

Sociotechnical analysis of nurses' use of personal mobile phones at work



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ABSTRACT

Background: Nurses' use of personal mobile phones at work is a growing trend in healthcare organizations. Although recent studies have explored the positive and negative implications of nurses using personal mobile phones at work, none has yet analyzed the interactions of sociotechnical components (users, technology and policy) on nurses' use of personal mobile phones at work.

Objectives: Identify sociotechnical interactions by analyzing each sociotechnical component (users, technology and policy) that affects nurses' use of personal mobile phones at work.

Methods: In-depth interviews were conducted with 30 nurses employed in 13 hospitals in the Philippines. The respondents include staff nurses ($n = 23$), charge nurses ($n = 4$), and nurse managers ($n = 3$). Staff nurses were asked on their use of personal mobile phones at work, while charge and nurse managers were asked on their observations regarding staff nurses' use of personal mobile phones at work. Responses were analyzed qualitatively using sociotechnical analysis.

Results: Sociotechnical analysis indicated that staff nurses used their personal mobile phones at work in various ways because its use helped in their nursing work, but inevitably altered a few of their routines. Although most hospitals had policies that prohibit the use of mobile phones, staff nurses justified their use of personal mobile phones by using it for work purposes and for the benefit of their patients. Staff nurses highlighted the absence of hospital-provided mobile phones as a key reason for using personal mobile phones at work. Charge nurses and nurse managers also influenced staff nurses' use of personal mobile phones at work.

Conclusions: Nurses could use their personal mobile phones at work for work purposes to enhance their clinical performance and improve patient care. Hospital administrators can leverage on nurses' use of personal mobile phones at work by formulating policies that consider both the benefits and potential drawbacks of mobile phone usage. Recommendations are made for the formulation of hospital policies to optimize the use of personal mobile phones of nurses at work.

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1. Introduction

Mobile phones are one of the most indispensable devices in the world. As of September 2016, more than 7.8 billion mobile phone subscriptions have been recorded from at least 4.7 billion unique subscribers globally [1]. Today, a growing body of evidence shows that nurses, the largest group of healthcare professionals [2], use personal mobile phones at work. For example, a survey of 241 US nurses shows that 88% use smartphone apps at work, while 69% use their devices for staff communication [3]. Similarly, 80% of nurses

and midwives in the UK report that they use their mobile phones for work purposes [4]. Moreover, a number of empirical studies suggest that personal mobile phones are used by nurses at work to conduct information search and to communicate with members of the healthcare team [5–7].

Nurses' use of personal mobile phones at work for work-related purposes has potential to improve clinical work [5–8]. However, several studies have identified drawbacks that could cause healthcare organizations to develop policies that prohibit the use of mobile phones. These include nurse distraction [8–10], infection control concerns [11–13], patient privacy, and confidentiality breach [10]. Despite the presence of empirical studies regarding the pros and cons of nurses using personal mobile phones at work, in-depth scholarly investigation is necessary to understand how and why they use it at work. Moreover, examining how such usage

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is related to existing hospital policies is crucial. Such results are important for healthcare organizations to develop sound policies that can enable them to capitalize on nurses' use of personal mobile phones while reducing drawbacks associated with such usage. Theoretically, the results of our study will contribute to the growing body of literature on the effects of personal mobile phones to healthcare organizations, particularly in an Asian context, such as the Philippines.

1.1. Sociotechnical analysis of health information technologies

The phenomenon of personal mobile phone use of nurses at work is an ideal case for sociotechnical analysis (STA) in a healthcare setting. STA refers to the analysis of the interactions between sociotechnical components, such as users (e.g., staff nurses), technologies (e.g., personal mobile phones), and policies (e.g., existing hospital memos and guidelines) [14]. The premise of STA is to consider the interaction of health information technology (HIT) with the social systems in a healthcare organization [14,15]. Previous studies show that conducting STA is useful for understanding how proposed HITs can be optimized to enhance service delivery [13,15]. Performing STA is also critical to uncover unintended consequences of HIT use that could improve policies that govern its use [16,17].

Historically, STA has been used to understand HITs that were deployed or initiated by healthcare organizations. Several of these HITs include electronic medical records [14,15,18] and patient care information systems [19,20]. However, with the growing use of personal mobile phones at work among nurses, our study provides a unique application of STA as we focus on an HIT that the hospital has not initiated nor provided. This notion is interesting because these devices are actually meant for personal use but are now being used for work purposes. Therefore, the reasons and motivations for mobile phone usage need to be clarified. The personal nature of this technology also presents several policy challenges, as hospitals may not have full control and accountability to this technology. By examining STA components (i.e., users, technology and policy) and uncovering their interactions, this study will provide a rich description of how and why nurses use personal mobile phones in hospitals with different policies. Overall, this study aims to answer the following research question: *How do the interactions of sociotechnical components (users, technology and policy) affect staff nurses use of personal mobile phones at work?*

2. Methodology

Past STA studies primarily utilized qualitative research methods, particularly through in-depth interviews with multiple stakeholders [14,15]. In July 2015, in-depth interviews were conducted with nurses working in tertiary hospitals in Metro Manila, Philippines. The Philippines is an ideal context for this study because the country has a severe shortage of hospital-hired nurses because most nurses prefer to work overseas [21,22]. In addition, most hospitals in the Philippines lag behind the deployment of HITs [23], which could increase the likelihood of nurses using their personal mobile phones for communication and information seeking at work. Thus, conducting the study in a low-resource country such as the Philippines is interesting as we can see how personal mobile phones are used to compensate for the lack of manpower and technology of hospitals. Among various regions in the Philippines, Metro Manila was selected because this is the country's capital and it is where the majority of hospital organizations that provide employment to nurses are located [23].

