

ORIGINAL ARTICLE

What clinicians think about smartphones for healthcare communication

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ABSTRACT

Smartphones are becoming a mainstream communication tool in healthcare settings. Prior studies call for the use of smartphones to enhance clinical communications. However practicality of use is crucial for smartphones in order to be beneficial in clinical settings. Since the applicability of smartphone for routine clinical communication has not been studied so far, this descriptive study aims to investigate the applicability of clinical smartphones for routine clinical communications. In this paper, we report on a survey study handed out to providers with a year of experience of using a clinical smartphone. The survey measured providers' perceptions of using smartphone for daily communications.

Key Words: Hospital communication, Healthcare management, Teamwork, Smart phone, Pager, New technology, Human computer interaction

1. INTRODUCTION

Approximately, 250,000 patients die annually in the United States (US) due to medical errors, the majority of which are caused by ineffective communication.^[1] Ineffective communication costs hospitals across the US \$11 billion annually, according to the Ponemon Institute.^[2] Safe and effective patient care demands interdisciplinary collaboration and communication among healthcare providers.^[3] Communication dependent activities such as coordination of care, transitions across the hospital, and follow up after discharge impact the quality of care. The existing variation in communication means through healthcare environment can endanger patient safety issue.

Communication in hospitals can be synchronous, such as face-to-face communication and phone conversations or asynchronous, such as email and phone messages.^[4] Face-to-face

communication is considered as the most favourable mode of communication in healthcare because of the ability to transfer large amounts of information compared to the other communication modes.^[5,6] When face-to-face interaction is not possible, communication is facilitated through devices. Hospitals and clinics use different types of devices for communication.^[6] An appropriate device for establishing clinical communication should transfer information swiftly, accurately, effectively and efficiently. Pagers has been the primary communication device in healthcare for a long time.

Pager technology is not commensurate with current healthcare communication needs,^[7] and actually adds to the continuing revenue of hospitals because of ineffective communication.^[8,9] Pagers cannot transfer the urgency of a situation in details through texting, and may cause underestimation of the situation.^[10] Also, pagers do not support synchronous vocal communication, even if they support two-way paging. When

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a provider receives a page, they are required to look for an available phone to call and talk with the sender. Decreased security, call setup delays, interruptions from unimportant pages in emergency situations and the need to document communication are other limitations of pagers.^[5,11] However, pagers have significant advantages to other alternatives such as high battery life, network power and data storage requirements.^[12] Pager networks have proven their reliability of message transmission, with signal strength reaching pagers wherever they are located within the network coverage area. Additionally, the simple interface and simplicity of set up has made the pager a dominant communication in healthcare for decades.

On the other hand, smartphones are considered the best alternative to replace pagers.^[13] Smartphones are ubiquitous, being 75.8 percent of all mobile phones used in the US.^[14] Smartphones have found a new application in healthcare because of their market acceptance and their familiar interface which helps in facilitating the adoption. Studies describe smartphones as efficient devices for transferring clinical communications.^[15,16] These smartphone capabilities provide great promise as a future clinical communication device.^[17] Provider to a provider, provider to team and team to team communication are supported through smartphones regardless of geo-spatial constraints. Providers using smartphones can prioritise communications and can be assured delivery of messages. Smartphones give providers the flexibility of making a synchronous direct call or engaging in asynchronous communication, depending on the urgency of the patient situation. Additionally, smartphones can be effective devices in educating residents^[18] and managing information and workflow. Smartphone handsets benefit from the enormous computation power that enables operation of various healthcare software on devices and allow devices to support routine medical applications such as Electronic Medical Records.^[19]

Adoption of smartphones in clinics has raised some concerns as well. Smartphones can cause cognitive distraction by shifting and tunnelling of attention.^[20,21] Receiving calls and messages while performing clinical tasks on smartphones can distract providers and interrupt their activities.^[22-26] Distraction and interruption are potential threats to patient safety, as is the risk of cross contamination through smartphones storing bacteria.^[27,28]

