en måte som passer min måte å lære på.	O 1	O 2	O 3	O 4	O 5
Selvtillit og læring	**SU**	**U**	**US**	**E**	**SE**
6. Jeg er sikker på at jeg mestrer innholdet i simuleringen som mine lærere presenterte for meg.	O 1	O 2	O 3	O 4	O 5
7. Jeg er sikker på at denne simuleringen dekket viktig innhold i forhold til det å mestre pensumet i sykepleie og sykdomslære.	O 1	O 2	O 3	O 4	O 5
8. Jeg er sikker på at denne simuleringen gjør at jeg utvikler de ferdighetene og tilegner meg den kunnskapen som trengs for å utføre nødvendige oppgaver i en klinisk praksis	O 1	O 2	O 3	O 4	O 5
9. Lærerne brukte nyttige hjelpemidler i simuleringen.	O 1	O 2	O 3	O 4	O 5
10. Det er mitt ansvar som student å lære det jeg trenger fra denne simuleringsaktiviteten.	O 1	O 2	O 3	O 4	O 5

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11. Jeg vet hvordan jeg kan få hjelp hvis jeg ikke forstår prinsippene som denne simuleringen omhandlet.	O 1	O 2	O 3	O 4	O 5
12. Jeg vet hvordan jeg kan benytte simuleringen for å lære meg de aktuelle ferdighetene.	O 1	O 2	O 3	O 4	O 5
13. Det er lærerens ansvar å fortelle meg hva jeg trenger å lære av simuleringen.	O 1	O 2	O 3	O 4	O 5

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Spørreskjema om undervisningspraksis (Educational Practices Questionnaire)

For å måle om den beste praksisen ble brukt i simuleringen, bes du fylle ut undersøkelsen under. Det finnes ingen riktige eller feil svar, bare din egen oppfatning av om du er enig eller ikke.

Bruk følgende skala når du evaluerer undervisningspraksis:	**Vurder hvert utsagn ut fra hvor viktig det er for deg.**
1 – Svært uenig i utsagnet 2 – Uenig i utsagnet 3 – Usikker – er verken enig eller uenig i utsagnet 4 – Enig i utsagnet 5 – Svært enig i utsagnet IR – ikke relevant; utsagnet gjelder ikke for den utførte aktiviteten	1 – Uviktig 2 – Litt viktig 3 – Verken viktig eller uviktig 4 – Viktig 5 – Svært viktig

Utsagn	1	2	3	4	5	IR	1	2	3	4	5
Aktiv læring											
1. Under simuleringen hadde jeg mulighet til å diskutere med læreren og medstudenter ideer og prinsipper fra undervisning i emnet.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
2. Jeg deltok aktivt i debrifingen etter simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
3. Jeg hadde mulighet til å utdype kommentarene mine under debrifingen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
4. Det var nok muligheter i løpet av simuleringen til å finne ut om jeg forstod lærestoffet godt.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
5. Jeg lærte av lærerens kommentarer før, under eller etter simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
6. Jeg fikk passende stikkord/vink i løpet av simuleringen	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
7. Jeg hadde mulighet til å diskutere målene for simuleringen med læreren min	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
8. Jeg hadde mulighet til å diskutere ideer og prinsipper som vi lærte i simuleringen med læreren.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
9. Læreren var i stand til å imøtekomme studentenes individuelle behov under simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
10. Bruk av simulering gjorde at læringen min ble mer effektiv.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5

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Spørreskjema for undervisningspraksis (studentversjon)

Bruk følgende skala når du evaluerer utdanningspraksisen: 1 – Svært uenig i utsagnet 2 – Uenig i utsagnet 3 – Usikker – er verken enig eller uenig i utsagnet 4 – Enig i utsagnet 5 – Svært enig i utsagnet IR – ikke relevant; utsagnet gjelder ikke for den utførte aktiviteten	**Vurder hvert utsagn ut fra hvor viktig det er for deg.** 1 – Uviktig 2 – Litt viktig 3 – Verken viktig eller uviktig 4 – Viktig 5 – Svært viktig

Utsagn	1	2	3	4	5	IR	1	2	3	4	5
Samarbeid:											
11. Jeg hadde mulighet til å jobbe sammen med medstudentene mine under simuleringen	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
12. I løpet av simuleringen måtte medstudentene mine og jeg jobbe sammen om den kliniske situasjonen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
Forskjellige måter å lære på:											
13. Simuleringen ga mulighet til å lære stoffet på forskjellige måter	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
14. Simuleringen ga meg mulighet til å vurdere min egen læring på forskjellige måter.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
Forventninger:											
15. Målene for simuleringen var klare og lette å forstå.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
16. Læreren min formidlet mål for og forventninger til simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5

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Simuleringens form (Simulation Design Scale)

For å måle om den beste formen og de mest nyttige elementene ble brukt i din simulering, bes du fylle ut denne undersøkelsen. Det finnes ingen riktige eller feil svar, bare din egen subjektive oppfatning av om du er enig eller ikke.

