REGISTERED NURSES' USE OF PERSONAL COMMUNICATION DEVICES IN HOSPITALS

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DEDICATION

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ABSTRACT

Personal communication devices such as basic cell phones, enhanced cell phones (smartphones) and tablet computers provide users instant access to a wealth of electronic media such as the Internet, email, and instant texting. In hospitals the potential distraction of personal communication devices could be particularly hazardous. However, the extent of this issue is unknown. The purpose of this study was to (1) determine the frequency of personal communication device (basic cell phones, enhanced cell phones (smartphones) and tablet computers) use among hospital registered nurses, and (2) to identify the concerns and opinions among hospital registered nurses regarding personal communication device use on in-patient units.

In March 2014 a previously validated 30-question survey was emailed to the 10,978 members of the Academy of Medical Surgical Nurses. There were 825 respondents who met the inclusion criteria.

The use of a personal communication device while working was reported by 78.1% of respondents. Sending personal emails and text messages while working was acknowledged by 38.6% of respondents. Nurses reported shopping on the Internet (9.6%), checking/posting on social networking sites (14.3%) and playing online games (6.5%) while working.

Safety concerns were expressed by 87.2% who believe that personal communication devices on a nursing unit are a serious distraction and 69.5% who believe that personal communication devices in hospitals have a negative on patient care. Registered nurses reported that distraction by their personal communication device had negatively affected their performance as a nurse (7.4%), that they had witnessed another registered nurse negatively affected (70.9%); that they had missed important clinical information (4%), that they had witnessed another registered nurse miss important clinical information (29.9%), that they had made a medical error (0.8%) and had witnessed another registered nurse make a medical error (13.1%) as a result of their use of a personal communication device.

This study suggests that the majority of registered nurses believe that personal communication device use on hospital units raise significant safety issues. There is a need for further study of this issue and to establish a consensus on the appropriate use of personal communication device while working in hospitals.

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CHAPTER 1. INTRODUCTION

As hospitals increasingly become electronically rich environments, clinicians are starting to be confronted by electronic distraction as a new problem in health care. The rapid innovations in personal communication devices such as basic cell phones, enhanced cell phones (smartphones) and tablet computers are placing new demands on cognitive processing and especially attention allocation of registered nurses. These innovations could have significant consequences on patient care. The distraction by personal communication devices has the potential to lead to substandard patient care or even physical harm to hospitalized patients. Initiatives to identify and prevent problems with distraction from personal communication devices on nursing units are needed, but empirical research to support such initiatives is lacking. As a first step, the present study will determine registered nurses' perceptions of how the presence of personal communication devices on in-patient hospital units is impacting patient care.

Personal Communication Devices in Hospitals

Personal communication devices (basic cell phones, enhanced cell phones [smartphones] and tablet computers) have become central to the lives of healthcare professionals. They help them fulfill tasks both at home and at work. These electronic tools provide users instant access to a wealth of electronic media such as the Internet, email, and instant texting. The benefits of these devices to healthcare providers are numerous, including instant access to medical references, clinical tools and patient information (Baumgart, 2011). They are used for consultation (Divall, Cammosso-Stefinovic & Baker, 2013), documentation (Yeung, Kapinsky, Granton, Doran & Cafazzo, 2012; Huff, 2011) and patient education (Shepherd, Badger-Brown, Legasic, Walia & Wolfe 2012). Applications have been created for many medical specialties (Dala-Ali, Lloyd, & Al-Abed, 2011; Elias, Fogger, McGuinness & D'Alessandro, 2013; Franko, 2011; Jensen et al., 2013; Sohn et al., 2013; Zuo, Guo & Rao, 2013).

Notwithstanding the many advantages for clinicians and patients, little is known about the potential of these personal communication devices to distract clinicians in in-patient settings. Studies in the aviation and vehicle traffic safety areas have reported unfortunate outcomes for individuals who multitask using mobile phones

(Asbridge, Brubacher & Chan, 2013; Byington & Schwebel, 2013; Consumer Reports, 2011; Klauer et al., 2014; Nasar & Troyer, 2013; National Highway and Traffic Safety Administration [NHTSA], 2012). These negative consequences occurred even when drivers used hands-free devices (Dula, Martin, Fox & Leonard, 2011; Strayer et al., 2013).

In addition to work-related electronic device use, there is an ever-increasing number and diversity of recreational sites available including videogames, gambling and social networking. Previous research has reported that personal Internet use during working hours is increasingly common and that a majority of workers, regardless of age or occupational status, report using personal communication devices to engage in non-work related Internet use in the workplace (Black, Light, Paradise Black & Thompson, 2013; Coker, 2011; Lim & Chen, 2009; Mastrangelo, Everton & Jolton, 2006; Prasad, Lim & Chen, 2010; Vitak, Crouse & LaRose, 2011; Ozdalga, Ozdalga & Ahuja, 2012).

A 2012 survey conducted by OR Manager magazine describes the hazards of distraction as common (Patterson, 2012). More than half of the 112 operating room managers reported that they had received reports of an operating room clinician being distracted by a personal communication device during patient care. In addition, 41% reported that they had "personally witnessed distracted behavior" (Patterson, 2012, p. 6). Six of the study participants indicated that the use of a personal communication device was linked to an adverse event during surgery at their facility, including one wrong site surgery. Additional instances of digital distractions cited in a December 2011 New York Times article include a registered nurse checking airfares during surgery and a neurosurgeon using a wireless headset to make personal calls during an operation. In the latter case, it was contended by the lawyer for the patient who was left partly paralyzed, that mobile phone use distracted the neurosurgeon during the operation. The case was settled out of court (Richtel, 2011).

Health care organizations are starting to take notice of the hazards of distraction that personal communication devices can create. The ECRI Institute (previously the Emergency Care Research Institute), a non-profit organization that uses applied scientific research to improve patient care, publishes an annual top ten-technology hazards list. "Caregiver distractions from smartphones and other mobile devices" is ninth on the list of

the top ten health technology hazards for 2013 (ECRI, 2012, p. 21).

Concern about distraction resulting from the use of cell phone technology in operating rooms led the American College of Surgeons to issue a position statement (ST-59) to guide surgeons in the use of these devices. The statement describes, "the undisciplined use of cellular devices in the OR—whether for telephone, e-mail, or data communication, and whether by the surgeon or by other members of the surgical team—may pose a distraction and may compromise patient care" (American College of Surgeons [ACS], 2008, p. 1). The American Association of Nurse Anesthetists also issued a position statement in June 2013 stating, "Any inattentive behavior during a procedure, such as reading, texting, gaming or using mobile devices to access nonclinical content, should be considered a potential patient safety issue" (American Association of Nurse Anesthetists [AANA], 2013, p. 2). Other professional organizations that have begun developing guidelines and educational programs on the issue of electronic distraction include the Association of PeriOperative Registered Nurses [AORN] (2011) and the American Association of Orthopaedic Surgeons [AAOS] (2012).

Nursing organizations are developing guidelines for using electronic media at work. The National Council of State Boards of Nursing (NCSBN) has published guidelines for the use of social media by registered nurses (National Council of State Boards of Nursing [NCSBN], 2011). The American Nurses Association (ANA) also revised its code of ethics to include social media (Prinz, 2011). Sigma Theta Tau, the honorary nursing association, also published a book in 2011 which devoted a chapter to guidelines on problems associated with the use of electronic media (Fraser, 2011). Internationally, the Royal College of Nursing in the United Kingdom wrote recommendations on using electronic media appropriately (Royal College of Nursing, 2009), and Canada has also issued legal advice on nurses' use of electronic media from a regulatory perspective (Anderson & Puckrin, 2011).

Statement of the Problem

Despite the availability of personal communication devices in clinical areas and the awareness of potential risks associated with using these devices, little is known about the effect of personal communication device use by registered nurses on the care of hospitalized patients. Research investigating the effects of

personal communication devices on the quality of patient care in hospitals is not abundant. The research that does exist is not nursing focused. Further investigation is warranted to determine the concerns and opinions of registered nurses about the effect of personal communication device use by registered nurses on the care of hospitalized patients.

Purpose of the Study

The purpose of this study was to identify concerns and opinions among registered nurses about the effect of personal communication device use by registered nurses on the care of hospitalized patients. This study is exploratory in nature and has two main objectives.

Research question 1. What is the frequency of personal communication device (basic cell phones, enhanced cell phones (smartphones) and tablet computers) use among hospital registered nurses?

Research question 2. What are the concerns and opinions among hospital registered nurses regarding personal communication device use on in-patient units?

Personal Communication Device Defined

For the purposes of this study, a personal communication device is defined as a wireless handheld device owned by an individual which can make and receive telephone calls or which provides a connection to the Internet via email, text messaging, video-conferencing and social networking software (Wallace, Clark & White, 2012). This definition includes cellular phones, smartphones, and electronic tablet computers, but excludes desktop computers, pagers or any company provided device.

Significance of the Study

This study is significant because the use of personal communication devices by registered nurses has the potential to affect the safety and quality of care of hospitalized patients in the United States. Studies are needed to inform the development of guidelines and policies that affect nursing practice.

Theoretical Framework

Goldhaber's theory of the attention economy is the framework which will be used for this study. In theories of the attention economy, attention is a scarce resource which allows it to become an economic medium

to which the axioms of market economics can be applied (Terranova, 2012). Scarcity is the condition that gives rise to an economy, the 'attention economy'. Attention is a scarce resource because 'the sum total of human attention is necessarily limited and therefore scarce" (Goldhaber, 2006, para. 26). According to Goldhaber

> "By the Attention Economy, then, I mean a system that revolves primarily around paying, receiving and seeking what is most intrinsically limited and not replaceable by anything else, namely the attention of other human beings" (Goldharber, 2006, p. 2).

The attentional assemblage of brain, electronic media and personal communication devices is a costly one for the efficiency of thinking (Trafton, Altmann, Brock & Mintz, 2003). According to one theorist,

> "The Internet is an interruption system. It seizes our attention only to scramble it. … The penalty is amplified by what brain scientists call switching costs. Every time we shift our attention, the brain has to reorient itself, further taxing our mental resources. Many studies have shown that switching between two tasks can add substantially to our cognitive load, impeding our thinking and increasing the likelihood that we'll overlook or misinterpret important information. On the Internet, where we generally juggle several tasks, the switching costs pile ever higher" (Carr, 2010, para. 17).

The attention economy and its attendant task switching costs result in the reconfiguration of the attentive capacities of the subject in ways that constitute attention as a scarce, and hence a valuable resource, while also producing an impoverished subject (Ophira, Nass & Wagner, 2009).

The economic subject of attention as it is drawn by theories of the attention economy is not only a matter of what the individual does when accumulating or spending one's limited stock of attention, but a question of the degradation of the individual's capacity to pay attention as the cost incurred by being constantly plugged into the assemblages of media. This study will use Goldhaber's theory of the attention economy to investigate issues of cognitive control and attentional allocation associated with personal communication device use by registered nurses on the care of hospitalized patients.

Implications for Nursing Research, Practice, and Policy

The results of this study can guide the development of hospital policies concerning personal communication use on hospital units as well as future investigations of the clinical implications of hospital registered nurses' use of personal communication device technologies. Many healthcare organizations are developing management strategies that address the ways in which personal communication devices can be used on hospital units. Empirical evidence on the use of these devices is needed to inform institutional policies about how personal communication devices can be used while working. An important first step is to identify the concerns and opinions among registered nurses about the effect of personal communication device use on the care of hospitalized patients.

The number of personal communication devices in use around the world is expected to reach 2 billion by the end of 2015. Policies that address employee-owned devices at work are being established in many work areas, including hospitals. These policies outline acceptable use which attempts to balance personal use of electronic media and workplace productivity. There are many questions that healthcare organizations are addressing which require a fuller understanding of present use and issues surrounding personal communication devices on hospital units.

