A Review of the Effect of Nurses' Use of Smartphone to Improve Patient Care

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Yoon is a 2017 graduate of University of Calgary's Bachelor of Nursing program who is currently working as a Registered Nurse with the Alberta Health Services. In the past, he has obtained BSc-biology degree at the University of British Columbia. As a nursing student, Yoon was curious about how the use of new technology by nurses, such as Smartphones, can influence patient care. Furthermore, he has interests in discovering new innovative ways for nurses to integrate new technology to effectively deliver care to their patients. He hopes to continue his endeavors in this field while working as an RN under AHS.

Abstract

Nurses in the acute-care setting use touchscreen smartphones (eg. iPhones) to facilitate patient care. However, on-duty nurses also use smartphones to access social media, text, and shop online. The overall benefit of nurses' use of smartphones to patient care is unclear. We conducted a systematic review to examine the use of smartphones by acute-care nurses and how that influences patient care. We searched Embase, MEDLINE, PsycINFO, CINAHL, and PubMed databases using the keywords "smartphone," "nurse," "patient care" and "quality of care" to identify articles focusing on smartphone use by nurses in acute care setting. Only 274 articles were initially identified. Fourteen articles remained after applying inclusion criteria such as nurses in acute care setting, written in English, and excluding those addressing the use of smartphones by non-nurses. We identified six themes encompassing advantages and disadvantages of smartphone use by nurses in the acute care setting. Theme 1: enhanced interprofessional communication. Theme 2: easy and quick access to clinical information (e.g. medications). Theme 3: improved time-management. Theme 4: reduction of work stress. Disadvantages included Theme 5: distraction from work, and Theme 6: the appearance of unprofessionalism. Smartphone use by nurses in the acute care setting impacts how they provide daily care to their patients. Benefits of smartphone use include improved patient safety, more efficient communication between healthcare providers, and better time-management. Disadvantages found involved distraction of nurses at work and the perceived appearance of unprofessionalism. We believe there is an unmeasured risk of smartphones as potential vectors of infection. We support the use of smartphones in a limited manner to aid their work performance but recommend that education is necessary for the appropriate use of smartphones to mitigate risks such as infection, distraction, and accountability of personal use.

Keywords: Nurse, Smartphone, Patient care, Patient outcome, Quality of care.

Introduction

As touchscreen smartphones have become more popularized in the general public since the introduction of Apple's iPhone™ less than a decade ago, there has also been a more spontaneous use of smartphones by bedside nurses in acute care settings. However, there does not seem to be a clear consensus as to whether or not nurses in acute care facilities should use smartphones during their clinical practice. Some nurses have discouraged the use of smartphones due to the risk of compromising patient privacy, distracting the nurse, and the appearance of unprofessionalism [1]. However, other nurses believe that smartphones can be utilized to quickly search for information relevant to their practice (e.g. drug information), communicate more efficiently with others in the healthcare team, and facilitate safe clinical decisions at the point of care [2,3]. As such, it became apparent that there were risks and benefits associated with nurses using smartphones within the acute care setting. However, it is unclear if there is an overall benefit concerning the provision of better care to patients. We conducted a systematic review of current evidence to examine how smartphone use can influence nurses providing patient care, and also to determine how the smartphones technology can be best integrated by nurses to improve their performance in patient care.