Interviewees were selected through a series of qualitative sampling methods. We initially developed inclusion criteria where an interviewee should be at least 21 years old and has worked as a

registered nurse in a government or a private tertiary hospital in Metro Manila for at least a year. Subsequently, prospective interviewees were invited through our professional network including interviewee referrals. Prior to field deployment, this study received ethical clearance from the institutional review board of Nanyang Technological University.

Overall, in-depth interviews were conducted with 30 nurses from six government and seven private tertiary hospitals. To acquire different viewpoints, we interviewed various nurses, such as staff nurses (SN, $n = 23$), charge nurses (CN, $n = 4$), and nurse managers (NM, $n = 3$).¹ To obtain variation in responses, we interviewed nurses working in various hospital areas, such as operating theaters, medical wards, emergency departments, and so on (Appendix A provides a complete list of the interviewees and their profile).

Personal interviews were conducted instead of focus group discussions so that participants could freely disclose information privately [24]. Verbal and written consents were acquired before the start of each interview. Semi-structured interviews were performed and interviewees were asked open-ended questions developed in consideration of previous studies on STA of HITs. Aside from demographic questions, we asked questions related to the three aspects of STA, namely, (1) use of personal mobile phones at work, (2) mobile phone technologies provided by the hospital for nurses, and (3) hospital policies related to personal mobile phone use at work. Instead of their use of personal mobile phones, we asked charge nurses and nurse managers on their observations of their staff nurses' use of personal mobile phones at work. Any notable remarks by the interviewees were explored further using probing questions. The interviews were conducted using a mix of English and Tagalog (widely used Filipino language) to allow interviewees to communicate their thoughts clearly. Interviews lasted for an average of 25 min. Follow-ups were conducted to clarify ideas conveyed by several nurses during the interview.

Two research assistants fluent in English and Tagalog produced verbatim transcriptions of the interviews and translated them into English. A qualitative data analysis software (Nvivo10) was used to analyze our interview transcripts. Following the recommendations of Ellison and colleagues [26], we performed a systematic line-by-line coding of each transcript based on a combination of *a priori* codes (i.e., predefined) and new codes emerging from the data. *A priori* codes were derived from the three components of sociotechnical analysis (i.e., users, technology and policy) and were used as preliminary codes. Within each *a priori* code, new codes were developed in the form of referential codes, such as "staff communication," "motivation of use," and "social observation". Breaking down the data facilitated the identification of emerging themes within each component [26]. During the entire coding process, we conducted routine discussions to identify and agree on major themes, and examined the ways these themes vary from one case to another in consideration of the characteristics of the interviewees.

3. Results

3.1. Characteristics of staff nurse interviewees

Prior to the discussion of the user, technology, and policy components of personal mobile phone use by staff nurses at work, we need to understand the characteristics of the staff nurse interviewees as well as details of their work background. Table 1 provides the basic profile of the staff nurses in this study.

¹ A staff nurse is in the frontline of providing direct nursing care to patients in a healthcare facility. A charge nurse serves as the team leader among several staff nurses working in a particular shift. A nurse manager is responsible for overseeing personnel and budget matters for one or two nursing areas [25].

Table 1
Profile of staff nurses ($n = 23$).

Profile	Values
<i>Demographics</i>	
Average age (range)	26.57 (23–45)
Female, (%)	13 (57%)
<i>Work background</i>	
Private hospital (%)	16 (70%)
Government hospital (%)	7 (30%)
Average years employed (range)	2.5 (1–5.5)
<i>Technographics</i>	
Smartphone users (%)	22 (96%)
Owens more than one mobile phone (%)	6 (26%)
Average years of mobile phone ownership (range)	11.87 (5–16)
Average years of smartphone ownership (range)	4.75 (0.7–8)
Postpaid subscription (%)	12 (52%)
Average monthly mobile phone expenditure in USD (range ^a)	23.40 (4.41–57.34)
Connects to mobile internet (3G/4G) (%)	19 (87%)

^a Converted from Philippine Peso (PHP). Exchange rate on July 20, 2015 is USD 1 = PHP 45.34.

Generally, most staff nurse interviewees were in their mid-twenties ($M = 26.57$) and the difference between the number of males ($n = 10$) and females ($n = 13$) was relatively small. Majority of the respondents were employed in private hospitals (70%) and have been working for 2.5 years on average.

In terms of mobile phone ownership, majority owned a smartphone ($n = 22$), and only one used a feature phone.² Six staff nurses owned two mobile phones. Most respondents have owned a mobile phone for more than a decade on average ($M = 11.87$ years), while those with smartphones owned one for 4.75 years on average. Moreover, little difference was noted between the number of prepaid ($n = 11$) and postpaid subscribers ($n = 12$). On average, their monthly mobile phone expenditure was USD 23.40.

Outside work, staff nurses used their personal mobile phones extensively. About 87% used their mobile phones to connect to the Internet via 3G or 4G connection. They frequently utilized their mobile phones for various activities, such as social media (e.g., Twitter, Facebook, Instagram, 91%), SMS (87%), Internet browsing (87%), mobile instant messaging (e.g., Viber, Line, and Facebook Messenger, 78%), video watching (e.g., YouTube, Facebook videos, 65%), and music playback (61%). Less than half use emails frequently (48%).

3.2. Sociotechnical analysis: user component

3.2.1. Positive attitudes on personal mobile phone use at work

Most of the staff nurses held positive attitudes towards the use of personal mobile phones at work because the devices are deemed as helpful technology. This belief is based on the premise that mobile phones are used for work purposes and not for personal use. Staff nurses indicated various ways to describe the helpfulness of mobile phones. Given that most of the staff nurses handle multiple patients at the same time, using their personal mobile phone was a means to perform tasks faster. “Instead of looking for the attending physician, I can just use my smartphone to contact him. Even if he is just within the hospital, looking for him is time consuming. If I use my smartphone, on the spot, I can reach him immediately” [SN23].