CHAPTER 2. REVIEW OF THE LITERATURE

Distraction in Real World Settings

Research on distraction in real-world settings began with cell phones and driving. The relationship between motor vehicle accidents and distraction due to cell phone use was first reported by Redelmeir and Tibshirani in 1996. They found that drivers who use a cell phone while driving are four times more likely to get into an accident as those who do not (Redelmeier & Tibshirani, 1997). Since then many studies have confirmed the relationship between cell phone use and motor vehicle accidents (Cooper et al, 2003; Horrey, Lesch & Garabet, 2009; McEvoy et al., 2005; Strayer, Watson & Drews, 2011). According to the National Highway Traffic Safety Administration, 20% of crashes that resulted in injuries in 2009 involved driver distraction, and personal communication devices were implicated in 18% of deaths resulting from distracted driving (U.S. Department of Transportation, 2011). Often drivers were in denial about their reduced driving abilities and continued to drive even when their driving ability was impaired, or they recognize the increased risk of talking on a cell phone and driving, but continued to do so because of an inability to control their cell phone use (Lesch & Hancock, 2004; McEvoy et al., 2005).

A comparison between driving and hospital nursing can be made because the potential for distraction is just as relevant and the results just as severe. Maples et al. (Maples, DeRosier, Hoenes, Bendure, & Moore 2008). Maples et al. (2008) found that talking on a cell phone restricts the peripheral vision, decreasing the field of vision. A decreased field of vision while working in a hospital could have significant adverse effects. They also described how talking on a cell phone, even without the physical aspect of dialing or holding the phone, played a significant role in the decrement of focus on the subject (Maples et al., 2008). Strayer et al. (2003) found that cell phone use while driving causes distraction due to the change in focus from driving to the cell phone conversation, a term they call “inattentional blindness.” Inattention blindness refers to the withdrawal of attention from the external scene around the subject and directs the attention to the internal cell phone conversation. This diversion of attention away from a patient may result in a lack of recognition of potential complications during hospitalization. Parker-Pope (2009) confirmed that use of personal communication devices impacts attentiveness

and can cause inattentional blindness where users become so focused on their personal communication device that they do not recognize changes in their environment. Hyman, Boss, Wise, McKenzie and Caggiano (2009) studied the effects of walking while using a personal communication device and found that people using a personal communication device walked more slowly and were less likely to register unusual activity along their path.

Prior research has documented the manner in which a variety of driving performance measures were impacted by concurrent cell phone use as well as the influence of age and gender of the driver. Lesch and Hancock (2004) compared subjects' confidence in dealing with distractors while driving and their ratings of task performance with their actual driving performance in the presence of a cell phone task. While high confidence ratings were predictive of better driving performance for male drivers, this relationship did not hold for females. For older females, as confidence increased, performance decreased. Brake responses of older females were slowed to a much greater degree that for younger males and females and for older males. Females also rated the driving tasks as less demanding than males, even though their performance was more greatly affected by distraction. These results suggest that drivers may not be aware of their decreased performance while using cell phones. The participants recognized that there was some risk associated with using a cell phone while driving, but felt that they should be given the responsibility for deciding when and where it is appropriate to use their cell phones and to modify their behavior accordingly. However, this presumes that drivers can accurately assess the risks involved. This study indicated that many drivers are relatively unaware of actual performance decrements resulting from concurrent cell phone use and that some groups of drivers (i.e., females and especially older females) express disproportionately high confidence relative to their actual performance in the presence of the cell phone task.

In addition to research in the field of traffic safety, studies in psychology and education have documented the negative consequences on learning when individuals use their lap top computers or smartphones to multitask (Fried, 2008; Fox, Rose & Crawford, 2009; Bowman et al., 2010). Students who use a laptop to take notes in class are more likely to multitask, to become distracted and to distract others. The more

the student uses their laptop to multitask, the lower the student's class performance and final grade (Fried, 2008). Numerous studies have demonstrated that high levels of Internet use are associated with lower student grade point averages (Grace-Martin & Gay, 2001; Junco, 2012, Krausher & Novak, 2010). Studies from a number of areas have documented unfortunate consequences when individuals use personal communication devices to multitask. Given these concerns, the potential for these devices to distract healthcare workers while they work has become a topic of interest.

Distraction in the Workplace

Since the 1990s, researchers have studied the effects of distraction on memory, learning and cognitive functioning and found that the human mind is poorly designed both for attending to multiple inputs of information and performing tasks simultaneously (Armstrong & Chung, 2000; Foerde, Knowlton & Poldrack, 2006; Furnhalm & Bradley, 1997; Cherry, 1953; Wood & Cowan, 1995; Dux, Ivanoff, Asplund & Marois, 2006; Hein, Alink, Kleinschmidt, Muller & He, 2007; Marois & Ivanoff, 2005). Generally, the participants in these studies exhibited interference when they attempted to perform even simple tasks simultaneously (Gladstone, Regan & Lee, 1989; Pashler, 1994). Researchers have speculated that the human brain can only respond efficiently to one task at a time.

The rapid innovations in personal communication device technologies and their associated digital media foster distraction because they promote multiple sources of media input, resulting in workers attempting to multitask. Multitasking behavior became increasingly common around the year 2000 as workers had easier and faster access to the Internet resulting from smartphones becoming less expensive and more widely disseminated. A key concern of such multitasking is that this increase in simultaneous media consumption reduces the amount of attention that is paid to each device (Hopkinson & Jennings, 2013; Ophira et al., 2009; Payne, Wharrad & Watts, 2012).

A seminal study in 2009 used experiments to compare heavy and light media multitaskers in their ability to exert cognitive control and process information (Ophira et al., 2009). Heavy multitaskers were, on average, 77 milliseconds slower in recognizing changes in patterns compared to light multitaskers. In addition, in long-memory

tests, heavy multitaskers were less able to filter out false memory elements than light multitaskers. The researchers concluded that heavy media multitaskers performed worse on tests of task-switching ability due to a reduced ability to filter out interference from irrelevant task sets. Their data revealed the negative effects of multitasking on the performance of tasks that require cognitive control (Ophira et al., 2009). In a related article, a researcher asked if the increasing prevalence of this behavior leads "to a question about the required skills and expertise to function in society. Society with its ever-increasing complexity seems to move people toward juggling among multiple tasks rather than focusing on one task for a long period" (Lin, 2009, p. 15521). These studies have led to speculation that the movement away from focused, in-depth behavior could have long term effects on the cognitive, social and emotional behavior of workers.

Distraction of Healthcare Workers

Distractions and interruptions are widespread in hospitals. Past studies have demonstrated that more than half of drug rounds might be interrupted (Westbrook, Woods, Rob, Dunsmuir & Day, 2010), in some cases generating as many as 2.2 interruptions per patient (Palese, Sartor, Costaperaria & Bresadola, 2009). Registered nurses and physicians in one operating theater were noted by observers to be unperturbed by many kinds of distractions from pagers to movement around equipment because such interference is so common (Healey, Sevdalis & Vincent, 2006). Yet each interruption can be associated with a more than 10% increase in error (Westbrook et al., 2010). Observations of urology specialists revealed a median of 20 interruptions per procedure, with an average of one "distracting stimulus" every 1.8 minutes (Persoon, Borrs, Witjes, Hendrikx & Scherpbier, 2011).

From these observational and survey-based studies, researchers have suggested that the greatest source of interruption for both physicians and registered nurses is their colleagues, followed by patients. Many of these interruptions are important to creating effective healthcare delivery either through information gathering (seeking or sharing) or addressing immediate health concerns of patients. Mobile devices, when they are referenced, are often among the least-frequent interruptions (Wu et al., 2011; Redding & Robinson, 2009; Persoon, et al., 2011), although one study noted telephone calls to be the "longest distractions" interrupting drug

rounds (Kreckler, Catchpole, Bottomley, Handa & McCulloch, 2008). Several studies have reported that physicians and registered nurses believe personal communication devices bring improvements in work effectiveness over previous pager-based systems. Emails and text messages delivered through smartphones provide more information that allows the recipient to prioritize the interruption relative to the present task more effectively than a pager (O'Connor et al., 2009; Wu et al., 2010; Solvoll, Scholl & Hartvigsen, 2013). O'Connor et al. (2009) confirmed that a wireless communication system (email and texting) in an intensive care unit increased the trust and speed of communication, as well as producing better processed responses, quicker reply times and, therefore, improved patient care. The greatest challenge with personal communication device interruptions is that they facilitate a greater volume of communication than either physicians or registered nurses are prepared for. Physicians feel overwhelmed by unimportant interruptions, and registered nurses feel ignored in both digital and verbal communications (Wu et al., 2011).

A study by Hasvold and Scholl (2011) on the effect of the introduction of hospital provided cell phones on the work of surgical nurses found that the cell phones broke down the informal communication and coordination structures on the unit. They concluded that the new communication devices disrupted the informal work rhythms of the unit which allowed staff to meet and interact during the day. These informal meetings allowed registered nurses and other staff to opportunistically dialogue, problem solve, coordinate and handle logistics concerning patient care. The communication technology had an adverse affect on the social life on the unit which reduced the efficiency of the new tools and contributed to the staff resistance towards the new system.

There is an increasing awareness that interruptions in the clinical environment may have negative consequences (Chisholm, Collison, Nelson & Cordell, 2000; Kalisch & Aebersold, 2010; O'Leary, Liebovitz & Baker, 20006; Westbrook et al., 2010; Wu et al., 2011). These negative consequences occur even when these interruptions are self-initiated (Katz-Sidlow, Ludwig, Miller & Sidlow, 2012; Rivera-Rodriguez & Karsh, 2010; Smith, Darling & Searles, 2011). This awareness has led to recommendations on how to minimize breaks in tasks to ensure safe transfer of information including shift change handoffs and teaching rounds in hospitals (Katz-Sidlow et al., 2012; Solet, Norvell, Rutan & Frankel, 2005).

Researchers often have focused on describing work-related communications in terms of systems theory, arguing that interruptions are common and essential to effective healthcare delivery, but vary in importance to, and impact on, effective health care delivery. Many have pointed their work toward developing clear, appropriate guidelines to govern interruptions from various sources, especially mobile devices including pagers and cell phones, that would help manage the work systems in which hospital staff function (Katz-Sidlow et al., 2012; Visvanathan, Gibb & Brady, 2011; Gill, Kamath & Gill, 2012; Solvoll, Scholl & Hartvigsen, 2013; Wu et al., 2011; Redding & Robinson, 2009). Others have sought to validate observation instruments that account for the non-linear workflow of registered nurses and to facilitate accurate recording of interruptions within this context (Potter et al., 2004; Brixey et al., 2005; Brixey et al., 2008). Researchers have recognized the importance of quantifying the type of interruption in terms of its necessity to deliver quality, efficient health care, and the impact of this on all parties involved: employee, patient, and colleagues (Gill, Kamath & Gill, 2012; Visvanathan, Gibb & Brady, 2011; Rivera-Rodriguez & Karash, 2010). Few of these previous studies have explicitly divided observations of personal communication device interruptions into categories of purpose (e.g., professional versus personal), and in some cases have considered personal communication device interruptions in larger categories of "technology" interruptions along with other mobile devices like pagers (Brixey et al., 2005). One systematic literature review utilized a definition of interruption that included beneficial alerts and alarms, which blocked any further study of inefficiencies and errors associated with personal communication interruptions in the workplace (Rivera-Rodriguez & Karash, 2010). Most of these studies took place before cell phones and their associated digital media became widely available in the early 2000s. These developments significantly changed the clinical environments, creating the need for additional investigations into distraction of healthcare workers.