Methods

In order to gain insight regarding how nurses' smartphone use can impact patient care, we searched CINAHL, PubMed, Embase, MEDLINE, PsycINFO database using a combination of the following keywords: "smartphone," "nurse," "patient care," and "quality of care." Based on this search, 274 articles were initially identified across all databases and from this, we removed 46 duplicate queries. We excluded articles that focused on patients using information from smartphone apps to better manage their disease and nurses encouraging patients to use their smartphones as part of their care. We also excluded articles that involved non-nurses such as physicians using smartphones for their practice and articles that were irrelevant to nurses using smartphones within the acute care clinical context. From this initial screening process, we were able to eliminate 190 articles, leaving 38. We then narrowed the selection criteria to studies that focused on bedside nurses using smartphones and studies about how the nurses' smartphone use impacted practice, resulting in selected ten articles (Fig 1) [4]. Using similar methods above and Google Scholar database, we identified four additional articles to include in our review. We examined the fourteen articles and focused on the identification of key themes regarding how smartphone use could impact the delivery of care by acute care nurses.
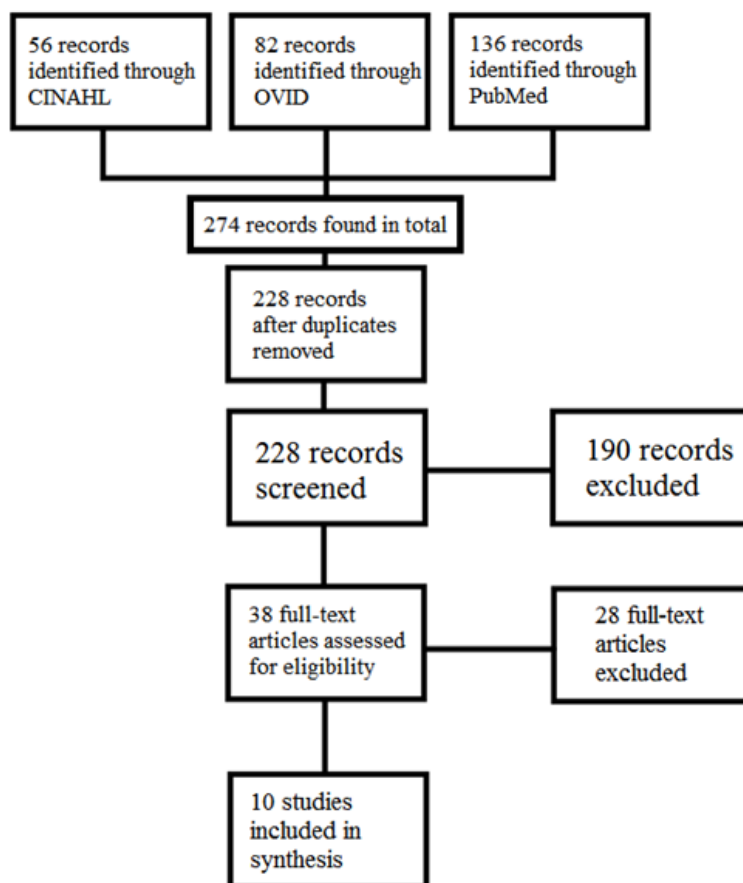

Figure 1: PRISMA diagram illustrating how articles were excluded and included for the systematic review. Embase, Medline, and PsycINFO were searched through OVID.

Results

We identified six major themes regarding how smartphones can impact nursing practice: 1)

Communication, 2) information access at the point of care, 3) time management, 4) stress relief, 5) distraction, and 6) the appearance of unprofessionalism (Fig 2).

Communication

Nurses experienced improved communication when they used smartphones to communicate with others on the healthcare team compared to using traditional methods of communication, such as pagers. In one study, nurses were able to receive a quicker response from other healthcare providers (HCPs) (p = 0.001) and also experience fewer interruptions to patient care (p = 0.002) when 35 nurses used smartphones to communicate with healthcare providers (HCP) [5]. In other studies, nurses believed that smartphone use resulted in better communication and collaboration amongst all healthcare professionals [6,7]. Using the pager system, the nurses were only capable of one-way communication with physicians, however, using smartphones enabled nurses to engage in a two-way communication. Two-way communication enabled quicker communication of simple messages as nurses did not need to wait for return calls, which led to fewer interruptions from patient care. Using smartphones in this manner also had an added effect of ensuring accountability of practice between nurses and other HCPs as information that was sent and received could be stored [8]. The nurses reported that improved communication increased patient outcomes and satisfaction, but there were no measured patient outcomes [5,7]. However, some nurses, especially nurses from the older generation, did not experience enhanced communication as result of smartphone use. These nurses thought that communicating with doctors were easier with a pager, or that they did not know how to take full advantage of the assigned smartphones [6,7].