Aside from time saving, personal mobile phones were seen as portable devices that were easy to use especially when seeking information relevant to work. “Although we have a list of

medications on MIMS [a drug reference book], using the mobile phone to search for [generic] name or even brand name. . . or if you have [nursing] procedures that you don’t know. . . even the preparations. . . you can easily find it using mobile Internet” [SN16].

Beyond the help that these devices provide, one staff nurse looked at her personal mobile phone as a necessity for work. “It is a necessity, we panic when the patient is about to die and the relative of the patient is nowhere to be found. It is a necessity to call the relative. If not, they won’t know that the patient is already dying” [SN17]. Others viewed the device as a way to maintain a professional image with their patients. “One time, a patient asked about his condition and how significant his lab values were. Of course, I am not knowledgeable on everything and I do not remember everything. Hence, I excused myself to go outside the room pretending to look at his chart, but what I did was immediately do a search on Google” [SN4]. Moreover, several respondents attributed using their devices for the best interest of the patient. “If we can communicate much faster with the physician, the faster our response to the patient. We avoid delays in the procedure to the patient. . . the less risk of harm to the patient” [SN2].

Staff nurses may also have a positive attitude towards the use of personal mobile phones because their colleagues at work also frequently use this technology. Staff nurses noted that the use of personal mobile phones at work is prevalent among members of the healthcare team, including fellow staff nurses, nursing supervisors (e.g., charge nurses and nurse managers) and physicians. “I also see my [nursing] supervisors using their [personal mobile] phones at work, while on duty” [SN22]. Some of these nurses even characterized using personal mobile phones at work as a daily routine. “It’s like normal. Nowadays, everyone, like doctors and nurses, use their [personal mobile] phone anytime and anywhere [in the hospital] [SN18].

3.2.2. Negative attitudes on personal mobile phone use at work

Although the use of personal mobile phones helped nurses in their work, the usage involved a certain level of personal cost to all staff nurses, as their mobile phone expenditure was not covered by the hospital. “It’s awful. It feels so bad that you need to use your own resources to carry out what should have been a hospital expense” [SN8]. However, for most interviewees, the benefit was far greater than the cost associated with its use. This benefit is primarily in the form of relief that tasks, such as updating the physician on their patients’ status and searching for clinical information, can be accomplished within a short period of time. “I want to finish the task [informing the physician about patient updates] and have no worries” [SN1].

Aside from cost-related issues, a few staff nurses perceived several negative implications of its use as being a source of distraction at work. “While inserting an intravenous line to the patient, my phone suddenly rang because someone was calling me. . . it is quite distracting” [SN13]. For charge nurses and nurse managers, the distraction was far beyond the usual sudden ringing of mobile phones as they have caught staff nurses playing mobile games, engaging in social media (primarily Facebook), and making personal calls and texts while on duty. For charge nurses and nurse managers, using personal mobile phones can negatively affect work and compromise patient care. “It’s a distraction. One time, a patient was vomiting and my staff nurses were still looking at their FB [Facebook]. They were not attentive to the patient, and that was really a distraction” [CN3].

Previous studies have also associated mobile phone use in hospital settings with infection control concerns [11–13]. However, interviews with staff nurses showed that they have little concern with the potential of mobile phones causing infections to patients. Interestingly, several staff nurses assigned in operating theaters noted no prior incident of patient infection caused by the use of

² Feature phones are mobile phones capable of sending/receiving text messages and performing calls. Smartphones have additional features, such as touch-screen interface, camera recording, audio/video playback, and internet connectivity through Wi-Fi or 3G/4G connection [27].

Table 2
Comparison of usual and altered routines per activity domain.

Activity domain	Usual routine	Altered routine after personal mobile phone use	Sample quotes
<i>Domain 1: Communication</i>			
–Inform patient updates to members of the healthcare team	Inform them face-to-face. Use the hospital's paging system.	Send text messages via SMS or mobile instant messaging apps. If urgent, call them. Sometimes send relevant images via instant messaging apps.	"If the patient undergoes code blue [cardiopulmonary arrest], we just text or call doctors instead of looking for them" [SN14].
–Inform relatives on the status of patient	Inform the relatives face-to-face.	Send SMS text messages. If urgent, call them.	"In the ICU [Intensive Care Unit], patients are often unstable. The relatives are not always there so we need to call them if ever they would like a DNR [do not resuscitate] if the patient becomes unstable" [SN17].
–Communicate to a patient with a different language	Acquire the services of a hospital interpreter.	Use mobile translation apps.	"We cater international patients like Japanese patients who have difficulty speaking in English. I use Google Translate so that we can talk with them" [SN1].
<i>Domain 2: Information-seeking</i>			
–Search relevant information for patient care	Retrieve from memory. Consult colleagues. Look for reference books.	Search patient care information through mobile internet. Open clinical apps or e-books.	"I open my mobile data then search it [drug info] via google so I don't have to open books anymore" [SN19].
–Answer patient queries.	Retrieve from memory. Consult colleagues.	Search information through mobile internet or check mobile apps.	"Sometimes, patients ask 'where is the clinic of. . .' I just open our [hospital's] app then I show it to the patient. We don't really remember every detail so it helps" [SN2].
<i>Domain 3: Documentation</i>			
–Document a patient outcome or incident	Memorize the outcome/incident and take note in the patient's chart.	Use mobile phone to take a picture of the outcome/incident as a reference.	"We are referred to some patients for skin tests. If the doctor is busy, we take a picture of the [result of the] skin test" [SN12].
–Check details on relevant patient forms.	View the form physically. Will have to wait if someone is using it.	Acquire a digital copy of patient forms by taking a picture via mobile phone.	". . .the admitting sheet needs to be returned to the admitting officer so we don't have a copy. We just take a picture of it using our cellphone so we can carry-out the orders in it" [SN18].

their personal mobile phones. Most staff nurses also noted that using personal mobile phones at work is not a problem as long such devices are used in non-sterile areas. However, NM3, a member of the infection control committee of a hospital, was worried about the use of personal mobile phones in hospital premises because she believed that very few staff nurses regularly washed their hands after using their mobile phones.