There is only limited research examining the level of adoption and satisfaction of smartphones among providers, with none focused on the usability of the handsets in health care. We do not yet clearly understand the effectiveness of smartphones for routine clinical communication, and the patterns of current smartphone usage in healthcare environments. The

objectives of this study are to understand the level of acceptance of smartphones as communication devices among care providers and to identify effectiveness and efficiency of smartphones in routine clinical scenarios. In this paper, we report on a survey study investigating clinicians' perceptions of clinical smartphones. Understanding clinicians' perceptions can help designers to design more usable devices.^[29]

2. METHODS

The study was conducted in a major academic hospital in the Midwest and was approved by an Institutional Review Board (IRB). The hospital has been using smartphones for patient care communication since 2013. Clinicians in this hospital comprise nurses, physicians, unit clerks and physical therapists, with all using alphanumeric pagers and smartphone based devices to communicate.

A survey was distributed to staff working in the general medicine unit, in both online (through QualtricsTM) and paper formats. David and Sutton (2010) argued that using both paper and online surveys can lead to a higher response rate.^[30] A total of 194 clinicians received the survey and from those, 164 clinicians including nurses, physicians, nursing assistants, resident physicians, pharmacists, social workers, and unit clerks participated in the survey. The format of the completed surveys comprised 130 online and 34 paper-based.

The survey questioned participants' experiences with smartphone devices, including usability and efficiency of communication through the handheld device. Frequency, Kruskal-Wallis H test and cross-tabulation analysis were used to understand the extent of smartphone use, and significant factors influencing employing smartphone use in healthcare.

3. RESULTS

Participants were asked about the ease of use of clinical smartphones. Of the 138 participants who responded to the question, 85% reported that smartphones were easy to use for routine clinical communication. Participants believed that the usefulness of the handheld devices increased with use.

Just over half of the participants did not perceive that pre-training was needed for using smartphones (see Table 1). However, data indicates the need for pre-training increases with the increase of years in practice. The correlation between years of experience and the need for pre-training is positive, but not significant ($r = 0.343$). Given the response to this question would not be normally distributed, the Kruskal-Wallis test revealed that there was a statistically significant difference between different professions. Further investigation using Mann-Whitney analysis identified significant difference between nurses and physicians, with nurses notably

believing that using clinical smartphones required pretraining.

Participants had a mixed opinion about the regularity of the handheld devices, mistakes and failures happening during practice. While 36% of participants reported mistakes and failures not being a common occurrence, 33% thought otherwise (see Table 2). Kruskal-Wallis test shows no significant difference among professions on their opinion about the devices mistakes.

Providers primarily agree that use of smartphones in health-care enhances the quality of care and communications. Participants believe that smartphones use guarantees better coordination and well timed patient care. Additionally, providers perceive efficiency and effectiveness of communication has improved by switching to smartphones. Patient safety is strengthened by employing smartphones in healthcare according to surveyees. Medical applications installed on providers' smartphones were found useful by 75% of the participants (see Table 3).

Table 1. The use of the smartphone required pre-training

The use of the smartphone required pre-training	Disagree	Impartial	Agree	N
Nurse	36.7%	32.7%	30.6%	48
Physicians	67.6%	19.7%	12.7%	71
Physical therapist	0.0%	0.0%	100.0%	2
Unit clerk	50.0%	0.0%	50.0%	2
Other	42.9%	14.3%	42.9%	17
Total	52.9%	23.2%	23.9%	140

Table 2. Device mistakes/failures were common

Device mistakes/failures were common	Disagree	Impartial	Agree	N
Nurse	38.8%	32.7%	28.6%	48
Physicians	38.0%	25.4%	36.6%	71
Physical therapist	0.0%	100.0%	0.0%	2
Unit clerk	0.0%	50.0%	50.0%	2
Other	21.4%	42.9%	35.7%	17
Total	35.5%	31.2%	33.3%	140

Table 3. Applications on the smartphone would be beneficial

Applications on the smartphone would be beneficial	Disagree	Impartial	Agree	N
Nurse	4.1%	22.4%	73.5%	48
Physicians	9.9%	11.3%	78.9%	71
Physical therapist	50.0%	0.0%	50.0%	2
Unit clerk	0.0%	0.0%	100.0%	2
Other	7.1%	28.6%	64.3%	17
Total	8.0%	16.7%	75.4%	140