Information Access at the Point of Care

Nurses can access information related to patient care efficiently and quickly using smartphones. Bedside nurses used smartphones'

mobile application feature to access clinical information such as medication parameters, patient education, and wound-care [7,9]. The nurses surveyed in other studies also reported that smartphones allowed ease of access to clinical information during their care of the patient. These nurses commonly sought clinical knowledge from formularies and textbooks via smartphone applications and web browsers on the smartphones [10,11]. Some nurses have used smartphones to inquire as well as share clinical expertise with their colleagues to support each other's practice [12]. Six nursing students using smartphones to search drug and other information found the device helpful to them in providing quick, safe, and confident care to their patients [13]. The student nurses claimed that patient care was easier and faster with smartphones, and the authors believed that having an appropriate resource available to students and boosting their confidence in the provision of care increased patient safety and satisfaction [13,14]. In a survey of student nurses and registered nurses, the respondents believed that smartphones were helpful in learning clinical information, which allowed them to provide safer and better quality of care, and thus, they wanted to be allowed to use smartphones while on duty [11]. In a different survey, British nurses who used smartphones at work reported that smartphone applications were easy to use, would increase patient safety, would be useful in patient care, and save time [10]. Although nurses have reported the advantage of integrating smartphone use in their clinical practice, the specific patient outcome has not been determined nor measured.

Time management

Nurses can improve time efficiency using smartphones as part of their practice. In one study, nurses in a 26-bed medical unit were able to conserve a total of 160 minutes within a 12-hour shift when they used smartphones instead of pagers. The nurses were able to save time as there was less need for nurses to physically reach the landline phone to return the call as well as having

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less interruption to patient care. And having fewer interruptions, the nurses reported enhanced time efficiency and workflow [5]. Nurses in China who used smartphones to receive call-bell requests from their patients were able to respond quicker than those who relied on the Public Announcement system (6 seconds with smartphone vs. 3.8 minutes with PA system, $p <$ 0.001). Furthermore, the nurse could communicate with the patient and respond directly rather than visit and inquire why the patient called [15]. The prompt response time to the call-bell request could also reduce the occurrence of adverse events such as falls. This also means the nurses would have to spend less time addressing the adverse events that had occurred [16]. In another study, 29 nurses surveyed felt that smartphones led to fewer interruptions during patient care and more time

to care for their patients. Some of these nurses stated that this has resulted in better patient outcome and satisfaction [6].

