SMARTPHONES IN CLINICAL NURSING PRACTICE: A MULTIPHASED APPROACH TO IMPLEMENTATION AND DEPLOYMENT

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ABSTRACT

Students in the undergraduate nursing program at the University of Calgary - Qatar are required to work with patients in clinical settings under faculty supervision.. One of the main goals of clinical courses is to provide students with the opportunity to learn in context and 'just-in-time', a much more realistic and memorable learning experience. During clinical placements, students need to acquire additional information about illnesses, medication and patient care on site. The current research was conducted to determine if properly selected smartphone technology and accompanying software would help provide students with information they needed in a just-in-time fashion and if this would have a positive impact on their learning. A multi-phased study was developed to (1) determine the impact of smartphone and software deployment in clinical courses on student learning and to determine barriers and issues that may inhibit success [Phase 1] and (2) to use the knowledge gained in phase 1 to address these issues and barriers by optimizing e.g., deployment strategies [Phase 2]. Findings from phase 1 indicate success in terms of learning outcomes while also showing that students would prefer to use their own smartphones. Phase 2 is currently underway and will result in the development of implementation strategies based on evidence gained from phase 1 and mobile technology usage pattern survey (ECAR).

KEYWORDS

Smartphone, nursing, clinical practice, deployment, selection rubric, just-in-time, learning

1. INTRODUCTION

There are many reasons for using smartphones in clinical healthcare settings. They provide just-in-time access to clinical reference tools as is evidenced by the widespread use by medical professionals (Wyatt et al., 2010; Farrell & Rose, 2008). They also have the potential to increase student interactions with instructors, peers and content (resources) and to provide the opportunity to engage in evidence-based-practice at point of care (Kenny, Van Neste, Park, Burton, and Meiers, 2009). Several models exist for deploying the smartphones and getting them to the students: (1) mobile technology may be provided by the educational institution either as part of the course materials (e.g., on a limited sign-out basis) or (2) permanently as part of their tuition costs (e.g., given a smartphone on entry into the program). In both cases the assumptions are that students do not already have similar technology and/or do not have the software required. These two may also inhibit a more ubiquitous adoption model (see e.g., Naismith, Lonsdale, Vavoula, & Sharples, 2004) resulting in students using the devices for very specific purposes and their own devices for everything else. Thus a third model may exist in cases where students can be expected to own mobile technology suitable for use in the learning environment facilitating opportunities for a more ubiquitous model of usage.

Mobile technology, specifically smartphones, is becoming omnipresent in many settings as costs of the technology and supporting infrastructure becomes more affordable and accessible. This presents opportunities for implementing and using mobile technology in a wider range of educational settings. However, the provision of mobile technology by educational institutions to their students becomes a major consideration as the numbers of e.g., smartphones deployed increases. It may also present opportunities to migrate the burden of managing mobile technology from educational institutions to the student. The following reports on a multi-phased study that begins with small targeted usage with the goal of piloting pedagogical strategies in nursing clinical settings and gaining an understanding of institution-led deployment

issues. The second phase explores the feasibility and rationale for migrating the supporting software to student-owned smartphones.

2. BACKGROUND

Currently, nursing students at University of Calgary - Qatar are limited in their ability to access relevant health care information in clinical placement settings. Few reference texts are available at clinical sites, and library electronic resources are generally not available or accessible in the clinical setting.

A significant part of clinical experiences is the 'just-in-time' nature of the learning. Students often encounter complications in cases ranging from changes in patient presentation to changes in medication to changes in diagnosis and treatment. Unfortunately, with little or no access to books or computers in clinical settings, it is difficult or impossible for students to update their case knowledge. Faculty felt that teachable moments and learning opportunities were lost as students were required to note issues and follow-up after the clinical session, typically hours or even days later.

Smartphones provide access to information immediately through wireless and 3G connectivity or through applications installed on the smartphone. The key to the success in clinical learning situations was the 'just-in-time' access to information that smartphones provided.

The ability to retrieve information while situated in the context of use presents the opportunity for a powerful learning experience during clinical placements. These opportunities to learn and to obtain just-in-time information should extend into practice after graduation. An implementation model that retains the technology in the hands of the educational institution may inhibit wider spread adoption.

3. METHODOLOGY

This study was conducted in two phases. The first phase was designed to pilot the use of smartphones in clinical settings in an undergraduate nursing program. Specific software was targeted for use and strategies developed for using the smartphones and software in clinical courses. This provided a standardization of hardware and software allowing for the control of mitigating variables such as differences in technology and/or software and installation and maintenance issues. The second phase was designed to migrate the software from the institutionally-owned smartphones to the students' smartphones.