The seminal study on the use of personal cell phones by healthcare providers was conducted by Smith, Darling and Searles in 2011. Smith et al. surveyed 439 cardiopulmonary bypass perfusionists and found that 7.3% reported that distraction by their personal cell phones had negatively affect their performance and 33.7% reported witnessing another perfusionist distracted by their cell phone while doing cardiopulmonary bypass (Smith et al., 2011). This occurred even though 78.3% believe that cell phones introduced a significant safety risk

to patients. Half of the study participants in this study reported texting during heart-lung bypass procedures, with 15% acknowledging that they accessed the Internet and three percent reporting that they visited local networking sites during procedures. Fifty-five percent admitted that they had talked on cell phones during cardiopulmonary bypass surgery, even though 40% believed talking on the phone during surgery to be "always an unsafe practice" (Smith et al., 2011, p. 377). There were clear generational differences in the role and appropriateness of the use of cell phones during bypass procedures in this study.

Similarly, a study conducted at a university-affiliated teaching hospital in New York City assessed smartphone use by medical residents and attending physicians and their interference with the transfer of clinical information during inpatient rounds (Katz-Sidlow, et al., 2012). Thirty-seven percent of the residents and 12% of attending physicians reported reading and responding to personal texts or emails during inpatient rounds. According to self-reports, 19% of residents and 12% of attending physicians admitted missing important clinical information because of distractions from their personal smartphones. In addition, 34% of residents and 20% of attending physicians reported that they observed another team member miss an important piece of clinical information because they were distracted by their smartphone during rounds. Both residents and attending physicians agreed that smartphones "can be a serious distraction during rounds" and nearly 80% of attending physicians believed that smartphone policies should be established to control the use of smartphones in clinical environments (Katz-Sidlow et al., 2012). Physicians "strongly favored the institution of formal policies governing appropriate smartphone use during inpatient rounds" (Katz-Sidlow et al., 2012, p. 598). These findings have set off an escalating discussion at hospitals about a problem that has been called, "distracted doctoring" or "electronic distraction" which is the result of the increased presence of personal communication devices in hospitals (Halamka, 2011; Papadakos, 2011).

Self Reported Versus Observed Distraction

Importantly, people who multitask do not always recognize or admit that their performance has been affected by their divided attention. Several studies have looked at whether drivers were aware of their reduced driving abilities when using a cell phone and reported that drivers described other drivers with cell phones as

driving poorly, but that they perceive their own driving ability as normal, even when tests showed otherwise (Lesch & Hancock, 2004; Strayer et al., 2003). A study by Lesch and Hanock (2004) investigated whether drivers were aware of their reduced driving abilities while simultaneously operating a motor vehicle and a cell phone. They came to the conclusion that drivers are oblivious to their reduced driving abilities while simultaneous using cell phones.

In the Smith et al. study (2011) of healthcare providers' use of cell phones in operating rooms, 92.7% of study participants indicated their performance never having been negatively affected by their use of their cell phones in the operating theatre, even though 42.3% regard speaking on a cell phone as "always an unsafe practice" (Smith et al., 2011). Although an overwhelming majority (92.7%) of study participants to the survey answered that they have never been distracted or been negatively affected by the use of cell phones while performing cardiopulmonary bypass and 98% claimed never to have made a medical error that was a result of cell phone distraction, when asked if they had ever witnessed another healthcare provider distracted due to the use of a cell phone, 34.5% reported witnessing a distracted healthcare provider performing cardiopulmonary bypass. The researchers concluded that healthcare providers were unaware of the impact of the use of their personal communication devices on their performance as healthcare providers.

Katz-Sidlow et al. (2012) found that attending physicians and medical residents consistently reported observing others using their personal communication devices during in-patient teaching rounds at a higher rate then they reported for themselves. The authors speculated that this response may reflect under-recognition of their own use or a discomfort in reporting the use of their smartphones during rounds. In addition, resident reports of their observation of other residents' use of their smartphones were higher (91%) than attending physician observations (73%). According to the authors, this may be the result of attending physicians being involved in presenting material or the result of residents using their smartphones in subtle ways to prevent the attending physicians from noticing their use.

Non-Work Related Distraction

Few of these previous studies explicitly divided observations of personal communication device use into categories of purpose (e.g., professional versus personal). Although not specifically divided into professional versus personal use, Smith et al. found that cardiopulmonary bypass perfusionists acknowledged talking on their cell phones (55.6%), sending text messages (49.2%), accessing email (21%), using the Internet (15.1%) and checking/posting on social networking sites (3.1%) while performing cardiopulmonary bypass (Smith et al., 2011).

Katz-Sidlow et al. (2012) attempted to ascertain the reasons that staff used their smartphones during rounds and found that they were: patient care related use (85%), reading or responding to personal texts or email (37%) and other non-patient care related use including Web-surfing (15%) (Katz-Sidlow et al., 2012). Attending physicians were half as likely as residents to use their devices during rounds and none of the attending physicians reported using their smartphones for non-patient care uses during rounds. The authors concluded that this could reflect the inability of the attending physicians to multitask or a desire to role model desired conduct during rounds. The researchers speculated that generational differences may also play a part, with residents more likely than the older attending physicians to feel comfortable multitasking and self-interrupting (Katz-Sidlow et al., 2012).

Policies Associated with Personal Communication Devices in Hospitals

Many health care institutions have implemented policies to outline the appropriate use of personal communication devices in the workplace. A survey of operating room managers reported that 48% said that their hospital had a policy on the use of personal communication devices during surgeries (Patterson, 2012). For those with a policy, 88% of the managers said their policy prohibits non-work related use of mobile devices in patient care areas. However, 68% of the managers said that the use of the hospital's computers to access the Internet had been abused and that the policy is not enforced. Eight out of ten of the managers say that the use of personal communication devices distracts healthcare providers from patient care, most commonly for anesthesiologists (80%) and registered nurses (69%). These safety concerns were similar to Smith et al.'s study of 2010 survey of cardiopulmonary perfusionists in which 78% of the study participants reported that personal

communication device use introduced a potentially significant risk to patients, but 56% had used a cell phone during cardiopulmonary bypass and 49% had sent a text message (Smith et al., 2011).

Positive and Negative Impacts

More recent research has looked into the positive and negative impact of personal communication devices on the health of employees. Although personal communication devices have become integral to the lives of healthcare providers, excessive or poorly controlled use can lead to disruptions in one's normal daily life. Excessive use has been linked to depression, dissociative disorder and attention deficit hyperactivity (Lin, Tsai, Chen & Koo, 2013). This phenomenon has been labeled as "Internet addiction" (Young, 2004). In 2006 a telephone survey of 2,513 adults using random digit dialing sample stratified by state reported a prevalence of problematic use of 0.7% (Aboujaoude et al., 2010). Among registered nurses, excessive Internet use at work was associated with fatigue (the greater the fatigue the more Internet use at work). Lin speculated that the stress resulting from a multitude of work factors such as high job demands and work schedules might produce a high level of Internet use (Lin et al., 2013). Lin reported a 10% prevalence of possible cases of Internet addiction among hospital registered nurses. Overall, Lin found that the most commonly engaged activities on the Internet were visiting news and information sites (35%) followed by email and online chat. Only 9% of online behavior was playing games, although the proportion of the time spent playing online games was significantly greater among possible cases of Internet addiction (Lin et al., 2013). Lin speculated that the Internet is considered by registered nurses as an activity to recover from work related fatigue or intershift recovery.

Lim and Chen (2009) also speculated that while internet browsing and sending personal emails while at work might be viewed by many mangers as a misuse of time and company resources, the use of personal communication devices might serve as a palliative coping strategy against negative workplace experiences. Chen and Lin surveyed a randomly drawn sample of study participants from an alumni list of a local business school and found that respondents reported that browsing the internet gave employees a temporal escape from work stress, allowing employees to regain a positive affect. Chen and Lim's work contributes to a growing body of literature that challenges previous management studies which focused on workplace Internet browsing as

workplace production deviance that led to productivity and monetary loss. These studies recognize that policies prohibiting all forms of personal communication devise use at work are not effective and stifle legitimate Internet use. They concluded that an acceptable Internet use policy would not be a total ban on non-work related usage of the Internet and instead create a reasonable balance between some personal communication device use and work.

In the Katz-Sidlow et al. study (2012) a majority of residents and attending physicians reported that policies and codes of conduct should be created for the use of smartphones during rounds to protect patients from the distraction caused by their use (Katz-Sidlow et al., 2012). As a result of the Katz-Sidlow et al. study, a policy on “digital professionalism” was instituted at the participating hospital (p.596) which significantly reduced the staff use of personal communication devices during rounds.

Despite the widespread use of personal communication devices in hospitals, little research has been conducted that links the use of personal communication devices by registered nurses and patient care. Earlier studies indicated that, although interruptions of medical care were associated with an increased error rate, communication technology was responsible for a very small proportion of interruptions (Kreckler et al., 2008; Brixey et al., 2008). Since these studies were conducted, personal communication devices and the manner in which they are used have changed radically, particularly with the increased availability of handheld access to the Internet. None of the early studies on personal communication devices and the work of hospital registered nurses were cognizant of the current pervasive connectedness and seductiveness of the new technologies. Computers were once large machines that sat on desks. Now they are small, handheld devices that lure owners into play and, perhaps, away from the vigilance required for patient care.

Multitasking is inherent in the medical environment. What has changed is the increasing pressure to interact with devices. Modern medicine demands that patient care be data driven and that the information be instantly available. Investment in technology by hospitals has increased substantially in the interest of preventing medical errors. Electronic devices have a great capacity to reduce risk, but they also have the potential for distraction while operating the device. Such distractions have the potential to be disastrous for the patient.

As a result of the increasing recognition of the decrement in performance associated with the use of personal communication devices in clinical settings, a study was conducted to (1) determine the frequency of personal communication device use by hospital registered nurses while working and to (2) identify the concerns and opinions of hospital registered nurses concerning the use of personal communication devices on hospital units. It is hoped that this study will contribute to an understanding of how to maximize the benefits of personal communication devices while minimizing the potential risk to hospital patients.

CHAPTER 3. METHODOLOGY

Chapter three describes the methodology of the study including the purpose, the research questions, data collection methods, and data analysis methods.

Three methods were used in data collection and analysis in this dissertation: (a) a survey of the registered nurses belonging to the Academy of Medical Surgical Nurses (AMSN) (b) a determination of the representativeness of the survey sample, and (c) a statistical analysis of the survey results using a variety of statistical tests.

Pilot Study

The survey instrument and protocol for this study was based on the pilot study that was developed and validated in 2012 (McBride, LeVasseur & Li, 2013). A 30-item, four-domain (utilization, impact, opinions, and performance) pilot questionnaire on the views of registered nursing staff regarding the effect of personal communication devices on patient care was developed based on a literature review and interviews with staff registered nurses was developed and tested in 2012 (McBride et al., 2013). A one-week apart pre-and post-test pilot study was conducted in November 2012 to examine the psychometrics of the questionnaire and the feasibility of conducting a larger study. Psychometric testing of the pilot questionnaire included examining internal consistency reliability and test-retest reliability in a convenience sample of 50 registered nurses. The response rate for the repeated measures on the pilot project was 30%. Cronbach coefficient alpha was used to examine internal consistency and reliability, and in three of the four question groups (utilization, impact, and opinions), the correlation was very high. This suggested that the questions were measuring a single underlying theme. The Cronbach alpha value for the questions in the performance group, describing use of personal communication devices while working, was lower than for the other question groups. These values may be an indication that the assumptions underlying the Cronbach alpha calculation had been violated for this group of questions. A Spearman rho correlation was used to determine the test-retest reliability. There was strong test-retest reliability between the two administrations of the test for the majority of the questions. The average test-retest percent of

agreement for the Likert-scale questions was 74% (range, 43–100%). Accounting for responses ±1 on the Likert scale increased the agreement to 96% (range, 87–100%). Missing data were in the range of 0–7%. The psychometrics of the pilot questionnaire showed good to fair levels of internal consistency and test-retest reliability. The pilot study demonstrated that the questionnaire was useful in exploring registered nurses' perceptions of the impact of personal electronic devices on patient care in a larger study (McBride et al., 2013).