Stress relief

Smartphone use by nurses for personal non-work reasons may provide some degree of stress relief. Over three quarters (78%) of 825 nurses reported using personal smartphones while caring for patients for non-work related activities such as using social media, playing games, doing online shopping and keeping in touch with families and friends [17]. In a similar study, the authors found that 46% of 312 nursing students in South Korea reported using smartphones during clinical their practice connect and socialize with their families and friends. These social activities may have provided the students with social and emotional support [18]. Nurses have
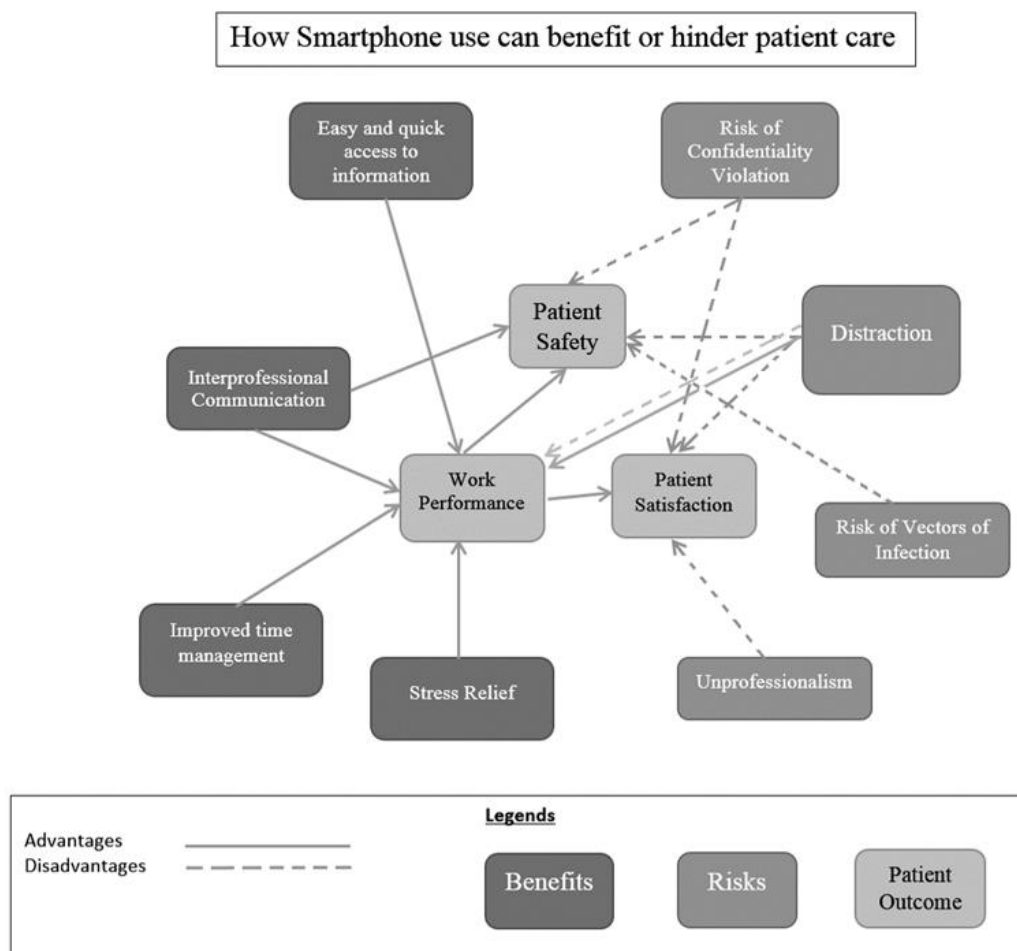

Figure 2: Concept map illustrating how each major themes related to nurse's smartphone use can impact nursing and patient outcomes.

also used smartphones to communicate with their colleagues to engage in non-work related conversations [12]. While there is speculation that nurses can use smartphones to help alleviate their stress during work-time, there is a lack of quantitative data on the magnitude of this stress reduction and if the benefits outweigh the risks.

Appearance of unprofessionalism

While some nurses deemed smartphones as useful tools for patient care, they were hesitant to use smartphones in front of patients and families, fearing they would appear unprofessional. It was reported that 31% of 111 registered nurses and 51% of 287 nursing students surveyed in Sweden felt that using smartphones in front of the patients and families would lead them to believe that the nurse may have insufficient clinical knowledge. They also felt that they were being perceived to be playing games or were using the smartphone for other non-work related purposes [11]. Although the nurses provided rationales of using smartphones to patients, they still felt that they appeared unprofessional and rude when accessing information or answering phone calls while providing care [6,7]. One nurse stated that using a smartphone would appear to patients as "doing your own personal stuff on work time". Furthermore, some nurses did not carry smartphones to patients' rooms as they were concerned they might be interrupted during care and appear unprofessional receiving incoming phone calls [7]. The nurses' perception towards using smartphones as appearing unprofessional would be a barrier to their adaptation to a new system of better communication modes and information source [6].