3.1 Phase 1

Smartphone technology was selected based on its targeted use in clinical nursing courses in phase 1. Software was selected based on the goals of just-in-time use and evidence-based-practice and the context of use. A system of deployment and maintenance was established. Data was gathered through the use of focus groups conducted with faculty and students and through the use of software installed specifically to track program usage on the smartphones. Students were informed that their usage was being tracked but the actual tracking was invisible to them resulting in silent-tracking (Boticki & So, 2010)

3.1.1 Technology Selection

There are a number of smartphones available on the market today, each with its own set of features. In order to select the most appropriate smartphones for use in the targeted courses (e.g., clinical placements) a smartphone selection rubric was created and revised with feedback from the research team which included faculty teaching clinical courses. A number of primary and secondary characteristics were included in the rubric including size, portability and connectivity. This resulted in the selection of the Samsung i9000 smartphone.

3.1.2 Software Selection

The target courses for deployment of the smartphones were clinical courses in the nursing curriculum. Pedagogical goals were to provide the students with relevant and useful just-in-time information which could then be used to help inform evidence-based practice. The most appropriate software for these purposes was found to be Skyscape (a modular program that includes drug guides, diagnosis and disease management tools, medical dictionary, etc.). Faculty members recommended the most appropriate software modules for the clinical courses that had been targeted for deployment. The software was installed on the smartphones prior to deployment.

3.1.3 Deployment

The strategy for deploying smartphones to students in clinical courses was developed over several semesters. Students enrolled in clinical courses were given permission to sign-out the smartphones for one semester. At the end of the semester the phones were returned and all student data and applications were cleared. Any necessary maintenance was performed and the phones were made ready for re-deployment in the upcoming semester.

3.2 Results: Phase 1

3.2.1 Student Usage Characteristics

It was originally planned to gather usage data when the smartphones were returned at the end of eachsemester. However, due to scheduling issues at the end of the first semester the data was not gathered and only the data from semester two was obtained.This resulted in data being gathered from 14 students. The database on the smartphone was then cleared in preparation for the next clinical course deployment. The software, 'AppUsage', collected data by counting the number of times an application was opened. It did not capture the length of time the application was open. Figure 1 shows the number of times applications were used (opened).

As figure 1 suggests the two applications that were used most often was the internet browser and the Skyscape software. The average use was 126 for internet use and 110 for Skyscape. The internet usage showed that 10 of the 14 users opened the internet application 24 times or more with four students using the internet regularly (275 to 415 times). The Skyscape usage showed higher usage patterns for all students with a range of 7 to 440 with 10 of the 14 students opening the application 50 or more times. Students also used the Settings applications an average of 37 times. They would have had to enter the application a number of times to setup and maintain wireless internet access settings. Only 5 students used messaging more than once or twice, these 5 used it more than 30 times suggesting these users may have installed a SIM card (required for phone and messaging service). Of particular interest is the very small number who used the email application particularly as this would have provided access to their email at all times. Only 1 student used the application regularly. However, it should also be noted that web-based email is the preferred way to access email by most students perhaps explaining the high number of internet accesses. Unfortunately this was not followed up in the focus groups.

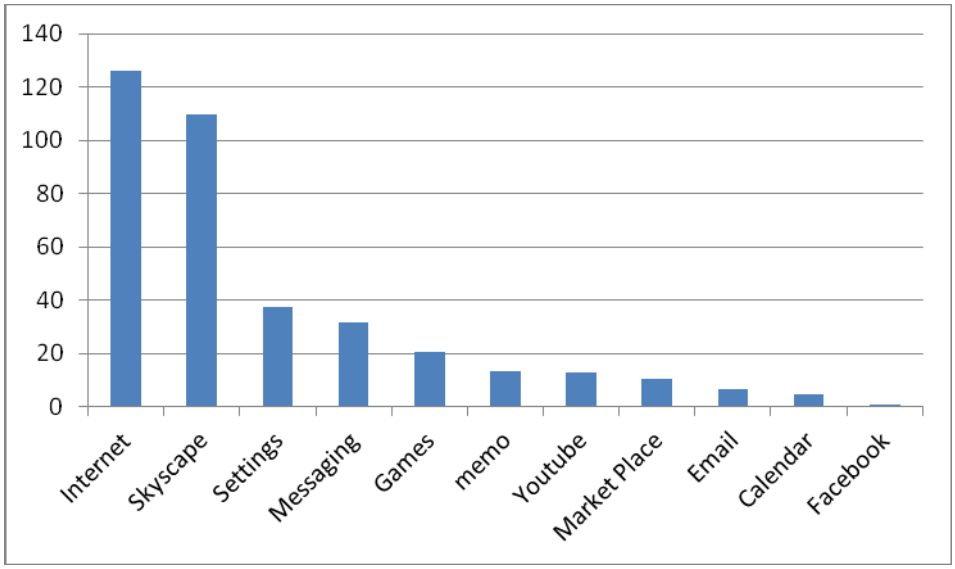

Figure 1. Average student usage data by number of uses.

3.2.2 Pedagogical Evaluation

At the end of each semester a focus group was conducted with faculty members involved in the project followed by a focus group with students. The focus groups were intended to gather feedback about the impact the smartphones had on the faculty and students in the course. The focus questions were similar for both.