Based on the results of the pilot study a number of minor changes were made to the questionnaire to be used in the present study which include:

- Increasing the number of levels in the Likert scale questions in order to avoid the ceiling and floor effect that might result in a lack of variability in the results.
- Redesigning the four questions in the performance group (scale 2) based on the Cronbach alpha values in the pilot study to clarify the underlying themes of error and performance.
- Adding a dichotomous question concerning the respondent's opinion about the ability to multitask in order to clarify the study participants' answers regarding using more than one item or stream of content at the same time (Ophir, Nass & Wagner, 2009).
- Eliminating the open ended questions to simplify and shorten the questionnaire because of the lack of informative responses received on the pilot project and to increase the response rate related to shortening the questionnaire (Dillman, 2000).

Survey Instrument

The survey instrument developed for this study was composed of 30 multi-part questions resulting in a total of 50 items (A). A revised version of the pilot questionnaire can be found in Appendix A. It consisted of four parts: questions aimed at obtaining information about (a) demographics, (b) use of personal communication devices, (c) opinions about the effects of personal communication devices on the work of registered nurses, and (d) hospital policies concerning personal communication devices.

The first two sections of the survey obtained participant's demographics and information pertaining to their personal communication device ownership and use (Appendix A). A definition of the term "personal communication device" was provided. The demographic information collected on the survey conforms to the standardized national minimum data set recommended by the Forum of State Nursing Workforce Centers to improve data collection and enhance information infrastructure (Moulton et al., 2012).

Demographics. The demographic portion of the questionnaire asked for general information such as age, gender, race/ethnicity, job title, types of activities their job involved (patient care, administration/management, research, teaching, quality assurance, case management) as well as questions regarding years worked as a registered nurse, average number of hours a week they are in contact with patients in an in-patient setting and what state they work in. Registered nurses were also asked to describe the size (number of beds), general location of their primary place of employment (inner city, rural, urban, suburban) and whether their primary place of employment was for-profit, not for profit or a state or local government community hospital.

Use of personal communication devices at work. The second section concerns features and type of activities (both work related and non-work related) that nurses use their personal communication device for. The questions asked respondents to rank the types of activities they engage in on a five-part Likert scale to determine how frequently they participated in each activity. The types of activities asked about ranged from using their personal communication devices to access work-related information to using them to play online games.

Opinions about the effects of personal communication devices on the work of registered nurses. Questions were asked in the third section of the questionnaire to ascertained registered nurses' experiences (both positive and negative) with personal communication devices on nursing units, specifically how personal communication devices have affected their performance as a registered nurse on an in-patient unit. These questions asked specifically about self-reported and observed effects involving performance decrement related to distraction, making a medical error and missing important clinical information.

Hospital policies concerning personal communication devices. In the final section participants were asked questions regarding policies concerning personal communication devices on nursing units and their feelings about other healthcare staff that they saw using their personal communication devices while working. This section included questions about whether their primary place of employment had a policy and opinions about what type of personal communication device use was acceptable.

Human Subjects Protection

Exempt approval was applied for from the Institutional Review Board of the University of Hawai'i Human Subjects Program (University of Hawai'i Human Studies Program, 2012). Approval was received on January 2, 2014 (CHS# 21816) (Appendix B).

Academy of Medical Surgical Nurses Database

Approval to utilize the Academy of Medical-Surgical Nurses (AMSN) membership list was applied for and was received via email from the AMSN Research Coordinator on March 18, 2014 (Appendix C) following exempt status approval from Institutional Research Board of the University of Hawai'i Human Subjects Committee (Appendix B). An invitation to participate in the study was emailed to 10,978 members of the AMSN who had provided their email address to the AMSN out of the entire membership list of 11,036 registered nurses who are members of the AMSN. The data were collected from March 27, 2014 to April 10, 2014. The study participants were invited to participate in the study by completing an Internet-based questionnaire, accessed via a link embedded in the recruitment email. The recruitment email was sent out as an "email blast" originating from the AMSN headquarters (amsn@ajj.com) with the subject line, "Survey-Use of personal communication devices by registered nurses." The link embedded in the recruitment and reminder emails was to a commercial web survey tool (http://www.surveyshare.com). The initial email included an introduction and explanation of the research. A copy of the questionnaire is presented as Appendix A. The email invitation and reminder are presented as Appendix D and E. All members of the AMSN who had been employed as a registered nurse in a medical facility sometime within the last 5 years and who, on average, have more than 5 hours a week of patient contact on an in-patient setting were eligible to participate.

There were 11,037 registered nurses members of the Academy of Medical-Surgical Nurses (AMSN) on March 27, 2014. Of the 10,979 Academy of Medical Surgical Nurses (AMSN) members who provided email addresses to the AMSN and who were sent the recruitment email 3,106 (28%) opened the email, 940 (8.56%) completed the online questionnaire, 825 (7.25%) met the inclusion criteria for participation in the study (Figure 3.1) (personal communication with Anne Kreiss, AMSN Association Services Manager, March 18, 2014).

The Academy of Medical-Surgical Nurses (AMSN) is a national non-profit professional nursing organization founded in 1990 to represent medical-surgical nurses. According to the bylaws, the goal of the AMSN is "to promote excellence in medical-surgical nursing through workplace advocacy, evidence-based practice, research and knowledge, professional development, national leadership and organizational health" (Academy of Medical-Surgical Nurses [AMSN), 2013). Medical-surgical nursing is an American Nurses Association recognized nursing specialty, made up of registered nurses who "provide nursing care to patients of all ages, with multiple medical, surgical and psychiatric diagnoses in many different practice settings including hospitals, clinics, surgery centers, offices, long term care facilities" (Academy of Medical-Surgical Nurses [AMSN], 2013). With approximately 400,000 of the 2.9 million registered nurses in the United States, medical surgical nursing is the largest specialty group of practicing registered nurses (Hanink, 2010).

Inclusion Criteria

All members of the AMSN who had been employed as a registered nurse in a medical facility sometime within the last 5 years and who, on average, have more than 5 hours a week of patient contact on an in-patient setting were eligible to participate (Figure 3.1). The two filtering questions applied were:

1) "Have you been employed as a registered nurse in a medical facility sometime during the last 5 years = yes" and

2) "On average, how many hours per week do you have patient contact in an in-patient setting? => 20 hours per week OR 11-15 hours per week OR 16-20 hours per week OR 6-10 hours per week".

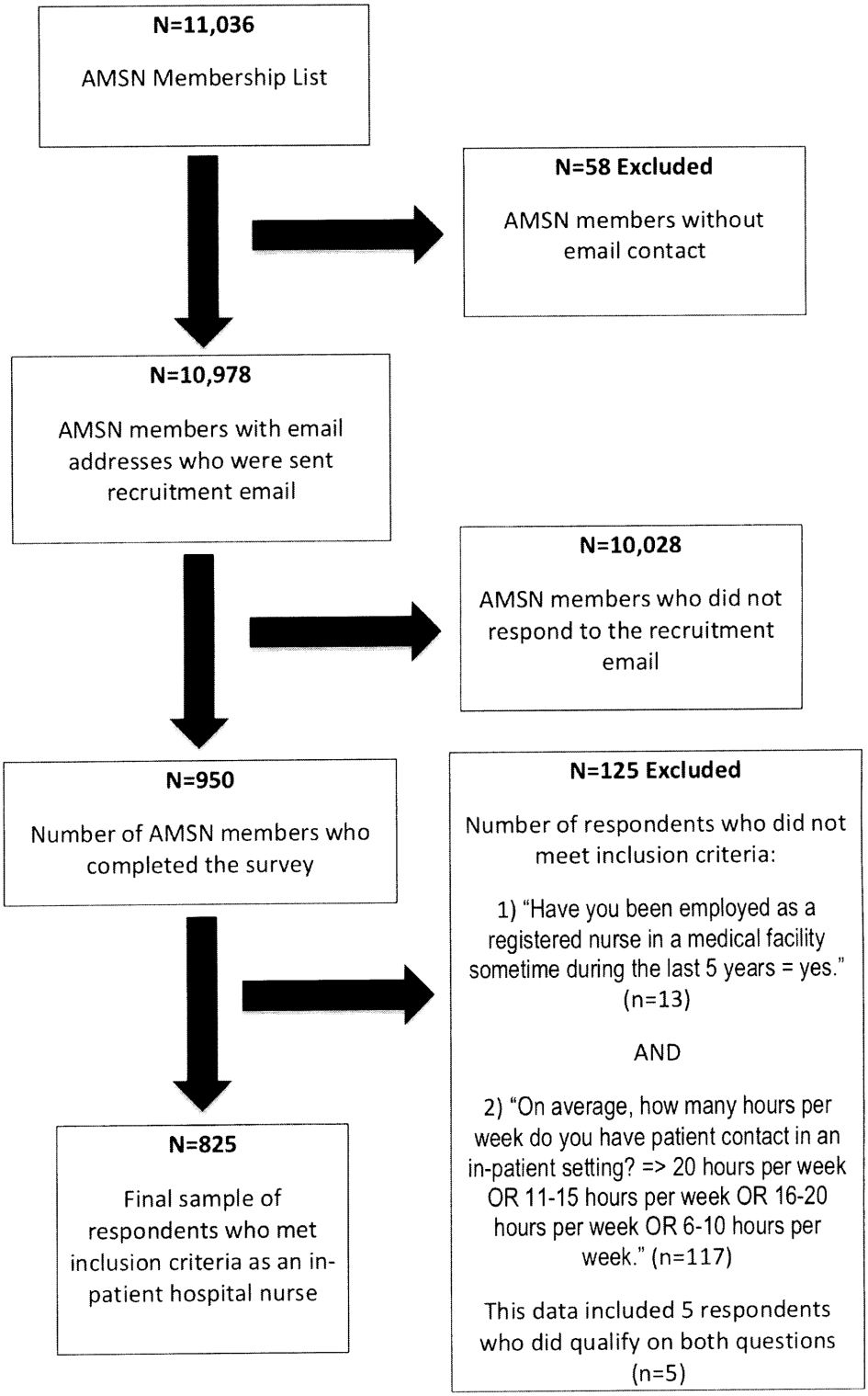
This resulted in 86% (825/950) of the online survey respondents being included in the study.

Sample Size

The final sample size for this study was 825 responses out of a total of 10,978 AMSN emails (Figure 3.1). A total of 950 study participants completed the survey resulting in an 8.56% (940/10,978) response rate. One hundred twenty five study participants were excluded from the final sample because they did not meet the inclusion criteria. Thirteen answered no to the question, “Have you been employed as a registered nurse sometime in the last 5 years?” One hundred and seventeen indicated that, on average, they worked less than 5 hours a week in patient care in an in-patient setting. Five study participants were excluded because they did not meet both inclusion criteria. Figure 3.1 illustrates the selection process for the sample.

Using the Fisher Z test for Spearman correlation and a correlation estimate of 0.169 based on the Spearman rho for the test-retest correlation from the pilot project, a sample of at least 272 study participants was needed to achieve a power of 0.80 at alpha of 0.05 (McBride, et al., 2013).