Distraction

When nurses and nursing students used smartphones during their practice, it has distracted them while caring for their patients. Based on a survey of nursing students in South Korea, student nurses stated they were sometimes distracted by smartphones and also witnessed other staff nurses being distracted by smartphones [18]. There is a potential hazard to patients when nurses are distracted by smartphones during patient care. However, there is uncertainty as to how much of an impact this distraction had on the patient outcome, Specifically, there was no quantitative association between nurses' distraction of smartphone use and its effect on patient care [17]. It is worth mentioning that when unit-issued smartphones were used by nurses and other healthcare staff in lieu pagers for work-related purposes, none of the 103 participants raised the issue that distraction was a significant factor during their work. Researchers also found that distractions were decreased during patient care when nurses used smartphone communication over pagers [5,6].

Discussion

Evidence to support nurses' use of smartphones within clinical practice was enhanced communication, ease of access to clinical information, and improved time management. Evidence against using smartphones include a potential source of distraction and displaying unprofessional appearance. Furthermore, we believe there are unmeasured risks of smartphones being vectors of nosocomial infection as well as being a cause of a potential breach of confidentiality. However, when appropriate strategies are implemented to mitigate these risks, we believe that the potential benefits of using smartphones can easily outweigh the risks associated with using these devices.

Nurses experienced improved communication when they used smartphones to communicate with others compared to using traditional methods of communication, such as pagers and landline phones. The improved communication was as a result of nurses having a more efficient tool for communication, being able to communicate with others quickly, and having to deal with fewer interruptions and delays associated with other methods of communications. By allowing nurses to engage in a two-way communication using smartphones, nurses can communicate with other HCPs quickly, use their smartphones to communicate with

others at any location in the unit, and easily access important contact information such as the patient's physician via the contact list on the phone [5,6,7]. Similarly, a direct two-way communication between the nurse and the patient allows greater depth of information to be shared between them, such as the reason for requesting assistance as well the level of urgency. This may, in turn, allow the nurses to prioritize their tasks better and can help reduce the occurrence or the severity of an adverse event such as falls [15].

Using smartphones as a tool to obtain clinical information at the point of care not only provides direct and instantaneous access to information but that this may also help reduce the barrier for nurses to seek pertinent clinical information as they need it. The reason for reduced barrier is because that when many bedside nurses require certain information, they would in most cases be required to physically find materials such as a computer or a book to access the information. As such, for many nurses with time constraint due to heavy workload, having a hand-held device to which they can access information instantly on the spot could be a critical determining factor as to whether or not they can integrate relevant clinical information, such as medications, into their care [19]. This can potentially impact patient safety, and outcome as nurses can make a better-informed decision during their care. Furthermore, nurses can also use other features of smartphones such as a calculator, a notepad, and task-reminder functions to assist them in their day to day care of their patients. Thus, we believe that many of these features that are available on smartphones would have an additive effect in not only aiding the nurse in carrying out their day to day tasks but saving time and also promoting patient safety. Other prospective usages of smartphones may include using smartphones and their accessories as a tool to visually document the progression of wound healing as well on the spot electronic documentation of any pertinent nursing actions such as medication administration [21,22]. We believe this would be conducive to reducing

medication errors as bed-side nurses would have the information at their point of care to verify the medication orders rather than simply relying on memories, which may be susceptible to errors from distractions they face during their care.

While there are benefits to nurses using smartphones during their care, smartphones can cause safety hazards to patient care when nurses are distracted from using them. When nurses were using their personal smartphones for non-work related purposes while caring for their patients, they were distracted from focusing their attention on caring for patients [17,18]. And although using smartphones to reduce work-related stress may have been beneficial, the magnitude stress reduction relative to possible hazards to patients caused by distraction is not clear [5,6]. Other risk associated with smartphone use includes the device being a potential vector for infectious disease as well as there being a chance of it being used to leak confidential patient information. So while there may appear to be real risks associated with nurses using smartphones, we believe that it is possible to mitigate some of these risks through various strategies. One of them may be to encourage nurses only use unit-issued smartphones for work-related reasons. While using smartphones for personal non-work related reasons caused distractions, nurses reported less distraction compared to using pagers when unit-issued smartphones were used solely for patient care [5,6]. We believe that this may be the case because when nurses use unit-issued smartphones, they most likely use the unit smartphones for work-related purposes rather than for personal use, hence leading to less distraction as well as patient confidentiality issues associated with non-work related use. As for other risks, frequently cleaning the device using antiseptic agents, and ensuring that access to the devices is secured and kept within the nursing unit will help mitigate the risks of infection and confidentiality, respectively. To effectively implement this, setting and enforcing these rules as well as periodic education on proper use of smartphones may ensure that the benefits of using smartphones to assist nurses in