3.2.3. Altered routines

Staff nurses used their personal mobile phones at work for work-related purposes in various ways that have inevitably altered their routines. Generally, alterations occurred on three activity domains, namely, communication, information seeking, and documentation. Table 2 provides specific ways on how staff nurses have altered their usual routines by using their personal mobile phones.

Among the three activity domains, staff nurses mostly used personal mobile phones to communicate with members of the healthcare team or with the patients and their relatives. Traditionally, such communication activities are conducted face-to-face. However, with the increasing use of personal mobile phones at work, members of the healthcare team use them frequently as an efficient means of communication. Others used their mobile phones to communicate with relatives of patients especially during emer-

gencies. To some extent, SN1 even used his personal mobile phone to translate the words of his foreign patient.

After communication, personal mobile phones were used to seek information. Previously, staff nurses tend to ask colleagues or consult a reference book in their work area. Although several staff nurses would still perform these actions, other staff nurses preferred to search information immediately through their personal mobile phones. Respondents often searched for a wide range of information like clinical diagnoses, medication details (e.g., dosage, action, and side effects), and relevant nursing procedures on Google or through clinical mobile applications (e.g., WebMD and Medscape). Compared to asking a colleague for information, several respondents perceived that searching for information on their own was more accurate and reliable. The need for timely information was crucial for staff nurses because they were constantly faced with uncertainties that may affect the level of care they provide patients: "In some cases, we encountered unfamiliar diseases of patients. I find my mobile data [Internet] useful because I can search for that disease, [nursing] interventions to consider, medications, and prognosis" [SN22]. Finally, personal mobile phones were handy when patients have questions, particularly on hospital directions.

Another way that personal mobile phones were used at work is through documentation particularly by using the camera of the

device. Specifically, several staff nurses used their mobile phone's camera to document patient outcomes or incidents, such as X-ray films, bloody sputum, or skin test results. Others have also used it to improvise a digital copy of the patient documents (e.g., patient's chart or admission sheet). Among the three activity domains associated with personal mobile phones, this use is considered the most problematic because of considerable privacy concerns. Asked on how to deal with potential privacy issues associated with these pictures, some staff nurses noted that they usually delete such images after its purpose has been fulfilled. "It is actually illegal to do that [take a picture of patient forms] because it is personal data and confidential. It was a matter of convenience. Instead of writing, we take a picture of it. After carrying out the order, I deleted the photo because I no longer have any use for it" [SN19].

3.3. Sociotechnical analysis: technology component

3.3.1. Hospital provision of mobile phones

In most cases, staff nurses relied on their personal mobile phones (mostly smartphones) for staff communication and information seeking because majority of the hospitals did not provide Internet-connected computers or mobile phones. All nurses working in six government hospitals mentioned that their hospital did not provide such technology. On the contrary, nurses working in five out of the seven private hospitals reported that their hospitals provided them with shared mobile phones that they can use for work purposes. This situation is reflective of the distinction between private and government hospitals in the Philippines given that the former ascribes greater importance on allocating budgets for HITs than the latter.

Hospital-provided mobile phones were mostly feature phones rather than smartphones, which is expected because feature phones are cheaper than smartphones. Nurses described hospital-provided mobile phones through several terms such as "unit phone," "duty phone," or "service phone." Most nursing areas were usually given one mobile phone, which is shared among staff nurses and charge nurses working in a particular shift. It should be noted that it is rare for hospitals to give more than one mobile phone in a particular nursing area.

Several variations in the provision of mobile phones are found within a particular hospital. For example, although NM1 and NM3 mentioned that their hospital (Private3) provided each nursing area with a smartphone, SN16 mentioned that her area (emergency department) only has a feature phone. This situation was similar to another private hospital (Private5), where CN4, who works in a geriatric unit, uses a hospital-provided smartphone while SN23, who works in the operating theater, uses a feature phone. According to NM3, the type (i.e., feature phone or smartphone) and quantity of the hospital-provided mobile phone given per area may depend on the request made by the nurse manager(s). Nonetheless, the hospital covered the monthly expenses for these mobile phones through postpaid subscriptions to one particular telecom company.

3.3.2. Issues with hospital-provided mobile phones

In most cases, only one hospital-provided mobile phone was supplied in the work area of the staff nurses. Staff nurses in areas with a hospital-provided mobile phone noted that the device was used primarily by the charge nurse as his/her role often involves communication among various members of the healthcare team. Nonetheless, staff nurses preferred to use the hospital-provided phone rather than their personal mobile phones to avoid out-of-the-pocket expenses. Moreover, as per policy, nurses were required to use only the hospital-provided mobile phone for work purposes.

Although this situation may look straightforward, staff nurses still experienced several problems that force them to use their personal mobile phones to accomplish certain tasks. First, with one

hospital-provided mobile phone per area, staff nurses may not be able to use the device at the same time, especially when the number of available units is inadequate to the number of staff nurses on duty. "We need to use our own [mobile] phone for urgent referrals because we only have one unit phone and there are so many of us. . .like 28 to 30 nurses per shift" [SN23].

Second, charge nurses frequently use the hospital-provided mobile phone, and this situation causes some nurses to think that borrowing it would be inconvenient especially when critical patient information needs to be communicated urgently to members of the healthcare team. "The charge nurse always uses it [hospital-provided mobile phone] when I need it the most for referral. In that case, I just use my own mobile phone to finish the task" [SN10].