Figure 3.1 Study Sample Selections



Administration

An electronic mailing with an Internet link to the survey was sent to every AMSN member who provided an email address to the AMSN on March 27, 2014. The email informed members of the purpose of the study and provided an Internet site where they could find the 30-question questionnaire (Appendix A). On clicking on the Internet link, each panelist was directed to the online questionnaire. An email reminder was sent out to the AMSN membership list one week after the invitation email on April 3, 2014 providing recipients with a second link to the questionnaire and reminding them of the deadline to complete the questionnaire which was one week after the reminder email was sent out. The recruitment email included a description of the study, a statement regarding the anonymity of the responses from the Internet-based survey and an explanation of implied consent (Appendix D). At the end of the survey, the study participants were thanked through a message attached to the final page of the questionnaire.

After the study was completed on April 10, 2014, two weeks after the initial invitation email and one week after the reminder email was sent out, the questionnaire responses were download into a data set and the study was closed.

Statistical Analysis

Statistical data analysis for this study was conducted using the IBM Statistical Package for the Social Sciences (SPSS) Windows Version 21. A two-sided $p < 0.05$ was regarded as statistically significant. In order to determine if the study participants was representative of the U.S. nursing workforce population, the probability that a random sample would generate the proportions it did given the population's distribution were assessed based on The National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey for RNs (National Council of State Boards, 2013) and National Sample Survey of Registered Nurses (Budden, Zhong, Moulton, & Cimiotti, 2013). An examination of the distribution of the sample over the different subgroups suggested an underrepresentation or overrepresentation of some groups relative to the population which is discussed in chapter 4. A probability that was above 5% was considered to be the margin of error.

CHAPTER 4. SURVEY RESULTS

The responses to the online survey are presented here.

Survey Results

Gender. More females (n = 775, 93.9%) than males (n = 48, 5.8%) met the inclusion criteria of being employed in a medical facility sometime during the last 5 years and being currently involved with patient care (Figure 3.1). Table 4.1 reports the number and percentages of study participants characterized by gender.

Table 4.1 Gender

	Study Participants	Percentage
Male	48	5.8
Female	775	93.9
Total	825	

Age. The average age of study participants was 47.82 years (n = 822, S.D. = 11.03). The youngest respondent was 23 years and the oldest was 69 years old. Median age of study participants was 50 years. Table 4.2 reports the sample mean, median, standard deviation and range of ages in years of study participants.

Table 4.2 Age

	n	*x*	*SD*	Min	Max	*M*
Age (years)	822	47.82	11.03	23	69	50

Race/Ethnicity. White respondents made up the majority of the respondents (n = 642, 77.8%). The remaining study participants were divided among American Indian or Alaska Native 0.4% (n = 3), Asian 6.8% (n = 56), Black/African American 5.7% (n = 47), Hispanic or Latino 4.2% (n = 35), Native Hawaiian or Pacific Islander 0.6% (n = 5). Table 4.3 reports the number and percentages of study participants characterized by race/ethnicity.

Table 4.3 Race/Ethnicity

	Study Participants	Percentage
American Indian or Alaska Native	3	0.4
Asian	56	6.8
Black/African American	47	5.7
Hispanic or Latino	35	4.2
Native Hawaiian or Pacific Islander	5	0.6
White/Caucasian	642	77.8
Other	17	2.1
Total	805	

Employment as a registered nurse in a medical facility. This question was one of the two questions used as filtering questions to identify study participants. Therefore, 100% of the 825 study participants answered that they had been employed as a registered nurse in a medical facility sometime during the last 5 years (Figure 3.1). Of the 950 AMSN members who completed the online survey, 97.6% (n = 927) answered that they had been employed as a registered nurse in a medical facility sometime during the last 5 years (Table 4.4). Thirteen (1.4%) respondents to the survey answered that they had not worked as a registered nurse in a medical facility in the last 5 years. Respondents who did not answer yes to this question did not meet the inclusion criteria for the study and were not included in the study sample. There were 10 (1%) non-responses (Figure 3.1). Table 4.4 reports the number and percentages of AMSN members employed in a medical facility for more than 5 years

Table 4.4 Length of Employment

	Study Participants	Percentage
Yes	927	97.6
No	13	1.4
Total	940	

Location of primary place of employment. Thirty-three percent (n = 272) of the study participants were employed in a medical facility located in an urban center, with the remainder residing in a suburb 29.9% (n = 247), inner city 20.8% (n = 172) or a rural location 14.7% (n = 121) or other 1.1% (n = 9) with 0.5% (n = 4) non-responses. Table 4.5 reports the number and percentages of study participants with their primary place of employment characterized by location.

Table 4.5 Location of Employment

	Study Participants	Percentage
Inner City	172	20.8
Rural	121	14.7
Suburban	247	29.9
Urban	272	33
Other	9	1.1
Total	821	

Nursing position. Sixty three percent (n = 520) of the study participants worked as staff nurses, 17.6% (n = 145) as charge nurses, 2.9% (n = 24) as advance practice nurses, 0.7% (n = 6) as nurse executives, 3.4% (n = 28) as nurse faculty, 8.8% (n = 73) as nurse managers and 3% (n = 25) in an unidentified health-related discipline. Table 4.6 reports the number and percentages of study participants characterized by primary nursing practice position.

Table 4.6 Nursing Position

	Study Participants	Percentage
Advanced Practice Nurse	24	2.9
Charge Nurse	145	17.6
Nurse Executive	6	0.7
Nurse Faculty	28	3.4

Nurse Manager	73	8.8
Other-Health Related	25	3
Staff Nurse	520	63
Total	821	

Nursing role. The study participants spent most of their time in patient care and education 76.6% (n = 632), followed by administration and management 9.8% (n = 81), student/staff teaching, training or instruction 5.5% (n = 45), case management 0.6% (n = 5), research 0.1% (n = 1), quality assurance 0.2% (n = 2), other 3.6% (n = 30) or not applicable 1.7% (n = 14). Table 4.7 reports the number and percentages of study participants characterized by primary nursing role.

Table 4.7 Nursing Role

	Study Participants	Percentage
Administration/Management	81	9.8
Case Management	5	0.6
Patient Care & Education	632	76.6
Quality Assurance	2	0.2
Research	1	0.1
Student/Staff-Teaching/Training/Instruction	45	5.5
Other	30	3.6
Not Applicable	14	1.7
Total	810	

Average hours per week in-patient setting. Of the 950 survey respondents 12.3% (n = 117) had patient care in an in-patient setting for 5 or less hours per week. These respondents did not meet the inclusion

criteria for the study and their data was not utilized in the data analysis (Table 3.1). Of the remaining 825 study participants over 81% (n = 671) worked an average of more than 20 hours per week with patients in an in-patient setting, 6.5% (n = 54) worked 16 to 20 yours per week, 5.8% (n = 48) worked 6-10 hours per week and 4.8% (n = 40) worked 11-15 hours per week, and 1.5% (n = 12) non responses. Table 4.8 reports the number and percentages of study participants characterized by primary nursing role.

Table 4.8 Average Hours of Patient Care Per Week

	Study Participants	Percentage
>20 hours per week	671	81.3
16-20 hours per week	54	6.5
11-15 hours per week	40	4.8
6-10 hours per week	48	5.8
Total	813	

Length of time worked as a registered nurse in a medical facility. The majority of study participants worked as a registered nurse in a medical facility more than ten years (n = 506, 61.3%). Twenty-one percent (n = 174) worked 5 to 10 years, 7.8% (n = 64) worked 3 to 5 years, 7.2% (n = 59) and 1.2% (n = 10) worked less than one year A small number of respondents (0.2%) answered not applicable (n = 2). Table 4.9 reports the number and percentages of study participants by years worked as a registered nurse in a medical facility

Table 4.9 Years Worked as a Registered Nurse

	Study Participants	Percentage
More than 10 years	506	61.3
More than 5 years but less than 10 years	174	21.1
More than 3 years but less than 5 years	64	7.8

More than 1 year but less than 3 years	59	7.2
Less than 1 year	10	1.2
Not Applicable	2	0.2
Total	815	

U.S. state currently employed in as a registered nurse. Eight hundred and twelve study participants were currently employed as registered nurses in the United States. Four respondents selected the not applicable response (0.5%). The not applicable response may represent United States territories such as Puerto Rico or Guam, which were not available in the pull down menu. Table 4.10 reports the number and percentages of study participants characterized by their primary place of employment by state.

Table 4.10 Primary Place of Employment by State

	Study Participants	Percentage
Alabama	4	0.5
Alaska	4	0.5
Arizona	15	1.8
Arkansas	6	0.7
California	66	8
Colorado	18	2.2
Connecticut	4	0.5
Delaware	2	0.2
District of Columbia	5	0.6
Florida	29	3.5
Georgia	23	2.8
Hawaii	3	0.4
Idaho	5	0.6
Illinois	45	5.5
Indiana	37	4.5
Iowa	8	1
Kansas	10	1.2
Kentucky	5	0.6
Louisiana	12	1.5
Maine	5	0.6

	Study Participants	Percentage
Maryland	20	2.4
Massachusetts	16	1.9
Michigan	31	3.8
Minnesota	14	1.7
Mississippi	3	0.4
Missouri	18	2.2
Montana	1	0.1
Nebraska	1	0.1
Nevada	4	0.5
New Hampshire	1	0.1
New Jersey	22	2.7
New Mexico	2	0.2
New York	30	3.6
North Carolina	33	4
North Dakota	2	0.2
Ohio	46	5.6
Oklahoma	13	1.6
Oregon	25	3
Pennsylvania	66	8
Rhode Island	1	0.1
South Carolina	8	1
South Dakota	0	0
Tennessee	11	1.3
Texas	54	6.5
Utah	2	0.2
Vermont	1	0.1
Virginia	19	2.3
Washington	38	4.6
West Virginia	0	0
Wisconsin	22	2.7
Wyoming	2	0.2
Total	812	

Assuming that regional differences could impact the results of the study, the state results of the study were classified by their United States Census Bureau-designated regional divisions. Table 4.11 reports the number and percentages of study participants characterized their primary place of employment located by United States Census Bureau-designated regional divisions.

Table 4.11 Primary Place of Employment by U.S. Census Regional Divisions [a]

	Study Participants	Percentage
East South Central	23	2.8%
Pacific	136	16.5%
Mountain	49	5.9%
West South Central	85	10.3%
New England	28	3.4%
South Atlantic	139	16.8%
East North Central	181	21.9%
West North Central	53	6.4%
Middle Atlantic	118	14.3%
Total	812	

[a] Regional divisions used by the United States Census Bureau:

Division 1: New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont)
Division 2: Mid-Atlantic (New Jersey, New York, and Pennsylvania)
Division 3: East North Central (Illinois, Indiana, Michigan, Ohio and Wisconsin)
Division 4: West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota)
Division 5: South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, Washington D.C. and West Virginia)
Division 6: East South Central (Alabama, Kentucky, Mississippi, and Tennessee)
Division 7: West South Central (Arkansas, Louisiana, Oklahoma, and Texas)
Division 8: Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming)
Division 9: Pacific (Alaska, California, Hawaii, Oregon, and Washington)

Primary place of employment (Urban/Rural). In regards to the study participants' working environments, 71.2% (n = 587) work in a not-for-profit institution, 18.4% (n = 152) work for a for-profit institution and 9.1% (n = 75) work for a state or local government community hospital. Table 4.12 reports the number and percentages of study participants by the ownership status of their primary place of employment.