Bruk følgende skala for å svare på spørsmålene.	Vurdér hvert utsagn ut fra hvor viktig det er for deg.
1 – Svært uenig i utsagnet 2 – Uenig i utsagnet 3 – Usikker – er verken enig eller uenig i utsagnet 4 – Enig i utsagnet 5 – Svært enig i utsagnet IR – ikke relevant; utsagnet gjelder ikke for den utførte aktiviteten	1 – Uviktig 2 – Litt viktig 3 – Verken viktig eller uviktig 4 – Viktig 5 – Svært viktig

Utsagn	1	2	3	4	5	IR	1	2	3	4	5
Mål og informasjon											
1. Det ble gitt nok informasjon i forkant av simuleringen for å vite hva som skulle skje og vekke interesse.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
2. Jeg forstod hensikten og målene ved simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
3. Under simuleringen fikk jeg klar nok informasjon til at jeg kunne løse problemene i den aktuelle sitasjonen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
4. Under simuleringen fikk jeg den informasjonen jeg trengte.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
5. Stikkordene/vinkene var passende og laget for å hjelpe meg til å forstå.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
Støtte											
6. Jeg fikk støtte på riktig tidspunkt.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
7. Mitt behov for hjelp ble sett og ivaretatt.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
8. Jeg følte at jeg hadde lærerens støtte mens simuleringen pågikk.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
9. Jeg fikk støtte i læringsprosessen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
Problemløsning											
10. Det ble tilrettelagt for selvstendig problemløsing.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
11. Jeg ble oppmuntret til å utforske alle alternativene under simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
12. Simuleringen var tilpasset mitt ferdighets- og kunnskapsnivå.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
13. Simuleringen ga meg mulighet til å prioritere det jeg skal gjøre som sykepleier med hensyn til vurdering og tiltak.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
14. Simuleringen ga meg mulighet til å sette mål for pasienten min.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5

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Tilbakemelding/Veiledet refleksjon										
15. Tilbakemeldingene var konstruktive.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
16. Tilbakemelding ble gitt på egnet tidspunkt.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
17. Simuleringen ga meg mulighet til å analysere min egen opptreden og handlingsmåter.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
18. Etter simuleringen hadde jeg mulighet til å få veiledning/tilbakemelding fra læreren slik at jeg kunne høyne kunnskapsnivået mitt.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
Troverdighet											
19. Situasjonen kunne ha oppstått i virkeligheten.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5
20. Virkelighetsnære faktorer, situasjoner og spørsmålsstillinger var lagt inn i simuleringen.	O 1	O 2	O 3	O 4	O 5	O IR	O 1	O 2	O 3	O 4	O 5

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Appendix 3 – Interview guide – Paper II

Semi-structured interview guide: Experiences of simulation as a supplement to support learning during clinical practice in nursing homes	
Hovedspørsmål for fokus: Fortell om tanker og erfaringer dere har gjort dere gjennom det å kombinere simulering med praksis i sykehjem. Er det andre ting dere tenker er viktig som ikke har blitt sagt? Tilleggsspørsmål: Kan dere beskrive hva dere erfarer som fremmende eller hemmende for læring i simulering? Gjerne med eksempler. Kan dere beskrive hva dere erfarer som fremmende eller hemmende for læring i klinisk praksis? Gjerne med eksempler. Har simuleringssupplementet bidratt med noe dere ikke har fått gjennom praksis? I tilfelle hva? Har praksis bidratt med som ikke simulering kan erstatte? I tilfelle hva? Fortell om deres tanker rundt hvordan dere har reagert eller kan komme til å reagere i liknende pasientsituasjoner som de vi har simulert?	Kommentarer/oppfølgingsspørsmål: Dette var interessant, kan du utdype litt mer, fortelle mer? Hva mener du når du sier…? Har jeg forstått deg rett....? Andre ting som kan virke fremmende eller hemmende? Kan du utdype? Kan du gi et eksempel? Andre ting som kan virke fremmende eller hemmende? Kan du utdype? Kan du gi eksempel? Andre ting dere har lyst til å tillegge?