Third, because hospital-provided mobile phones were feature phones with functions limited to voice calls and text messaging, several nurses would opt to use their own smartphones to accomplish tasks that require the use of advanced features not available in hospital-provided mobile phones. "Some doctors want to see the patient's heart rate and rhythm through the cardiac monitor. I am not able to do that with our unit phone because it is not a smartphone. It is only a feature phone. Using my own smartphone, I can do that by taking a picture of the cardiac monitor screen and sending the image [to the doctors] via Viber [a mobile instant messaging application] because that's what doctors want" [SN11].

Finally, because all hospital-provided mobile phones were subscribed to one telecom company via postpaid subscription, sending text messages as well as making calls to mobile phones subscribed to another telecom company is prohibited because it may incur additional cost that is beyond the budget. "We have two unit phones for staff [nurses]. One is subscribed to Sun Cellular and the other to Globe Telecom. If the [hospital-provided] mobile phone that has a Sun number is used by someone else and we need to contact a mobile phone that has a Sun number, we cannot just use the Globe [hospital-provided] mobile phone because we have a directive that if it's Sun, use the Sun mobile phone as they are really concerned with overcharging. Because of that, we just use our own mobile phone if we cannot use the unit phone" [SN11].

3.3.3. Reducing the use of personal mobile phones at work

Despite issues associated with the use of hospital-provided mobile phones, the provision of having such phones could resolve the issue on the use of personal mobile phones at work by staff nurses. Accordingly, all staff nurses whose area does not have hospital-provided mobile phones would like to have one in their work area. "If the hospital could provide unit phones, it would be good for us so that we avoid using our own cell phones" [SN22]. According to NM2, the only time that staff nurses may completely avoid using their personal mobile phones at work will be when hospitals start providing them with such technology. Unless this situation happens, majority of the staff nurses expressed that they will continue using their personal mobile phones for work purposes, as these devices are helpful in their work.

In case their areas are given a hospital-provided mobile phone in the future, staff nurses would want a feature phone or a smartphone. A hospital-provided mobile phone in the form of a feature phone is enough for some staff nurses as their needs have more to do with performing calls and/or sending/receiving text messages. However, others believe that a smartphone is ideal because such device will allow them to use additional functions, such as access to mobile applications and information search via mobile Internet, which could help them in their work.

Although a hospital-provided mobile phone could reduce instances of personal mobile phone use at work, such provision may not fully eliminate personal use. Even in areas where a hospital-provided mobile phone is present, some interviewees suggested that the number of available mobile phones be increased because

the current number was insufficient for the number of staff nurses in their area. “Most of our staff nurses here use their own [mobile phone] because there’s only one [hospital-provided] mobile phone in the unit” [SN2]. Others would like to upgrade the hospital-provided phone to a smartphone so they can access relevant mobile applications. “It would be good to have a smartphone because it is touchscreen and we can use apps that are helpful to nurses” [SN16].

3.4. Sociotechnical analysis: policy component

3.4.1. Prohibitive policies on personal mobile phone use

Based on the interviews, 9 out of 13 hospitals had policies that prohibited nurses’ use of personal mobile phones at work. Among these nine hospitals, six had written policies as reflected in hospital memos or employee handbooks, whereas three hospitals instituted prohibitions through verbal orders issued by nursing superiors. On the contrary, nurses from four hospitals mentioned that their hospitals did not provide any written or verbal orders that prohibited the use of personal mobile phones at work. Nonetheless, majority of the staff nurses felt that their hospitals did not support their use of personal mobile phones at work because of the presence of prohibitive policies.

Various reasons justify the enforcement of prohibitive policies on the use personal mobile phones at work. For example, several nurses in private hospitals mentioned that policies on prohibitions on personal mobile phone use were driven by several complaints from patients. One staff nurse working in an emergency department shared her experience on this matter: “There is one issue involving an ER [emergency room] patient that complained because she was not properly attended by the resident physician. . . Since then, the hospital became strict with it [use of personal mobile phones] to the extent that the hospital will confiscate it if they saw you using your own cell phone at work. Because of this policy, we are always reminded not to use our cell phones at work” [SN16].

The growing ownership of smartphones has also increased the tendency among nurses to use their personal mobile phones for non-work purposes, which could serve as a distraction at work. All charge nurses and nurse managers shared this sentiment as they tend to observe this situation among their staff nurses. Such distraction can be caused by various mobile phone activities. A nurse from a hemodialysis unit in a private hospital shared the reason for the prohibition of personal mobile phone use, which resulted from mobile gaming at work: “Two months ago, our hospital released a memo that prohibits its use [personal mobile phones]. Once you are caught, you may be terminated. . . I think the reason for it is that the department [of nursing] saw some of the nurses playing CoC [Clash of Clans] at work.” [SN19].

Aside from mobile gaming, social media use at work triggers the prohibition of personal mobile phones at work. A charge nurse working in a geriatric unit of a private hospital shared that “Personal use of [mobile] phone is not allowed while on-duty. The use is clearly not allowed. The hospital management emphasizes that usage of the phone is a distraction when taking care of the patients. This prohibition is written in the policy handbook of the unit. Aside from that guideline, the management also released a memo that the personal use of mobile phones [at work], especially when using FB [Facebook] and Instagram, is not allowed” [CN4].

Regardless of whether complaints or issues on personal mobile phone use have occurred, others, particularly staff nurses employed in a private hospital (Private2), shared that their hospital has a code of discipline that prohibits the use of personal mobile phones. One staff nurse from that hospital shared that, “It is not allowed to be used [at work]. . . it’s in the code of discipline. . . as stated in our department manual. Every unit has their own manual. It is written that the use of mobile phones and electronic gadgets is prohibited during duty hours” [SN4].

Several private hospitals even direct their staff nurses to place their personal mobile phones inside a locker within the nurse station to ensure that mobile phone use does not occur during duty hours. “It [personal mobile phone use] is not allowed according to the hospital. It is written in our hospital policy and they provide us with a locker for cell phones, so it’s really not allowed [SN6].”