4. DISCUSSION

The objective of the present study is to understand how successful smartphones are for interdisciplinary communication in healthcare settings. Findings from the survey show that using smartphones for clinical communications satisfies clinicians. Smartphones are perceived as effective devices for multimodal clinician communication. Replacing clinical

communication devices has positive impacts on the patient safety and the quality of patient care as shown in the study. With respect to the devices inbuilt potential for integration with healthcare information technologies and for continuous improvements, smartphones are powerful, portable devices for satisfying current and future needs of practitioners.^[31] Multimodal communication facilitated through smartphones

connections transfers speech and image at the same time and enhances information recall.^[32] Text messaging through the smartphones enhances the speed of message interactions and decreases the need for person-to-person contacts.^[33]

Whilst the possibilities offered by smartphones for healthcare are promising, it is important to be wary of possible pitfalls. Employing smartphones as a communication device in healthcare settings might have some potential risk. During this study some complaints have been recorded over the device notification. Complaints were mainly about missing a notification due to hardware or software failures. Also, there is a potential risk of alarm fatigue, for clinical smartphones users in hospitals' highly frequent alarm environment.^[34] Information overload is another potential risk of employing smartphones. Smartphones increase the volume of available information to healthcare providers, and this increase in frequency might engender information overload.^[35]

An unintended restart, a crash, Wi-Fi connectivity issues, a frozen screen and any other problems impede communication and decrease the reliability. The reliability of smartphones used in a hospital environment is a matter of safety. A significant number of participants in this study believe technological failures and mistakes are common. Furthermore, smartphones, like older mobile phones, emit radio frequency energy. The emitted radio wave may interfere with medical devices' functions.^[36] The possibility of the potential interference should be studied and scrutinised.

Over relying on text messages in hospitals could change the perception of the communication and responding pace expectancy and increase the risk of misunderstanding and misinformation during a message interpretation. Additionally, over relying on text message could lead to omission of the valued face-to-face communications.^[37,38]

During our survey some of the practitioners shared their concerns over patient misperception of using smartphones by providers. Patients might perceive providers employ their personal devices for their personal communications while working as the devices look like ordinary mobile phones. A similar concern was investigated by Hsieh et al.^[39] Also, in the absence of a proper medical auto-correct dictionary for smartphone keyboards, the chance of misspelling, miscommunication and the length of typing text messages compared to personal devices are increasing.

5. CONCLUSIONS

Communication is one of the major reasons for medical errors and patient safety issues.^[40] Our study shows that clinicians find clinical smartphones valuable for improving healthcare communication quality and enhancing patient safety. The result concurs with Wu et al. (2010) findings that have demonstrated the positive outcomes of replacing alphanumerical pagers with smartphones.^[16] Smartphones allow safe, straight away and reliable transmission of patient information without waiting for physicians call back^[41] therefore they have the potential to prevent some of the typical communication errors. Smartphones can convey comprehensive information and reminders for follow-up on actions, which is an advantage over other concurrent devices such as pagers. Handoffs between providers can be facilitated through exchanging information in smartphones, providing an external representation of the knowledge shared between providers.

Based on our results, the majority of participants evaluated smartphones as a successful device for transferring clinical conversations. Clinical smartphones, thanks to their user friendly interface and their market acceptance, can be easily used by clinicians after a modest training.^[42] However, by the increase of experience, the resistance toward using smartphones for clinical communications and the need for training on the gadget increases.

According to the study, information transfer, effective integration of patient care communication with other patient information systems, and improved knowledge sharing and learning make smartphones an indispensable communication and coordination device in healthcare. It seems smartphones can be adapted as the main communication conveyer in clinical areas. Currently smartphone use is confined to the hospital or clinic area, due to security and information bridge risks. It is expected by facilitating secure connection outside hospitals, communications through smartphones, would become more efficient and effective than before.

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CONFLICTS OF INTEREST DISCLOSURE

The author declares no conflicts of interest.

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