Appendix 4 – CLECS – Papers III and IV

Clinical Learning Environment Comparison Survey – Norwegian Version

I skjemaet nedenfor er det listet opp en rekke læringsbehov. I de to kolonnene til høyre, ber vi deg om å krysse av for hvor godt disse læringsbehovene blir ivaretatt i klinisk praksis (Ramme 1), og for hvor godt disse læringsbehovene blir ivaretatt i klinisk simulering (Ramme 2).

Valgene rangerer fra Godt ivaretatt (4) til Ikke ivaretatt (1). Hvis utsagnet ikke gjelder for dine personlige opplevelser, krysser du av for IR (Ikke relevant).

Hvor godt blir følgende læringsbehov ivaretatt:	Ramme 1: I klinisk praksis					Ramme 2: I klinisk simulering				
	Godt ivaretatt	Ivaretatt	delvis ivaretatt	ikke ivaretatt	Ikke relevant	Godt ivaretatt	Ivaretatt	Delvis ivaretatt	Ikke ivaretatt	Ikke relevant
Kommunikasjon	4	3	2	1	IR	4	3	2	1	IR
1.Forberede meg på å ivareta pasientens behov										
2.Kommunisere med tverrfaglig team										
3.Samhandle med pasienten										
4.Gi pasientens pårørende informasjon og støtte										
Sykepleieprosessen	4	3	2	1	IR	4	3	2	1	IR
5.Forstå begrunnelsene for pasientens behandlingsplan										
6.Forstå betydningen av pasientens patofysiologi										
7.Identifisere pasientens problemer										
8.Iverksette en sykepleieplan										
9.Prioritere tiltak										
10.Foreta hensiktsmessige vurderinger										
Helhetlig omsorg	4	3	2	1	IR	4	3	2	1	IR
11.Vurdere virkningen av utført sykepleie										
12.Identifisere kortsiktige og langsiktige mål for sykepleien										
13.Diskutere pasientens psykososiale behov										
14.Diskutere pasientens behov ut fra alder, utviklingsstadium og situasjon										
15.Diskutere pasientens åndelige behov										
16.Diskutere pasientens kulturelle behov										

Hvor godt blir følgende læringsbehov ivaretatt:	Ramme 1: I klinisk praksis					Ramme 2: I klinisk simulering				
	Godt ivaretatt	Ivaretatt	Delvis ivaretatt	ikke ivaretatt	Ikke relevant	Godt ivaretatt	Ivaretatt	Delvis ivaretatt	Ikke ivaretatt	Ikke relevant
Kritisk tenkning	4	3	2	1	IR	4	3	2	1	IR
17.Forutse og oppdage endringer i pasientens tilstand										
18.Iverksette hensiktsmessige tiltak ved endringer i pasientens tilstand										
Egen mestringsevne	4	3	2	1	IR	4	3	2	1	IR
19.Reagere rolig og behersket ved endringer i pasientens tilstand										
20.Vite hva jeg skal gjøre om jeg begår en feil										
21.Være trygg på egne avgjørelser										
22.Føle meg trygg på mine ferdigheter										
Veileder-student forholdet	4	3	2	1	IR	4	3	2	1	IR
23.Ha veileder tilgjengelig for meg										
24.Føle meg utfordret og stimulert										
25.Få tilbakemelding på det jeg gjør umiddelbart										
26.Føle at jeg får støtte av veileder og medstudenter når jeg tar pleierelaterte beslutninger										
27.Utvikle min evne til kritisk refleksjon gjennom erfaring										

TUSEN TAKK for at du tok deg tid til å gjennomføre spørreundersøkelsen.

Appendix 5 – Knowledge test – Paper IV

Alle testene er anonyme, og vil ikke bli brukt til vurdering av deg som student. Hensikten med studien er å skape grunnlag for forbedring av praksisundervisning.