Compared to private hospitals where such policy was written in memos or employee handbooks, nurses working in government hospitals suggested that they do not have any written policies that prohibited their use of personal mobile phones. Nonetheless, such prohibitive policy was usually enforced through verbal orders of nursing supervisors. Nursing supervisors tend to have a high level of authority in the hospital and thus, most staff nurses in government hospitals make sure they are not caught using their personal mobile phones at work. “There’s no specific policy that you can’t bring your [personal mobile] phone inside your pocket. . . Just make sure that you won’t be caught [using personal mobile phone]. . . because it’s really not allowed by the [nursing] supervisor” [SN14].

Although most hospitals prohibit the use of personal mobile phones at work, a few staff nurses working primarily in government hospitals noted that their hospitals have not issued any policy on such matter. One staff nurse working in the intensive care unit of a government hospital shares that “There is no memo that says it’s allowed or not so we use it [personal mobile phone]. It is as if they do not care if we bring our phones or not. They are not strict with it” [SN17].

3.4.2. Degree of compliance with policies prohibiting the use of personal mobile phones

While most hospitals enforce a policy prohibiting the use of personal mobile phones at work, the degree of compliance among staff nurses varies according to several factors. A major factor related to its compliance is whether a hospital provided a mobile phone to staff nurses. In this case, staff nurses working in areas with a hospital-provided mobile phone relatively followed such policy. “I don’t use my personal phone to call staff nurses or communicate with doctors. I use the unit phone as much as possible” [SN10]. Meanwhile, nurses who were not given a hospital-provided mobile phone tended not to follow such prohibitions, resulting in the prevalent use of personal mobile phones at work. According to some interviewees, hospitals will have a difficult time to implement a prohibitive policy on personal mobile phone use without providing staff nurses with mobile phones. “Our hospital has limited technology. . . Although the hospital has rules that it [personal mobile phone] is not to be used, but if the nurse says that ‘I am paying the bill and I’m sending text messages to doctors and nurses.’ If you look at it, they are even doing the hospital a favor” [NM2].

Another crucial factor is the degree of tolerance of the supervisors of staff nurses. Several staff nurses shared that it really depends on how permissive their superiors are about personal mobile phone use. “They [nurse managers] are strict on using [personal] mobile phones at work. But if it is for work purposes and not FB [Facebook] or YouTube, it’s just ok for them” [SN4]. In cases where staff nurses are caught using their personal mobile phones for personal use, the usual punishment at the first instance is usually in the form of verbal reprimand by the charge nurse or nurse manager. Similarly, majority of the interviewed charge nurses and nurse managers mentioned that the personal use of mobile phones of staff nurses is not allowed at work, however if it is used entirely for work purposes (e.g., contacting doctors or searching for information on a new drug), they would permit it. “There are contradictions with the policy because the hospital provides limited technology. Today, we need faster communication for referral and everything. Hence, what nurses do is they use their [personal] mobile phones, but the hospital policy says that they should never use it while on duty. Therefore, a gap exists and so does a loophole. For me, what I do

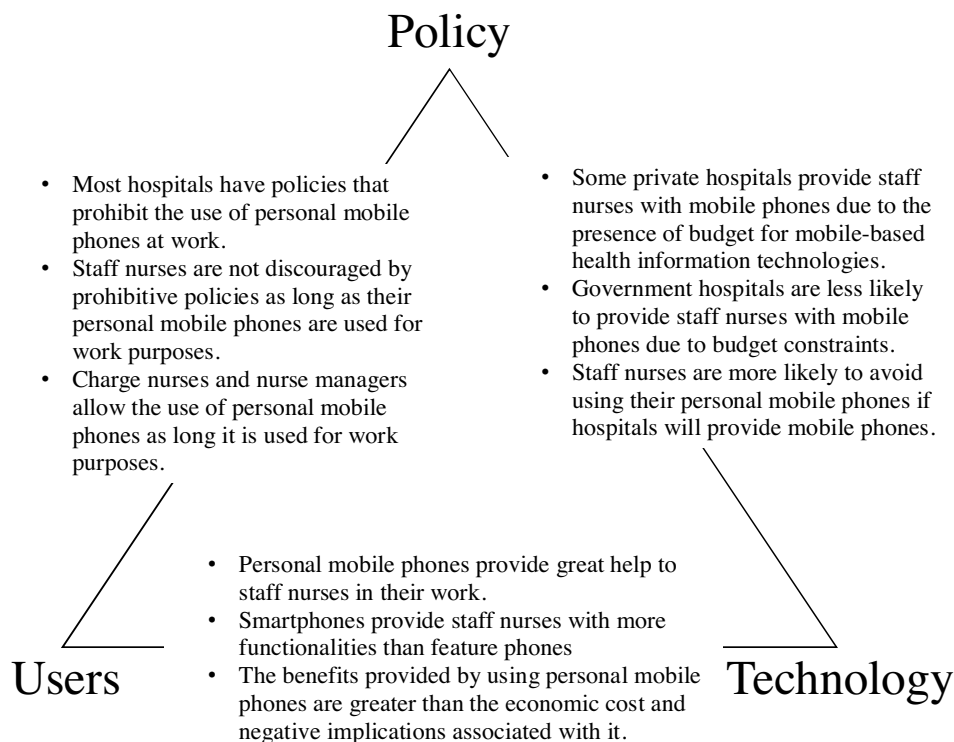


Fig. 1. Sociotechnical analysis of staff nurses' personal mobile phone use at work.

when it comes to that. . .because I am not very traditional, I allow them [to use it] as long as it is not for YouTube, it's ok" [NM2].