Table 4.12 Primary Place of Employment by Ownership Status

	Study Participants	Percentage
For Profit	152	18.4
Not-for-profit	587	71.2
State or local government community hospital	75	9.1
Total	814	

Number of beds in primary place of employment. Twenty-five percent (n = 209, 25.3%) of respondents indicated that they worked in a medical facility with more than 500 beds, 11.3% (n = 93) with 400-499 beds, 16.5% (n = 136) with 300-399 beds, 15.3% (n = 126) with 200-299 beds, 14.3% (n = 118) with 100-199 beds, 7% (n = 58) with 50-99 beds, 6.1% (n = 50) with 25-49 beds and 2.8% (n = 23) with 6 to 24 beds with 1.2% (n = 10) other and 0.2% (n = 2) non responses. Table 4.13 reports the number and percentages of study participants with their primary place of employment characterized by the number of beds.

Table 4.13 Primary Place of Employment by Number of Beds

	Study Participants	Percentage
500 or more beds	209	25.3
400-499 beds	93	11.3
300-399 beds	136	16.5
200-299 beds	126	15.3
100-199 beds	118	14.3
50-99 beds	58	7
25-49 beds	50	6.1
6-24 beds	23	2.8
Other	10	1.2

	Study Participants	Percentage
Total	823	

Feelings about personal communication devices. In general, feelings about personal communication devices among the study participants were positive with 39.3% (n = 324) reporting strongly positive feelings, 27.2% (n = 224) slightly positive feelings, 18.3% neutral (n = 151), 9.1% (n = 75) slightly negative, and 4.8% (n = 40) strongly negative feelings overall about personal communication devices with 1.3% (n = 11) non responses. Table 4.14 reports the number (with percentages in parentheses) of study participants (n = 814) who answered the question about how they felt about personal communication devices.

Table 4.14 Feelings Towards Personal Communication Devices n (%)

	Strongly negative	Slightly negative	Neutral	Slightly positive	Strongly positive	No response	Total
In general, how do you feel about personal communication devices (cell phones, smart phones or tablet computers?	40 (4.8)	75 (9.1)	151 (18.3)	224 (27.2)	324 (39.3)	11 (1.3)	825

Frequency of use of personal communication device while working. Study participants reported that they used their personal communication device at work frequently, with 23.5% (n = 194) always, 37.8% (n = 312) often, 16.8% (n = 139) sometimes, 12.7% (n = 105) rarely and 6.4% (n = 53) never using their personal communication devices with 2.7% (n = 22) non-responses (Table 4.15). A total of 80.3% (n = 645) study participants answered that they used personal communication devices (sometimes, often or always) at work (excluding lunch and breaks). Table 4.15 reports the number (with percentages in parentheses) of study participants (n = 803) who answered the question about how often they used their personal communication device (cell phone, smartphone or tablet computer) while working (excluding lunch and breaks). A histogram of the results is presented in Appendix F.

Table 4.15 Frequency of Use of Personal Communication Device While Working n (%)

	Never	Rarely	Sometime	Often	Always	No response	Total
How often do you use your personal communication device (cell phone, smartphone or tablet) while working (excluding lunch and breaks)?	53 (6.4)	105 (12.7)	139 (16.8)	312 (37.8)	194 (23.5)	22 (2.7)	825

Primary personal communication device. When asked to identify their primary personal communication device 73% (n = 602) of the study participants reported that their primary personal communication device was a smartphone (cell phone, texting, email, Internet access and apps), 12.6% (n = 104) a cell phone with texting, 8% (n = 66) a basic cell phone, 2.8% (n = 23) a tablet computer, 1.3% (n = 11) did not own a personal communication device. Table 4.16 reports the number and percentage of study participants who identified their primary personal communication device.

Table 4.16 Type Personal Communication Device

	Study Participants	Percentage
I don't have a personal communication device	11	1.3
I have a basic personal communication device (cell phone only)	66	8
I have a personal communication device (cell phone and texting)	104	12.6
I have a smart phone (phone, texting, email, internet access, apps)	602	73
I have a tablet computer	23	2.8
Total	806	

Average use of personal communication while at work. Study participants were asked about their participation in specific work and non-work related personal communication device activities while working (excluding breaks and lunch) which previous research had identified as potential uses (Coker, 2011; Koehler,

Vujovic, & McMenamin, 2013; Lim, 2002; McBride, et al., 2013). When broken down into six types of work-related use, study participants reported varying rates of personal communication device use at work. Their negative responses ranged from 40.6% (n = 335) ("as a calculator for nursing/medical formulas") to 70.1% (n = 578) ("for work-related protocols"). In responding to questions concerning the non-work related use of personal communication devices, the most frequent response was also never. It is interesting to point out that although the most frequent response to the question, "to call or check/send text messages to family or friends," was never (33.7%, n 278), this question received the highest overall positive response, (rarely = 26.4%, (n = 218), sometimes = 23.4% (n = 191), often = 8.5% (n = 70), always = 6.9% (n = 57). Table 4.17 reports the number (with percentages in parentheses) of study participants who used their communication device for various activities while working.

Table 4.17 Personal Communication Device Activities n (%)

Activity	Never	Rarely	Sometimes	Often	Always	No response	n
Access work related drug reference	368 (44.6)	111 (13.5)	191 (23.2)	117 (14.2)	28 (3.4)	10 (1.2)	825
Access work related nursing/medical information	363 (44)	107 (13)	194 (23.5)	118 (14.3)	30 (3.6)	13 (1.6)	825
As a calculator for nursing/medical formulas	335 (40.6)	110 (13.3)	186 (22.5)	130 (15.8)	51 (6.2)	13 (1.6)	825
For work-related protocols	578 (70.1)	105 (12.7)	60 (7.3)	44 (5.3)	20 (2.4)	18 (2.2)	825
Access work related apps that assist in patient care	506 (61.3)	107 (13)	107 (13)	65 (7.9)	22 (2.7)	18 (2.2)	825
To access sites for professional education and development	447 (54.2)	106 (12.8)	133 (16.1)	98 (11.9)	26 (3.2)	15 (1.8)	825
Access patient handouts and teaching	556 (67.4)	107 (13)	67 (8.1)	52 (6.3)	22 (2.7)	21 (2.5)	825
To call or check/send work related text messages or emails to other members of the healthcare team	410 (49.7)	110 (12.1)	122 (14.8)	100 (12.1)	72 (8.7)	11 (1.3)	825

Activity	Never	Rarely	Sometimes	Often	Always	No response	n
To read online news	489 (59.3)	108 (13.1)	125 (15.2)	59 (7.2)	28 (3.4)	16 (1.9)	825
To call or check/send text messages for family or friends	278 (33.7)	218 (26.4)	191 (23.2)	70 (8.5)	57 (6.9)	11 (1.3)	825
To shop	648 (78.5)	82 (9.9)	39 (4.7)	23 (2.8)	17 (2.1)	16 (1.9)	825
To check/post social networking sites	565 (68.5)	129 (15.6)	129 (9.1)	21 (2.5)	22 (2.7)	13 (1.6)	825
To play online games	692 (83.9)	65 (7.9)	33 (4)	11 (1.3)	10 (1.2)	14 (1.7)	825

Feelings about the use of personal communication devices while working. Study participants were asked about the positive and negative effects of personal communication devices on nursing units which previous research had identified as potential effects (Coker, 2011; Wu et al., 2013; Morris-Docker et al, 2004; Young, 2004). When broken down into three types of negative effects associated with the use of personal communication devices on units, study participants reported high rates of strong disagreement, ranging from 47.8% (n = 394) (The use of my personal communication device for non-work related activities has distracted me while working") and 62.1% (n = 512) ("The use of my personal communication device for non-work activities has negatively affected my performance while working"), indicating that they do not believe that their own job performance was negatively affected by their personal communication device. The only question with a high rate of agreement was, "I have witnessed another nurse whose personal communication device for non-work activities was negatively affecting his/her performance" 40.1% (n = 331) ("agree") and 30.2%. (n = 249) ("strongly agree"). This question received the highest positive response among the questions related to the negative affects of personal communication devices (Table 4.18).

In responding to questions concerning the benefits related to the use of personal communication devices at work, the most frequent response was also "strongly disagree". The study participants strongly disagreed with these statements with responses ranging from 29.2% (n = 241) ("The use of personal communication devices at

work for non-work related activities reduces work-related stress") to 42.1% (n = 347) ("Personal communication device use at work for non-work related activities improves my ability to focus on my work"). It is interesting to note that 37% (n = 305) of respondents strongly disagreed with the statement "Personal communication device use has improved patient safety" (disagree = 20.6% (n = 170), neutral 24.8% (n = 205), agree = 12.8% (n = 106) and strongly agree = 2.7% (n = 22). Table 4.18 reports the number (with percentages in parentheses) of study participants who reported the negative and positive effects of the use of their personal communication devices while working.

Table 4.18 Positive and Negative Effects of Personal Communication Devices n (%)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No response	n
The use of my personal communication device for non-work related activities has distracted me while working	394 (47.8)	186 (22.5)	89 (10.8)	96 (11.6)	43 (5.2)	17 (2.1)	825
The use of my personal communication device for non-work activities has negatively affected my performance while working	512 (62.1)	148 (17.9)	74 (9)	48 (5.8)	25 (3)	18 (2.2)	825
I have witnessed another nurse whose personal communication device use was negatively affecting his/her performance while working	65 (7.9)	331 (9.2)	86 (10.4)	331 (40.1)	249 (30.2)	18 (2.2)	825
The use of my personal communication device for non-work related activities has helped me focus on my work	305 (37)	184 (22.3)	215 (26.1)	123 (14.9)	14 (1.7)	15 (1.8)	825

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	No response	n
The use of my personal communication device has enabled better coordination of patient care among the healthcare team	271 (32.8)	153 (18.5)	213 (25.8)	123 (14.9)	50 (6.1)	15 (1.8)	825
Personal communication device use has improved unit cohesion and teamwork	282 (34.2)	193 (23.4)	224 (27.2)	193 (23.4)	24 (2.9)	16 (1.9)	825
Personal communication device use has improved patient safety	305 (37)	170 (20.6)	205 (24.8)	106 (12.8)	22 (2.7)	17 (2.1)	825
Personal communication device use is beneficial to patient care	241 (29.2)	144 (17.5)	221 (26.8)	162 (19.6)	41 (5)	16 (1.9)	825
Personal communication device use at work for non-work related activities improves my ability to focus on my work	347 (42.1)	188 (22.8)	172 (20.8)	85 (10.3)	13 (1.6)	20 (2.4)	825
The use of personal communication devices at work for non-work related activities reduces work related stress	243 (29.5)	162 (19.6)	188 (22.8)	167 (20.2)	44 (5.3)	21 (2.5)	825

Negative performance. A variety of questions were asked to determine the extent to which registered nurses were aware of their performance decrement as well as their observations of other registered nurses' performance decrement associated with the use of their personal communication devices. There was a substantial difference between the self-reported and observed report of personal communication devices negatively affecting performance (n = 810, 7.4%) versus (n = 809, 70.9%) (Table 4.19). A two-proportion Z test

was done to assess the significance of the results. The difference between the two proportions was statistically significant ($z = -26.6142$, $p = 0.00$, two tailed) at the $p < 0.05$ level. Table 4.19 reports the number (with percentages in parentheses) of study participants who reported self-reported and observed personal communication device use negatively affecting performance as a registered nurse

Table 4.19 Self-Reported and Witnessed Negative Performance n (%)

	Has the use of a personal communication device every negatively affected your performance as a nurse?	Have you ever witnessed a nurse colleague's personal communication device use negatively affect their performance?
Yes	61(7.4)	585 (70.9)
No	749 (90.8)	224 (27.2)
No response	15 (1.8)	16 (1.9)
Total	825	825

Medical error. A similar difference occurred between self-reported and observed responses to the question asking about a medical error, defined as an adverse effect of care, including a near miss or a sentinel event) made because of distraction caused by the use of a personal communication device (8% versus 13.1%) (Table 4.20). A two-proportion Z test was done to assess the significance of the results. The difference between the two proportions was statistically significant ($Z = -9.6798$, $p = 0.00$, two tailed) at the $p < 0.05$ level. Table 4.20 reports the number (with percentages in parentheses) of study participants of self-reported and observed medical errors (defined as an adverse effect of care, including a near miss or a sentinel event) caused by distraction from a personal communication device.