Demografiske opplysninger:

Intervensjonsgruppe____________Kontrollgruppe__________

1. Hvor gammel er du? ______år

2. Kjønn: _____Kvinne ______Mann

3. Hvilket utdanningsnivå har du fullført etter videregående skole?
______Ingen____Bachelorgrad_____Mastergrad

4. Hvor mange år med tidligere erfaring fra jobb i helsetjenesten har du? (f.eks pleieassistent, hjelpepleier, helsefagarbeider, ambulansearbeider etc.) _______år

1. Kunnskapstest.

I denne kunnskapstesten får du spørsmål knyttet til teoretisk og praktisk kunnskap innen emner, fag og pensum hentet fra første studieår.

Velg <u>ett</u> svaralternativ ved å sette en ring rundt a, b, c, d eller vet ikke

1. Din pasient på sykehjemmet har respirasjonssvikt type 2. Respirasjonssvikt type 2 innebærer:
   a) Normalt innhold av O2 og forhøyet innhold av CO2 i blodet
   b) Lavt innhold av O2 og forhøyet innhold av CO2 i blodet
   c) Lavt innhold av O2 og lavt innhold av CO2 i blodet
   d) Høyt innhold av O2 og lavt innhold av CO2 i blodet
   e) Vet ikke

2. Du anbefaler dine pasienter med hjertesvikt på sykehjemmet å:
   a) Drikke mindre for å kompensere for økt saltinntak
   b) Drikke mer for å øke blodtrykk og hjertefrekvens
   c) Drikke mer for å kompensere for økt urinproduksjon
   d) Drikke mindre for å redusere arbeidsbelastning for hjertet
   e) Vet ikke

3. Hos en pasient med langtkommen KOLS trigges respirasjonen i hovedsak av:
   a) At respirasjonssenteret registrerer forhøyede CO2 nivå og signaler sendes til respirasjonsmuskulaturen
   b) At baro-reseptorer registrerer forhøyede CO2 nivå og signaler sendes til respirasjonsmuskulaturen

c) At kjemoreseptorer registrerer forhøyede CO2 nivå og signaler sendes til respirasjonsmuskulaturen
d) At kjemoreseptorer registrerer lave O2 nivå og nødsignaler sendes til respirasjonsmuskulaturen
e) Vet ikke

4. En indikasjon på forverring av hjertesvikt hos din pasient på sykehjemmet kan være:
a) *Økt mageomfang*
b) Temperaturstigning
c) Hurtig vekttap
d) Oliguri
e) Vet ikke

5. Du har en pasient med demenssykdom på sykehjemmet som plutselig nekter å ta livsnødvendige medisiner. Du er alene som sykepleier på vakt og løser situasjonen ved å:
a) Bruke nødrett fordi du i den gjeldende situasjonen vurderer det slik at skaden ved ikke å ta medisinene er større enn tvangen som utøves
b) Benytte tvangsmedisinering for å få gitt medisinene da pasienten din ikke er samtykkekompetent
c) Informere behandlende lege at pasienten ikke vil ta sine medisiner
d) Knuse tablettene og ha de i pasientens mat eller drikke for å unngå tvangsmedisinering
e) Vet ikke

6. En av pasientene dine har utviklet akutt høyresidig hjertesvikt. Du vet at akutt høyresidig hjertesvikt:
a) Er den dominerende årsaken til hjertesvikt med senere ledsagende venstre ventrikkelsvikt
b) *Kommer som regel på toppen av en tilgrunnliggende lungesykdom*
c) Er som regel forbundet med kliniske tegn som lungestuvning
d) Kan føre til akutt lungeødem
e) Vet ikke

7. Respirasjonssenteret hos din pasient med langtkommen kronisk obstruktiv lungesykdom har:
a) Blitt vant til et høyere PH nivå
b) Blitt vant til et lavere C02 nivå
c) Blitt vant til et lavere 02 nivå
d) Blitt vant til et høyere C02 nivå
e) Vet ikke

8. Dine pasienter på sykehjemmet med hjertesvikt:
a) Bør redusere de fleste formene for aktivitet for å hindre overbelastning av hjertemuskulaturen
b) Kan oppleve å ha tørrhoste på grunn av hjertesvikten
c) Kan oppleve å ha slimete bronkier på grunn av hjertesvikten

d) Bør ikke sitte oppreist når de skal sove på grunn av hjertesvikten
e) Vet ikke