The way certain policies were communicated with staff nurses seems to affect the use of personal mobile phones. For several staff nurses, a "no mobile phone while on-duty" policy was described as "unclear," "unspecific," or "vague." This perception often leads to an interpretation that staff nurses can use their personal mobile phones as long as it is for work purposes, not for personal use, and does not bother patients. "That's [policy] quite vague. No phones allowed especially when you are about to take pictures of patients or take anything from the patient like voice record, pictures without any consent at all. However, we can use the [personal] mobile phone because we have to talk to some associates within the hospital. However, it's not really that not allowed" [SN1].

4. Discussion

4.1. Sociotechnical analysis of staff nurses' use of personal mobile phones at work

Our study provided rich insights into the intricate interrelationship of the three sociotechnical components (user, technology and policy) that affect the use of personal mobile phones by staff nurses at work. The summary of our sociotechnical analysis is shown in Fig. 1.

The interactions of user and technology components highlight the fact that personal mobile phones, despite being personal devices, are instrumental in the work of staff nurses and they are willing to carry the financial cost associated with such use. Similar to previous studies [5–7], we found that staff nurses actively used their personal mobile phones as a means to enhance staff communication and to immediately search for clinical information. Given the potential benefits of this technology to clinical work, this study also found that staff nurses' colleagues (e.g. fellow staff nurses, nursing supervisors, and doctors) also use personal mobile phones at work

purposes which tend create a normalizing effect on the use of such technology.

On the contrary, we found several negative implications associated with nurses' use of personal mobile phones at work. As in previous studies [5,6], personal mobile phones were used to take pictures for documentation purposes and this action could raise privacy and confidentiality concerns. Similar to the study of McBride and colleagues [8,9], our findings showed that personal mobile phones have been recognized to cause distractions, especially when used for personal reasons (for instance, mobile gaming, social media, making personal calls, and text messaging). Issues were also raised regarding infection control associated with mobile phone use at work.

However, despite the financial cost and negative implications associated with the use of personal mobile phones at work, staff nurses are eager to continue to use such technology. Based on the findings, staff nurses' use of personal mobile phones is a practical way to manage tasks effectively and efficiently despite being in a workplace that lacks relevant HITs that could support their work (e.g., hospital-provided mobile phones and Internet-enabled computers). As noted in previous studies [28,29], the use of personal mobile phones at work provides more benefits rather than disadvantages as long as the phones are used for work-related purposes. The risks associated with mobile phone use could also be mitigated with clear policies and adequate staff education.

Moreover, because majority of the staff nurses own smartphones that have superior function than feature phones (mobile phones often provided by hospitals), they can appropriate its advanced features (e.g., Internet browsing, image capture, and instant messaging) to their routines as needed, which somewhat altered their previous routines. Such technological appropriation highlights the control and power of staff nurses over their personal mobile phones that shape their practice as a nurse [30]. However, hospitals could limit the use of personal mobile phones if the hospital can provide mobile phones for work purposes. Based on our findings, staff nurses would avoid using their personal

mobile phones if they are given hospital-provided mobile phones at par with the models that nurses are currently using. As most staff nurses own smartphones, hospitals could provide them with smartphones instead of feature phones. However, another underlying factor is that the number of mobile phones provided may not be sufficient for everyone. Thus, providing an adequate number of shared mobile phones to nurses in a particular area should be considered.

In terms of the interaction of technology and policies, among 13 hospitals where the interviewees were employed, only five private hospitals provided staff nurses with mobile phones for work, whereas none of the government hospitals provided such device. Our finding is relatively similar to a study in Australia where only few healthcare professionals were provided with mobile phones by their hospitals [5]. Although mobile phones, particularly feature phones, are cheaper nowadays, related expenditures could be viewed as a burden unless a hospital has clear policies and sufficient budget on the provision of mobile-based HITs to nurses. In the Philippines, private hospitals could address such expenditure because they have more financial resources to adopt HITs [31]. Therefore, the use of personal mobile phones at work in government hospitals will likely to be more prevalent than in private hospitals. Furthermore, as government hospitals tend not to provide nurses with mobile phones, they may have more relaxed policies on its use compared to private hospitals. In contrast, private hospitals that provide nurses with mobile phones at work may strictly enforce policies prohibiting the use of personal mobile phones while on duty.

An analysis of the policy and user components indicates that policies governing nurses' use of personal mobile phones are generally on the negative side because the use of mobile phones is prohibited at work. In general, hospitals impose prohibitive policies on mobile phone use as a self-regulatory measure because no overarching national policy is implemented in the Philippines. Our findings indicate that such prohibitions were triggered by patient complaints along with incidents of distraction because of the personal use of mobile phones at work. Violations on the use of personal mobile phones were usually related to personal use at work. However, despite the present policies that prohibit its use, staff nurses and even their superiors (i.e., charge nurses and nurse managers) tend to justify using it for work-related usage as long as it can benefit patients. Although a relaxation on policies prohibiting the use of personal mobile phone among various healthcare staff is subject to debate among practitioners and scholars, previous studies have noted that a total ban on the use of personal mobile phones is difficult to impose because of its actual advantages and the manageability of the risks involved [28,29]. Therefore, existing hospital policies on the use of personal mobile phones by nurses at work should be reexamined for appropriateness.

4.2. Policy recommendations

Mobile phones can be of great assistance to nurses because this technology could enhance communication and information access among members of the healthcare team. However, clear policies on the use of mobile phones should be established to maximize advantages and control potential risks. Based on the results, we propose several recommendations for healthcare organizations when developing policies on the use of personal mobile phones at work:

1. Educate nurses on the responsible use of personal mobile phones at work. Educational sessions could be conducted to emphasize the advantages (e.g., improve staff communication and easy access to clinical information) and disadvantages (e.g., staff distraction and infection control concerns) on the use of personal mobile phones at work. If the hospital provides mobile phones to

nurses, emphasize the importance of its use over personal mobile phones (e.g., no need to spend own mobile phone credits).