Both students and faculty commented on how useful the smartphones were in providing information as needed, especially when patients had been discharged and new patients assigned. Students used Skyscape extensively to access information regarding, for example, pathophysiology and pharmacology.

Both groups felt that a small amount of training would have been beneficial in terms of using the smartphones and software. A significant number of students indicated that the smartphones provided were not the same as their personal smartphones. This meant that they needed to learn their way around a new software interface. One student captured the sentiment, “on my own phone I could close my eyes and get to what I want.” Virtually all felt that having them available in clinical was clearly an appropriate use.

Towards the end of the focus session, several students began to discuss how they saw smartphones fitting into the overall framework of practice. They felt Skyscape was great for quick, simple-to-locate and understand information but that it lacked depth. They suggested textbooks were more appropriate for providing the depth of information they were seeking. They did not feel that putting books on smartphones was appropriate as the viewing area was too small and too hard to read. They preferred print books for this purpose.

3.2.3 Deployment Evaluation

After several semesters of use, the research team also conducted a review of the deployment practices. This review highlighted a number of issues that were becoming more evident as the number of smartphones deployed grew. The issues included the increasing amount of time required to clean and prepare the phones at the end of each semester as well as issues around areas of responsibility. This was exacerbated as we acquired additional smartphones. It was not possible to acquire the same version of the phone resulting in two slightly different sets of processes for cleaning and preparing the smartphones for (re-) deployment.

In our setting the Learning Commons (our local library) had agreed to distribute and maintain the smartphones as they already managed a daily laptop sign-out service. The Learning Commons staff became the point of first contact for students. Students obtained their phones from staff and returned them to the same location. When phones failed to work properly they were taken to the same staff. A system of triage was conducted to determine if the phones needed to be returned to IT for repair or if the problem could be resolved by the staff member.

There was considerable discussion around who was responsible for various elements of the smartphone maintenance, including initial setup and ongoing service, semester-end cleanup, installation of software, and

deployment management. Organizational and flowcharts were developed to help understand the process. Detailed maintenance schedules and checklists were also developed to help standardize and systematize the workload. However, all involved felt these were not scalable solutions. At this point there were roughly 75 smartphones in service and it was anticipated that the annual growth rate of the nursing program would result in the need for double or triple the number of smartphones necessary to meet the demand.

3.3 Phase 2

Phase 2 is currently in the development stage. The aim of this phase is to provide mechanisms to migrate the software (e.g., Skyscape in our case) to student-owned smartphones. This involves investigations designed to confirm the prevalence of personal (student- owned) smartphones suitable for the software and the usage intended. Investigations are also being conducted into the best way to deploy the software onto student phones (e.g., pricing, installation, maintenance, etc.).

3.3.1 Usage Survey

Although anecdotal evidence from students throughout the study suggested that a large percentage of students could be expected to own their own smartphones there was a need to quantify this before going forward. Earlier feedback through focus groups had suggested that there were a number of different types of phones in common usage with common software usage patterns (e.g., use of Blackberry Messenger on Blackberry phones, Whatsup on Android phones, etc.). Permission to use the ECAR Mobile Technology Survey (Educause, 2012), developed by the Educause group, was obtained to ensure that a sufficiently broad range of relevant data was captured. Information from this survey includes types of mobile technology owned and used, type and frequency of software use, and perceptions of the importance of this software to the participants academic success. The survey is currently deployed to the nursing student body at the University of Calgary - Qatar.

3.3.2 Deployment Strategy Options

There are currently several deployment options being considered. These include (1) continuing to provide smartphones to students as is currently the practice, (2) students independently purchase and install the Skyscape software on their own phones prior to beginning a clinical course, or (3) a hybrid model where students will pay for the software but UCQ will assist in the purchasing and installation similar to the purchase of course textbooks.

As has been discussed above, the first option does not scale well and has become onerous to manage. It also does not leverage student phone ownership and usage patterns. The second option provides the students with the most independence but may not provide the best pricing or installation support desired. At present, the third option seems optimal.

The issue of equity must also be considered. Students who are not financially able to purchase their own software or do not own smartphones can make application to the study team to sign-out phones from the existing pool of smartphones.

Finally, training will be provided based on the feedback obtained thus far and based on the results of the ECAR survey.

4. CONCLUSION

Smartphone usage in clinical nursing courses has shown to be beneficial and was confirmed in this study. Every attempt was made to select appropriate technology for a clearly defined need and yet ensure the technology would have wider application within and throughout the nursing program. Feedback from students suggested that the just-in-time availability of concise and easy to understand information helped them explore their patients' cases more fully and in so doing, improved their learning. However, feedback also suggested that students would prefer to have the software on their own smartphones. Reasons included personalization, familiarity with their own phones, and the ability to keep the software throughout their program and post graduation.

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