9. Du skal administrere O2 behandling til din pasient med KOLS på sykehjemmet. Du vet at pasienter med KOLS som behandles med O2:
   a) Vil trenge tilførsel av store doser O2 for å kompensere for det lave O2 nivået i blodet
   b) Kan risikere å få økt respirasjonsfrekvens og redusert CO2 opphopning i blodet som følge av behandlingen.
   c) Vil få mindre obstruktiv respirasjon når respirasjonssenteret registrerer at O2 nivået stiger til normale nivåer som følge av behandlingen
   d) Kan risikere å få redusert respirasjonsfrekvens og større CO2 opphopning som følge av behandlingen
   e) Vet ikke

10. Medikamenter til hjertesviktpasientene dine på sykehjemmet rettes mot å:
    a) Styrke hjertets pumpekraft og øke blodtrykk og hjertefrekvens
    b) Hemme kroppens fysiologiske kompensasjonsmekanismer
    c) Gi økt væskevolum og sirkulasjon i kroppen
    d) Styrke kroppens fysiologiske kompensasjonsmekanismer
    e) Vet ikke

11. Du får beskjed om å sette et Pulsoksimeter-apparat på pasienten din på sykehjemmet. Pulsoksimetri er en undersøkelse som gir informasjon om:
    a) PaO2
    b) Utluftning av CO2
    c) SpO2
    d) PaCO2
    e) Vet ikke

12. En av pasientene dine på sykehjemmet har utviklet delir med utagerende og aggressiv adferd. Du vet at:
    a) Du må sørge for rask tilførsel av beroligende medikamenter for at pasienten skal kunne gjenvinne kontroll
    b) Delir er en akutt forvirringstilstand som aldri er livstruende og vil gå over av seg selv etter en viss tid
    c) Identifisering og behandling av utløsende årsak er en akuttoppgave ved delir
    d) Det må iverksettes avledende sansestimuli fra trygghetspersoner for å dempe pasientens forvirring
    e) Vet ikke

13. Et vanlig symptom du kan finne hos dine pasienter med hjertesvikt er:
    a) Nokturi
    b) Oliguri
    c) Anuri
    d) Polyuri
    e) Vet ikke

14. Du har ansvar for en pasient på sykehjemmet med sterk grad av KOLS som har hatt svært tung pust og truende utmattelse. Du observerer at pasienten nå hypoventilerer, er rødmusset i ansiktet, svett, klam og urolig. Pasienten slutter etterhvert å klage og blir roligere. Du vurderer dette som:
a) At pasientens farge i ansiktet skyldes at pasienten nå klarer å lufte ut mer CO2
b) At pasientens farge i ansiktet skyldes alt for høyt CO2 innhold i blodet og pasienten er i ferd med å gå inn i en CO2 narkose
c) At pasientens farge i ansiktet skyldes at pasientens O2 innhold i blodet har blitt betydelig bedret, pasientens akuttfase er over.
d) At pasienten synes å ha funnet roen og trenger å sove
e) Vet ikke

15. Din pasient med hjertesvikt kan oppleve å måtte tisse ofte på natten fordi:
a) Pasienter med hjertesvikt sover dårligere
b) Pasienter med hjertesvikt står på vanndrivende medikamenter
c) Pasienter med hjertesvikt blir oppfordret til å drikke for å øke blodtrykket
d) Pasienter med hjertesvikt har økt blodgjennomstrømning til nyrene om natten
e) Vet ikke

16. Du får beskjed om å gi en pasient Glukokortikoider til inhalasjon. Du vet at Glukokortikoider til inhalasjon:
a) brukes for å relaksere bronkialmuskulaturen
b) brukes for å motvirke inflammasjon og ødem
c) ikke brukes ved KOLS, men til pasienter med astma
d) brukes ved revmatiske lidelser og osteoporose
e) Vet ikke

17. Et tegn på at din pasient med en venstresidig hjertesvikt også har utviklet en høyresidig hjertesvikt er:
a) Halsvenestuvning
b) Lungestuvning
c) Tørrhoste
d) Tung pust i liggende stilling
e) Vet ikke

18. Din pasient på sykehjemmet bruker en rekke legemidler i tablettform men har problemer med å svelge tablettene. Du vet at:
a) Sublinguale tabletter alltid skal svelges hele
b) Tabletter alltid bør knuses hvis pasienten har svelgeproblemer
c) Bukkale tabletter alltid skal svelges hele
d) Depottabletter ikke skal knuses
e) Vet ikke