2. Create a list of do's and don'ts on the use of personal mobile phones at work. For example, personal mobile phones could be used to access clinical information on the Internet. However, nurses should not be allowed to use the camera function of their mobile phones at work to prevent privacy and confidentiality breaches.
3. Subsidize a percentage of the monthly mobile phone expenses of nurses if the hospital does not plan to provide nurses with mobile phones. A fixed monthly allowance for mobile phone expenditures could be offered as an alternative.
4. Allocate a budget to provide each nursing area with a shared mobile phone and have it subscribed as a postpaid connection. The number of mobile phones to be allocated may depend on the number of nurses working per shift (e.g., one mobile phone per five nurses). A list of do's and don'ts on the use of such phone at work should also be provided.

4.3. Limitations and future research directions

Our findings should be balanced with its limitations. Although we attempted to gather a diverse set of nurses working in various hospitals, our findings are limited within the hospitals where our interviewees are working. Thus, we are unable to generalize our results to other hospitals in the Philippines. Future studies should focus on improving the generalizability of the research findings through a quantitative study of personal mobile phone use among nurses in the Philippines. Next, as hospitals tend to be complex organizations composed of multiple stakeholders, future research could gather data from patients, hospital executives, and/or allied healthcare staff (e.g., physicians, pharmacists, etc.) regarding their thoughts on nurses' use of personal mobile phones at work. Finally, as Berg [19] mentioned, a sociotechnical analysis of HITs should not be limited to interview data and should be supplemented with observational data. As such, future research could be directed towards performing on-site observation of the personal mobile phone use of nurses at work to validate the results of this study.

5. Conclusion

Despite its limitations, this study is among the first to account for the effects of sociotechnical components (user, technology and policy) on staff nurses' use of personal mobile phones at work in the Philippines. Based on sociotechnical analysis, personal mobile phones provide staff nurses with valuable help, despite prohibitions on its use in most hospitals. Similar to any HIT, using personal mobile phones for nursing work has certain advantages (e.g., enhanced communication and information seeking) and disadvantages (e.g., privacy concerns and work distractions). Nonetheless, these devices could be utilized to improve the work productivity of nurses as long as they are given clear and constructive guidelines. Finally, hospitals should re-evaluate their policies on nurses' use of their personal mobile phones at work by considering its benefits when used for work-related purposes.

Conflict of interest

The authors declare that there are no conflict of interest.

Author contributions

Bautista and Lin contributed to the conception and design of the study. Bautista conducted the interviews. Bautista and Lin performed data analysis. Bautista wrote the first draft of the

Summary Points

What was already known on the topic?

- Recent studies highlight nurses’ use of personal mobile phones at work.
- These studies are mainly descriptive and do not provide in-depth analysis of the phenomenon.
- Sociotechnical analysis is a useful framework to understand how health information technologies are used in healthcare organizations.

What this study has added to our knowledge?

- Nurses’ use of personal mobile phones at work involve the interrelationship of sociotechnical components such as users (staff nurses), technology (personal mobile phones), and policy (hospital policies).
- Results suggest that hospitals should consider revisiting their policies regarding nurses’ use of personal mobile phones at work.
- Sociotechnical analysis is a useful framework to examine nurses’ use of personal mobile phones in hospital settings.

manuscript. Both authors contributed to the final version of the manuscript.

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Appendix A. Interviewee profile

ID	Gender	Hospital	Work area	Interview date
<i>Staff nurses (n = 23)</i>				
SN1	Male	Private1	Medical-Surgical	20-Jul-15
SN2	Male	Private1	Endoscopy	20-Jul-15
SN3	Male	Private1	Endoscopy	20-Jul-15
SN4	Female	Private2	Medical-Surgical	20-Jul-15
SN5	Female	Private2	Maternal-Surgical	21-Jul-15
SN6	Female	Private2	Executive Health (Wellness)	21-Jul-15
SN7	Female	Private2	High Risk Unit (Communicable)	21-Jul-15
SN8	Male	Private2	High Risk Unit (Communicable)	21-Jul-15
SN9	Male	Private1	Operating Theater	21-Jul-15
SN10	Female	Private1	Operating Theater	21-Jul-15
SN11	Female	Private1	Post-Anesthesia Care Unit	21-Jul-15
SN12	Male	Private1	Post-Anesthesia Care Unit	21-Jul-15
SN13	Male	Government1	Emergency Unit	22-Jul-15
SN14	Female	Government2	Pediatric	22-Jul-15
SN15	Male	Government2	Respiratory	22-Jul-15
SN16	Female	Private3	Pediatric	23-Jul-15
SN17	Female	Government4	Emergency Department	23-Jul-15
SN18	Female	Private6	Intensive Care Unit	24-Jul-15
			Hemodialysis Unit	

SN19	Female	Private6	Hemodialysis Unit	24-Jul-15
SN20	Male	Government5	Obstetric Unit	24-Jul-15
SN21	Female	Government5	Emergency Unit	24-Jul-15
SN22	Male	Government6	Intensive Care Unit	25-Jul-15
SN23	Female	Private5	Operating Theater	26-Jul-15
<i>Charge Nurses (n = 4)</i>				
CN1	Female	Government2	Pediatric Intensive Care Unit	21-Jul-15
CN2	Male	Government3	Surgical	22-Jul-15
CN3	Male	Private4	Post-Anesthesia Care Unit	23-Jul-15
CN4	Female	Private5	Geriatric Unit	23-Jul-15
<i>Nurse Managers (n = 3)</i>				
NM1	Female	Private3	Clinical Information Technology	23-Jul-15
NM2	Female	Private7	Obstetric and Pediatric Unit	24-Jul-15
NM3	Female	Private3	Patient Safety Management	25-Jul-15

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