Table 4.20 Self-Reported and Witnessed Medical Errors n (%)

	Have you ever made a medical error (defined as an adverse effect of care, including a near miss or a sentinel event) because you were distracted by the use of your personal communication device?	Have you ever witnessed a nurse make a medical error (defined as an adverse effect of care, including a near miss or sentinel event) because they were distracted by the use of their personal communication device?

Yes	7 (0.8)	108 (13.1)
No	784 (95)	697 (84.5)
No response	34 (4.1)	20 (2.4)
Total	825	825

Missed important piece of clinical information. Respondents also reported observing other registered nurses using their personal communication devices and missing important clinical communication at a higher rate than they reported for themselves (4% versus 29.9%) (Table 4.21). A two-proportion Z test was done to assess the significance of the results. The difference between the two proportions was statistically significant ($Z = -13.9882$, $p = 0.00$, two tailed) at the $p < 0.05$ level. Table 4.21 reports the number (with percentages in parentheses) of study participants of self-reported and observed missed important pieces of clinical information caused by distraction from a personal communication device.

Table 4.21 Self-Reported and Witnessed Missed Important Clinical Information n (%)

	Do you think you have ever missed an important piece of clinical information because you were distracted by the use of your personal communication device?	Have you ever witnessed a nurse miss an important piece of clinical information because they were distracted by their personal communication device use while working?
Yes	33 (4)	247 (29.9)
No	763 (92.5)	557 (67.5)
No response	29 (3.5)	21 (2.5)
Total	825	825

Serious distraction. Study participants responded to the question about whether they believe "personal communication devices can be a serious distraction during work" always 13% (n = 107), often 29.6% (n = 244), sometimes 44.6% (n = 368), rarely 8.7% (n = 72) or never 1.2% (n = 10). Table 4.22 reports the number (with

percentages in parentheses) of study participants (n = 801) who reported that personal communication devices introduce a serious distraction,

Table 4.22 Personal Communication Devices Are a Serious Distraction n (%)

	Never	Rarely	Sometime	Often	Always	No response	Total
Do you think that personal communication devices can be a serious distraction during work?	10 (1.2)	72 (8.7)	368 (44.6)	244 (29.6)	107 (13)	24 (2.9)	825

Balance of negative and positive effect. When asked if, on balance, the use of personal communication device use by registered nurses while working had a more positive or negative effect on patient care 27.5% (n = 227) said that the effect of personal communication devices on patient care was more positive and 69.5% (n = 573) said it has a more negative effect. Table 4.23 reports the number (with percentages in parentheses) of study participants who reported that personal communication device use by registered nurses on hospital units had a more positive/negative effect on patient care.

Table 4.23 Positive Versus Negative Effect on Patient Care

On balance, do you think the use of personal communication device use by nurses on the unit has a more negative or positive effect on patient care?	Study Participants	Percentage
More negative	573	69.5
More positive	227	27.5
No response	25	3
Total	825	

Multitasking. Study participants were asked to self-identify their multitasking behavior. The question on the online survey used to identify groups of heavy and light multitaskers was, “If multitasking is consuming more than one stream of media content at the same time, how would characterize yourself?” Results showed that

32.5% (n = 268) of study participants identified themselves as light multitaskers, significantly more than the 11.2% (n = 92) who identified themselves as heavy multitaskers and 15.2% (n = 125) who never multitask. The largest number, 38.4% (n = 317) identified themselves as average multitaskers with 2.8% (n = 23) non responses. Table 4.24 reports the number and percentages of study participants who characterized their multitasking behavior.

Table 4.24 Self-Reported Multitasking Behavior

If multitasking is consuming more than one stream of media content at the same time, how would you characterize yourself?	Study Participants	Percentage
Heavy multitasker	92	11.2
Average multitasker	317	38.4
Light multitasker	268	32.5
I never multitask	125	15.2
No response	23	2.8
Total	825	

Employer policy on the use of personal communication devices at work. Among the study participants 82.1% (n = 677) knew that their medical facility had a policy regarding personal communication device use at work. Table 4.25 reports the number and percent of medical facilities that study participants reported had a policy on the use of personal communication devices at work.

Table 4.25 Hospital Policies

Does your employer have a policy on the use of personal communication devices at work?	Study Participants	Percentage
No	117	14.2
Yes	677	82.1
No response	31	3.8
Total	825	

Employer's policy for personal communication device use at work. The majority of study participants said their employer either had (67.6%, n = 558), or should have (24%, n = 198) a policy for personal communication device use at work (Table 4.25). Only 5.8% (n = 48) said they thought their employer should not establish a policy for personal communication use at work. Table 4.26 reports the number and percent of study participants that believe that their employer either has or should have a policy on the use of personal communication devices at work.

Table 4.26 Need for Hospital Policies

Do you think your employer should establish a policy for personal communication device use at work?	Study Participants	Percentage
No	48	5.8
Yes	198	24
Not applicable, there is a policy in place	558	67.6
No response	21	2.5
Total	825	

How registered nurses should use their personal communication devices at work. The most common description of how the study participants felt that registered nurses should use their personal communication devices at work were that they should only be used for work-related activities (31.4%, n = 259), followed by only used for urgent personal reasons (29.1%, n = 240), used for any reason, as long as one uses common sense and good judgment (21.6%, n = 178) and should never be used while working (16.2%, n = 134). Table 4.27 reports the number and percent of study participants who indicated how they believe registered nurses should use their personal communication device at work.

Table 4.27 How Nurses Should Use Their Personal Communication Devices

What best describes your opinion of how nurses should use their personal communication devices at work (excluding breaks and meal times)?	Study Participants	Percentage

Personal communication devices should never be used while working.	134	16.2
Personal communication devices should only be used at work for urgent personal reasons.	240	29.1
Personal communication devices should only be used at work for work related activities.	259	31.4
Personal communication device use at work for any reason is fine, as along is one uses common sense and good judgment.	178	21.6
No response	14	1.7
Total	825	

Feelings about seeing a registered a nurse use a personal communication device on the unit.

Finally, the study participants felt strongly negative 30.2% (n = 249), slightly negative 35.3% (n =291), neutral 30.5% (n = 252), slightly positive 2.3% (n = 19) or strongly positive 0.4% (n = 3) when they saw a registered nurse using their personal communication device on the hospital unit. Respondents also thought that patients felt strongly negative 54.9% (n = 453), slightly negative 31.2% (n = 257), neutral 11.6% (n = 96), slightly positive 1.1% (n = 9) or strongly positive 0.1% (n = 1) when they saw a registered nurse using their personal communication device on the unit. They also reported thinking that that other healthcare staff members felt strongly negative 30.2% (n = 249), slightly negative 35.5% (n = 293), neutral 31.4% (n = 259), slightly positive 1.8% (n = 15) or strongly positive 0.1% (n = 1) when they saw a registered nurse using their personal communication device on the unit. Table 4.28 reports the number (with percentages in parentheses) of study participants' perceptions concerning attitudes towards registered nurses who use their personal communication devices on a nursing unit.

Table 4.28 Opinions Observing Personal Communication Devices at Work n (%)

	Strongly negative	Slightly negative	Neutral	Slightly positive	Strongly positive	missing	Total
How do you feel about a nurse when you see them using their personal communication	249 (30.2)	291 (35.3)	252 (30.5)	19 (2.3)	3 (0.4)	11 (1.3)	825

device on the unit?							
How do you think patients feel when they see a nurse using their personal communication device on the unit?	453 (54.9)	257 (31.2)	96 (11.6)	9 (1.1)	1 (0.1)	9 (1.1)	825
How do you think other healthcare staff feels when they see a nurse using their personal communication device on the unit?	249 (30.2)	293 (35.5)	259 (31.4)	15 (1.8)	1 (0.1)	8 (1)	825

Determining the Representativeness of the Survey Sample

In order to determine if the study participants were representative of the U.S. nursing workforce, the probability that a random sample would generate the proportions it did given the U.S. nursing workforce's distribution was assessed. An examination of the distribution of different sample subgroups was conducted to determine the under- or over- representation of specific subgroups relative to the U.S. nursing workforce. Z-tests and Fisher's Exact tests were run to test for statistically significant differences between populations in each cross tabulation. A Z-test was used for larger sample sizes where both samples were greater than or equal to 5, while a Fisher's Exact test was used when one or both of the samples was less than 5. Statistically significant differences were noted. Both Z-tests and Fisher's exact tests were run at 95% confidence level, indicating that there was a 5% probability that the relationship could be due to chance.

An estimate of the population distribution of various subgroups in the U.S. registered nurse workforce was obtained from the report: The National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey for RNs (Budden et al., 2013). This report was based on an online survey conducted by the National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers from January 2013 to March 2013. The report is the most current and authoritative data, and supersedes the National Sample Survey of Registered Nurses which the Health Resources and Services

Administration (HRSA) published based on data collected in 2008 (Health Resources and Services Administration, 2010). The probability that the percentage of various subgroups in the study sample was representative of the larger population of U.S. nursing workforce was calculated and the results are presented in Table 4.29. It should be noted that the National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers study used a different survey instrument that the previous HRSA survey used. The study conducted by the National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers was the first to use the Minimum Dataset (MDS) and is shorter and less detailed than the HRSA study (2010) (Moulton et al., 2012). The MDS was developed to meet the need for one data set that could be used nationally to consistently collect the same data. However, the MDS does not include questions concerning the respondent's age or characteristics of the respondents' primary place of employment (urban/rural). Therefore, data from the HRSA survey (2010) was used in the analysis of the representativeness of the study sample related to age and primary place of employment (urban/rural) (Health Resources and Services Administration, 2010). In addition, when comparing the current study's results to those of The National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey for RNs (2013) it is important to note that the 2013 survey was a survey of all RN licensees, which included individuals who were not actively employed in nursing, while the study sample included only registered nurses who had worked in a hospital in the last 5 years. As a result of these issues, data comparisons should be interpreted with caution.

Gender. The percentage of males in the survey sample is 5.8%. In contrast the percentage of males in the U.S. nursing workforce is 7% (Budden et al., 2013). The probability of getting 5.8% (n = 48) males in a random sample is 18.68% leading to the conclusion that males are represented appropriately in the study sample. Similarly, the percentage of females in the survey sample is 93.9% (n = 775) which is similar to the 93% percentage of females in the U.S. nursing workforce. The probability of this percentage of females in a simple random sample is 29.37%, leading to the conclusion that females are also appropriately represented in the study sample (Table 4.29).

Primary Place of Employment (Urban/Rural). The majority of survey respondents reside in urban areas, which is consistent with the distribution of the overall U.S. nursing population. The probability that a sample has 85.3% (n = 704) urban residents given that the overall U.S. nursing population has 84.3% urban residents is 18.4% (Health Resources and Services Administration, 2010). Thus, the study sample is reasonably random and is not over or under represented with regard to primary place of employment (Table 4.29).

Age Group. The probabilities indicate that respondents in the age groups "25 and younger," "26-30," "31-35," and "36-40" are underrepresented and the age groups "56-60" and "61-65" are over represented in the sample (Table 4.29). One possible source of this bias was the inclusion criteria of being employed in a medical facility sometime during the last 5 years and who were currently involved with patient care (Figure 3.1). This may have affected the age distribution of the study sample towards older registered nurses. Additionally, the use of the AMSN membership list may have biased the age distribution of the survey sample.