19. Eventuelle endringer i ødemer hos din pasient med hjertesvikt bør helst observeres
a) Med pasienten liggende på ryggen i seng
b) Med pasienten liggende på høyre side

c) *Med pasienten sittende eller stående*
d) Med pasienten liggende på venstre side
e) Vet ikke

20. Pasienten din med KOLS har en rødlig ansiktsfarge. Assistenten du har i opplæring lurer på hvorfor og du forklarer at:
    a) Kroppen kompenserer for kronisk høyt CO2 nivå med å øke sirkulasjonen og pasienten får en rødlig ansiktsfarge
    b) *Kroppen kompenserer for kronisk lavt 02 nivå ved en overproduksjon av erytrocytter og pasienten får en rødlig ansiktsfarge*
    c) Respirasjonsarbeidet er såpass anstrengende at det for kolspasienten blir som en treningsøkt og pasienten får en rødlig ansiktsfarge
    d) Den rødlige fargen i ansiktet ikke har noe med kolssykdommen å gjøre, men at assistenten bør observere om øreflipper, fingre og lepper er blå
    e) Vet ikke

21. En av pasientene på sykehjemmet er 87 år og har et blodtrykk på 145/90. Du vurderer dette som et:
    a) Patologisk blodtrykk i forhold til alder
    b) Ortostatisk blodtrykk i forhold til alder
    c) *Normalt blodtrykk i forhold til alder*
    d) Hydrostatisk blodtrykk i forhold til alder
    e) Vet ikke

22. Din pasient med kronisk venstresidig hjertesvikt kan ha:
    a) Halsvenestuvning, forstørret lever og milt med økt mageomfang
    b) Høyt minuttvolum, tretthet, stuvningssymptomer med anstrengelsesdyspne, dyspne i hvile
    c) *Lavt minuttvolum, anstrengelsesdyspne, tretthet, stuvningssymptomer med dyspne i hvile.*
    d) Høyt minuttvolum, halsvenestuvning og redusert hjertefrekvens
    e) Vet ikke

23. Du skal ta en urinstix av din pasients morgenurin. Du vet at det er stor sannsynlighet for at pasienten har cystitt ved:
    a) *Positivt utslag på nitrit*
    b) Positivt utslag på erytrocytter og proteiner
    c) Positivt utslag på proteiner og glucose
    d) Positivt utslag på glucose og bilirubin
    e) Vet ikke

24. Du har en pasient med KOLS. Du vet at behandlingen som ordineres til pasienten:
    a) Ikke har stor innvirkning på sykdomsutvikling og dødelighet, men kan gi mindre symptomer, færre akutte sykdomsforverringer
    b) Kan reversere obstruksjon og sykdomsutvikling, og gi mindre symptomer for pasienten
    c) Består av store mengder slimløsende midler da disse viser seg å ha stor effekt

d) Kan reversere den restriktive respirasjonssvikten og gi mindre symptomer for pasienten
e) Vet ikke

25. Du administrerer inhalasjon av Beta 2-agonisten Ventoline til din pasient. Du vet at inhalasjon av Ventoline:
a) Virker etter ca 30 minutter og varer i ca 6 timer
b) Har langtidsvirkende effekt med full effekt etter ca 6 timer
c) Virker etter få minutter og varer i ca 4 timer
d) Virker etter ca 15 minutter og varer i ca 5 timer
e) Vet ikke

26. Du mistenker at din pasient kan ha utviklet delir. Dette begrunner du med
a) At pasienten din har blitt gradvis verre i sin kognitive funksjon
b) At pasienten din generelt klager mye på pleien og er lite samarbeidsvillig
c) At pasienten din ikke ønsker å være med på sosiale aktiviteter
d) At pasienten din plutselig har lukket seg inn i en apatisk likegyldighet
e) Vet ikke

27. Du skal gi pasienten din inhalasjon med både Atrovent og Ventoline. Du vet at:
a) Begge virker bronkodilaterende, men at virkningen inntreffer raskere med Atrovent.
b) Begge er beta-2- agonister med bronkodilaterende effekt
c) Begge har både en antiinflammatorisk effekt og en bronkodilaterende effekt
d) Begge virker bronkodilaterende, men virkningen inntreffer raskere med Ventoline
e) Vet ikke