their day to day care would outweigh the potential risk of using them.

With regards to barriers to implementing this plan, some healthcare organizations have policies that discourage the use of smartphones by healthcare staff during clinical setting. However, these policies mainly focus on staff using smartphones for personal non-work related reasons. The formation of these policies may have likely been as a result of healthcare staff bringing own smartphones to hospitals for their personal use after the device became popularized. It may have also been because that as smartphone technology, which became popularized less than a decade ago, is a relatively new phenomenon in the healthcare context, as such; there is lack of documented use compared to other technologies such as personal computers. Hence, while there is growing evidence with regards to benefits and risk of smartphone use within the clinical context by nurses, they are not as widespread and well-known as other technologies that have existed for some time. Another significant barrier to nurses using smartphones was the fear that they would appear unprofessional to patients as well as the probable perception of patients and families that the nurse may seem unprofessional while using smartphones in their line of duty [6]. We believe that given the lack of wide-spread adaptation of smartphone use into not only nursing care but also healthcare in general, it would be plausible to state that individual patients and families may perceive smartphone use as being for personal use only. However, if smartphones use in healthcare becomes more widespread than now, this may shift the perception of the public with regards to the role of smartphones in the healthcare setting. It is also worth noting that while many nurses, especially young nurses suggested that smartphones were better than the pagers, other nurses, especially older nurses preferred pagers over smartphones [6,10]. The difference of opinion between the generations could be because while younger nurses were already familiar with basic smartphone functionality from their day to day personal use, older nurses who were unfamiliar with this new

technology may have faced challenges in integrating the device with their clinical care. Other barriers to smartphone use are financial costs associated with obtaining the phones, programming the phones for nurses to use, and linking the phones to existing computer systems at each unit [20].

Based on our systematic review, smartphones can assist nurses in their day to day care. However, there is a lack of research on direct measures of patient outcomes from nurses' smartphone use including, but not limited to, the number of adverse events (e.g. falls, medication errors), the effectiveness of patient education and overall patient satisfaction. Further research may be needed on this to help clarify if smartphone use may significant benefit patients. However, if nurses are able to manage their time as well as better coordinate their day to day tasks using smartphones, this can also benefit patients. Presently, nurses in various units are restricted from using smartphones during work-time due to reasons such as perceived risk of distraction and unprofessional appearance. But based on our systematic review, we believe that there may be overall benefits to nurses' clinical performance when they are permitted to use unit-issued smartphones for work-related purposes. However further studies may be needed to verify if the advantages of using smartphones outweigh the risks for patients. While there are nurses who opposed smartphone use in the clinical setting, there are also nurses who supported its use. As such, we believe that nurses should be given the opportunity to decide for themselves whether or not they should utilize smartphones to facilitate their clinical practice.

Conclusion

Based on our systematic review, we would recommend smartphone use by acute-care nurses under specific conditions, such as using unit-issued smartphones after providing appropriate education as well as having usage rules to nurses who are accountable for their practice. While this tentative recommendation may be beneficial in promoting nursing practice,

we believe that further research can expand our understanding of the extent of positive and negative impact on patient care, as few research papers directly measured any quantifiable change to the patient outcome when smartphone uses were implemented. The use of smartphones by nurses is a relatively new phenomenon, and there may be in the near future, newer innovative approaches that nurses can utilize using this tool to enhance further how they deliver care to their patients.

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