28. Pasienten din med KOLS på sykehjemmet har en tønneformet thorax. Du forklarer for en studentkollega at KOLS pasienter kan få tønneformet thorax fordi:
a) KOLS fører til at ribbensmuskulaturen blir stiv og reduserer lungenes evne til sammentrekning
b) KOLS fører til tap av elastin som igjen fører til et stort lungevolum
c) KOLS fører til en forhøyet kompensatorisk respirasjonsfrekvens og dermed utvides thorax
d) KOLS fører til at pasienten må sitte fremoverlent for kunne utnytte lungekapasiteten maksimalt og dermed utvides thorax
e) Vet ikke

29. Du observerer at pasienten din på sykehjemmet er cyanotisk på øreflipper, nese og negler. Cyanose opptrer når:
a) Blodet har for lavt O2 innhold
b) Blodet har for høy PH
c) Blodet har for høyt trykk gjennom årene
d) Blodet har for lavt CO2 innhold

30. Du skal ta en urin stix prøve av din pasient på sykehjemmet. Du vet at en kjemisk undersøkelse av urinen kan:
   a) Påvise type av eventuelle infeksjonsskapende bakterier
   b) *Påvise Ph, protein, glukose, erytrocytter, leukocytter og nitrit*
   c) Påvise leucocytter, sylindre, urinkrystaller og mikrober
   d) Påvise Ph, nitrit, virus, bakterier og urinkrystaller
   e) Vet ikke

Appendix 6 – General Self-Efficacy Scale – Paper IV

Norwegian Version of the General Perceived Self-Efficacy Scale
Espen Røysamb, Ralf Schwarzer & Matthias Jerusalem (1998)

Velg ett svaralternativ ved å sette en ring **rundt de svarene som passer best for deg (en ring for hvert spørsmål)**

1 = Helt galt 2 = Nokså galt 3 = Nokså riktig 4 = Helt riktig

	Helt galt	Nokså galt	Nokså riktig	Helt riktig
1. Jeg klarer alltid å løse vanskelige problemer hvis jeg prøver hardt nok.	1	2	3	4
2. Hvis noen motarbeider meg, så kan jeg finne måter og veier for å få det som jeg vil.	1	2	3	4
3. Det er lett for meg å holde fast på planenemine og nå målene mine.	1	2	3	4
4. Jeg føler meg trygg på at jeg ville kunne takle uventede hendelser på en effektiv måte.	1	2	3	4
5. Takket være ressursene mine så vet jeg hvordan jeg skal takle uventede situasjoner.	1	2	3	4
6. Jeg kan løse de fleste problemer hvis jeg går tilstrekkelig inn for det.	1	2	3	4
7. Jeg beholder roen når jeg møter vanskeligheter fordi jeg stoler på mestringsevnen min.	1	2	3	4
8. Når jeg møter et problem, så finner jeg vanligvis flere løsninger på det.	1	2	3	4
9. Hvis jeg er i knipe, så finner jeg vanligvis en vei ut.	1	2	3	4
10. Samme hva som hender så er jeg vanligvis i stand til å takle det.	1	2	3	4

Appendix 7 – Approvals from NSD – Paper II

Camilla Olaussen
Avdeling for sykepleieutdanning Lovisenberg diakonale høgskole
Lovisenberg gt 15 b
0456 OSLO

Vår dato: 05.01.2017 Vår ref: 51842 / 3 / ASF Deres dato: Deres ref:

TILBAKEMELDING PÅ MELDING OM BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 02.01.2017. Meldingen gjelder prosjektet:

51842	*Læringseffekt av fullskalasimulering.*
Behandlingsansvarlig	*Lovisenberg diakonale høgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Camilla Olaussen*

Personvernombudet har vurdert prosjektet og finner at behandlingen av personopplysninger er meldepliktig i henhold til personopplysningsloven § 31. Behandlingen tilfredsstiller kravene i personopplysningsloven.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, ombudets kommentarer samt personopplysningsloven og helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/meldeplikt/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://pvo.nsd.no/prosjekt.

Personvernombudet vil ved prosjektets avslutning, 25.04.2016, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Katrine Utaaker Segadal

Amalie Statland Fantoft

Kontaktperson: Amalie Statland Fantoft tlf: 55 58 36 41
Vedlegg: Prosjektvurdering

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

NSD – Norsk senter for forskningsdata AS Harald Hårfagres gate 29 Tel: +47-55 58 21 17 nsd@nsd.no Org.nr. 985 321 884
NSD – Norwegian Centre for Research Data NO-5007 Bergen, NORWAY Faks: +47-55 58 96 50 www.nsd.no

Camilla Olaussen
Lovisenberg gt 15 b
0456 OSLO

Vår dato: 07.12.2017 Vår ref: 57344 / 3 / LAR Deres dato: Deres ref:

Forenklet vurdering fra NSD Personvernombudet for forskning

Vi viser til melding om behandling av personopplysninger, mottatt 22.11.2017.
Meldingen gjelder prosjektet:

57344	*Læringsutbytte ved fullskalasimulering kombinert med klinisk praksis*
Behandlingsansvarlig	*Lovisenberg diakonale høgskole, ved institusjonens øverste leder*
Daglig ansvarlig	*Camilla Olaussen*

Vurdering

Etter gjennomgang av opplysningene i meldeskjemaet med vedlegg, vurderer vi at prosjektet er omfattet av personopplysningsloven § 31. Personopplysningene som blir samlet inn er ikke sensitive, prosjektet er samtykkebasert og har lav personvernulempe. Prosjektet har derfor fått en forenklet vurdering. Du kan gå i gang med prosjektet. Du har selvstendig ansvar for å følge vilkårene under og sette deg inn i veiledningen i dette brevet.

Vilkår for vår vurdering

Vår anbefaling forutsetter at du gjennomfører prosjektet i tråd med:

- opplysningene gitt i meldeskjemaet
- krav til informert samtykke
- at du ikke innhenter sensitive opplysninger
- veiledning i dette brevet
- Lovisenberg diakonale høgskole sine retningslinjer for datasikkerhet

Veiledning

Krav til informert samtykke

Utvalget skal få skriftlig og/eller muntlig informasjon om prosjektet og samtykke til deltakelse.
Informasjon må minst omfatte:

- at Lovisenberg diakonale høgskole er behandlingsansvarlig institusjon for prosjektet
- daglig ansvarlig (eventuelt student og veileders) sine kontaktopplysninger
- prosjektets formål og hva opplysningene skal brukes til
- hvilke opplysninger som skal innhentes og hvordan opplysningene innhentes

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

NSD – Norsk senter for forskningsdata AS Harald Hårfagres gate 29 Tel: +47-55 58 21 17 nsd@nsd.no Org.nr. 985 321 884
NSD – Norwegian Centre for Research Data NO-5007 Bergen, NORWAY Faks: +47-55 58 96 50 www.nsd.no

Appendix 8 – Approval from NSD – Paper III

NORSK SENTER FOR FORSKNINGSDATA

NSD sin vurdering

Prosjekttittel

Translation and psychometric testing of the Norwegian version of The Clinical Learning Environment Comparison Survey using a sample of first-year nursing students.

Referansenummer

956321

Registrert

04.02.2019 av Camilla Olaussen - Camilla.Olaussen@ldh.no

Behandlingsansvarlig institusjon

Lovisenberg diakonale høgskole / Avdeling for sykepleieutdanning

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Camilla Olaussen, camilla.olaussen@ldh.no, tlf: 41554548

Type prosjekt

Forskerprosjekt

Prosjektperiode

20.05.2019 - 31.12.2022

Status

05.02.2019 - Vurdert

Vurdering (1)

05.02.2019 - Vurdert

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg den 5.2.2019. Behandlingen kan starte.

MELD ENDRINGER
Dersom behandlingen av personopplysninger endrer seg, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. På våre nettsider informerer vi om hvilke endringer som må meldes. Vent på svar før endringer gjennomføres.

1 av 3 23/06/2019, 15:37

Appendix 9 – Approval from NSD – Paper IV

NSD sin vurdering
Prosjekttittel
Simulation as learning support during clinical practice in nursing homes: Effects of a novel clinical model in Bachelor of Nursing Education

Referansenummer
875320

Registrert
11.07.2019 av Camilla Olaussen - Camilla.Olaussen@ldh.no

Behandlingsansvarlig institusjon
Lovisenberg diakonale høgskole / Avdeling for sykepleieutdanning

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)
Simen Alexander Steindal, Simen.Alexander.Steindal@ldh.no, tlf: 92660422

Type prosjekt
Forskerprosjekt

Prosjektperiode
05.08.2019–31.05.2023

Status
17.07.2019 - Vurdert

Vurdering (1)

17.07.2019 - Vurdert
Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet med vedlegg 17.07.2019. Behandlingen kan starte.