Location. The probabilities indicate that respondents from the regions of East South Central and New England are underrepresented in the sample and respondents from the Pacific region and the East North Central region are over represented in the sample (Table 4.29). Although respondents to the study sample were asked to identify the state where they worked, individual states were combined into census regions in this analysis to clarify potential relationships and to compensate for the small number of sample size in a number of states. Several states had either no study participants (South Dakota, and West Virginia) or only one respondent (Montana, Nebraska, New Hampshire, Rhode Island and Vermont) (Table 4.10). The grouping of states based on U.S. census regions is based on a subjective judgment balancing an adequate number of observations and the belief that bordering stations had similar demographics and therefore could be combined. Of note, The National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey for RNs collected state data by asking respondents to indicate their "primary state of residence" (Budden et al., 2013). In contrast, the study survey collected state data by asking respondents to indicate what state the study participant was "currently employed in as a registered nurse" (Table 4.10). As a result of the different wording of the questions concerning state location, an accurate comparison of the results in order to determine

the representativeness of the study sample may not be appropriate.

Race/Ethnicity. The analysis of race/ethnicity indicated that Whites, American Indians/Alaskan natives and Native Hawaiian or Pacific Islanders are underrepresented in the study participant data and Hispanic and multiple/other ethnicities are over represented (Table 4.29). The current study found that 77.8% (n = 642) White respondents. In contrast, The National Council of State Boards of Nursing and the Forum of State Nursing Workforce Centers 2013 National Workforce Survey for RNs found the percentage of White registered nurses to be 83% (Budden et al., 2013). The probability of getting 77.8% White registered nurses in a random sample is 0.0% leading to the conclusion that White registered nurses are underrepresented in the survey sample. Similarly, Hispanic/Latino nurses accounted for 4.2% (n = 35) of the current study respondents. This compares to U.S. registered nursing workforce data which found 3% of the responding registered nurses were Hispanic/Latino. The probability of getting 4.2% Hispanic/Latino registered nurses in a random sample is 0.0%, leading to the conclusion that Hispanic/Latino registered nurses were over represented. Consideration was given to weighting the study sample data for race/ethnicity, however, several points argue against it. These include the very small sample sizes within several race/ethnic groups (American Indian/Alaska native n = 3; Native Hawaiian or Pacific Islander n = 5; multiple/other n = 22) and the inherent subjectivity of racial/ethnic groupings.

As a result of the issues described above, including the limitations associated with the study design and the available sample size, it was decided not to weight the current survey data but to report the unweighted survey results with the recognition that the results, while valuable, may not be generalizable to the entire U.S. registered nursing workforce.

Table 4.29. Comparison of Study Sample Subgroups and U.S. Registered Nurse Workforce

	Number of Survey Participants	Percentage of Survey Participants	Percentage in US Registered Nurse Workforce [a]	Probability [b]	Representation in the Sample
Total Size	825				
Gender					
Male	48	5.8%	7%	18.68%	
Female	775	93.9%	93%	29.37%	
Location [c]					
Urban	704	85.3%	84.3%	18.4%	
Rural	121	14.7%	15.8%	21.1%	
Age Distribution [b]					
25 or younger	17	2.1%	5.2%	0.0%	Under Represented
26-30	59	7.2%	9.6%	0.01%	Under Represented
31-35	71	8.6%	11.0%	3%	Under Represented
36-40	78	9.5%	12.5%	0.0%	Under Represented
41-45	89	10.8%	12.3%	19%	
46-50	108	13.1%	14.5%	25.4%	
51-56	140	17.0%	15.1%	0.0%	Over Represented
56-60	183	22.2%	11.3%	0.0%	Over Represented
61-65	63	7.6%	5.9%	3.6%	Over Represented
66-70	14	1.7%	1.8%	82.5%	
71 or older	0	0.0%	0.8%	0.1%	Under Represented
Race/Ethnicity					
White	642	77.8%	83%	0.0%	Under Represented
Black/African	47	5.7%	6%	71.9%	

	Number of Survey Participants	Percentage of Survey Participants	Percentage in US Registered Nurse Workforce [a]	Probability [b]	Representation in the Sample
American					
Hispanic/Latino	35	4.2%	3%	3.9%	Over Represented
Asian	56	6.8%	6%	35%	
American Indian/Alaska native	3	0.4%	1%	0.0%	Under Represented
Native Hawaiian or Pacific Islander	5	0.6%	1%	0.0%	Under Represented
Multiple/Other	22	2.7%	1.3%	0.0%	Over Represented
Region [d]					
East South Central	23	2.8%	8.14%	0.0%	Under Represented
Pacific	136	16.5%	13.53%	1.42%	Over Represented
Mountain	49	5.9%	7.09%	20.05%	
West South Central	85	10.3%	10.31%	99%	
New England	28	3.4%	6.74%	0.0%	Under Represented
South Atlantic	139	16.8%	16.45%	76%	
East North Central	181	21.9%	16.59%	0.0%	Over Represented
West North Central	53	6.4%	9.18%	0.0%	Under Represented
Middle Atlantic	118	14.3%	14.47%	80%	

[a] Budden, Zhong, Moulton & Cimiotti, 2013

[b] a social statistics website (http://www.socscistatistics.com/tests/ztest/) was used to calculate the p-value using a two proportion Z test.

[c] Health Resources and Services Administration, 2010

[d] United States Census Bureau-designated regions:
New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont)
Mid-Atlantic (New Jersey, New York, and Pennsylvania)

East North Central (Illinois, Indiana, Michigan, Ohio and Wisconsin)
West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota)
South Atlantic (Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, Washington D.C. and West Virginia)
Central (Alabama, Kentucky, Mississippi, and Tennessee)
West South Central (Arkansas, Louisiana, Oklahoma, and Texas)
Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming)
Pacific (Alaska, California, Hawaii, Oregon, and Washington

Correlation Results

The following section presents correlation and trending results for several significant survey responses. The results are segmented by the variables of interest: age, gender region, and race/ethnicity. In addition relevant correlations relating to performance, professional behavior and multitasking behavior are included. The purpose of this section is to demonstrate that there are statistically significant differences among these subgroups.

Age. In general, across all questions, there are clear statistical differences in responses between the younger age groups and the older age groups (Table 4.30 – Table 4.38). For example, respondents in older age groups are much more likely to never have used their personal communication device to access drug related references, work related nursing/medical information, or as a calculator for nursing/medical formulas (Table 4.30). In addition, respondents in older age groups are much more likely to strongly disagree that they have been distracted by their communication service during work hours (Table 4.31). They are also more likely to strongly disagree that the use of personal communication devices has had a beneficial impact on patient care and patient safety and that the use of personal communication devices at work reduces work-related stress (Table 4.32 – 4.38). They are also more likely to report feeling strongly negative towards registered nurses who use their personal communication devices in the hospital (Table 4.35) and to believe that personal communication devices are a serious distraction on a nursing unit (Table 4.36). They are less likely to multitask (Table 4.37). Tables 4.30 to 4.38 reports the significant correlations with age. Histograms of the results of these investigations are presented in Appendix G.

Table 4.30 Specific Activities and Age Group

Specific Activities	Age Group (years)								
	21-30	31-40	41-50	51-60	61-70	X^2	*n*	*p*	Significant
Drug references	38 (49.1)	73 (50.4)	82 (42)	110 (34.4)	31 (40.8)	43.43	812	0.00	Significant
Work-related nursing/medical information	39 (51.9)	73 (50.3)	82 (42)	115 (36.1)	31 (40.8)	37.12	809	0.02	Significant
Calculator	45 (59.2)	83 (58.1)	89 (45.9)	126 (39.4)	23 (30.3)	44.48	809	0.00	Significant
Work-related protocols	15 (19.7)	20 (13.9)	28 (14.4)	50 (15.8)	10 (13.5)	18.35	804	.304	
Work-related apps	28 (37.4)	42 (29)	36 (18.6)	69 (21.9)	17 (22.4)	30.07	804	.018	Significant
Professional education and development	30 (39.5)	51 (35.4)	56 (28.9)	97 (30.6)	21 (27.5)	17.73	807	.340	
Patient handouts and teaching materials	19 (25.1)	23 (15.9)	31 (16.3)	53 (16.9)	14 (18.6)	17.15	801	.376	
Call or check/send work related text messages or emails to other members of the healthcare team	31 (40.8)	61 (42.1)	67 (33.2)	106 (33.2)	27 (35.1)	17.90	811	.330	
Read online news	24 (31.6)	49 (34.3)	43 (22.4)	74 (23.3)	21 (27.6)	30.08	806	.018	Significant
Call or check/send text messages or emails to family or friends	34 (45.4)	73 (50.3)	43 (39.6)	106 (33.1)	26 (33.8)	41.63	811	0.00	Significant
Shop on the internet	11 (14.4)	22 (15.4)	15 (7.7)	25 (7.8)	5 (6.7)	26.70	806	.045	Significant
Check/post on social networking sites	23 (30.2)	38 (26.1)	21 (10.9)	33 (10.4)	3 (4)	77.53	809	0.00	Significant
Play online games	6 (7.9)	16 (11.1)	6 (3)	22 (7)	4(6.7)	30.61	808	.015	Significant

4.30 The number (with percentage in parentheses) of study respondents who answered either “sometimes,” “often,” or “always” to the question, “On an average day describe use of your personal communication while at work,”

segmented by age group.

A chi-squared test was performed to examine the relation between age and the respondents' opinion about whether their use of their personal communication device for non-work related activities had distracted them while working (Table 4.31). The relation between these variables was significant X^2 (16, N = 805) = 41.307, p < .01. Older respondents were less likely than younger respondents to believe that they have been distracted by their personal communication devices at work. A histogram of the results is presented in Appendix G.

Table 4.31 Distraction by Personal Communication Device and Age Group number

The use of my personal communication device for non-work related activities has distracted me while working.	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*
Strongly disagree	25 (33.3)	67 (46.9)	97 (50)	166 (52.2)	38 (50.7)	393
Disagree	29 (38.7)	45 (31.5)	35 (18)	66 (20.8)	11 (14.7)	186
Neutral	7 (9.3)	11 (7.7)	22 (11.3)	39 (12.3)	10 (13.3)	89
Agree	13 (17.3)	18 (12.6)	28 (14.4)	28 (8.8)	8 (10.7)	95
Strongly agree	1 (1.3)	2 (1.4)	12 (6.2)	19 (6)	8 (10.7)	42
Total	75 (100)	143 (100)	194 (100)	318 (100)	75 (100)	805

4.31 The number (with percentages in parentheses) of study participants (n = 805) segmented by age agreed with the statement, "The use of my personal communication device for non-work related activities has distracted me while working."

The relation between age and respondents' opinions about whether the use of their personal communication device for non-work related activities had negatively affected their performance as a registered nurse was also analyzed. The relation between these variables was significant X^2 (16, N = 804) = 26.845, p < .043. Older respondents were less likely than younger respondents to believe that their performance as a registered nurse was negatively affected by the use of their personal communication device (Table 4.32).

Table 4.32 Negatively Affected Performance and Age Group number

The use of my personal communication device for non-work related activities has negatively affected my performance while working.	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*

The use of my personal communication device for non-work related activities has negatively affected my performance while working.	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*
Strongly disagree	44 (57.9)	88 (62.4)	130 (67)	201 (63.4)	48 (63.2)	511
Disagree	20 (26.3)	35 (24.8)	35 (18)	49 (15.5)	9 (11.8)	148
Neutral	7 (9.2)	6 (4.3)	15 (7.7)	39 (12.3)	6 (7.9)	73
Agree	4 (5.3)	10 (7.1)	9 (4.6)	17 (5.4)	8 (10.5)	48
Strongly agree	1 (1.3)	2 (1.4)	5 (2.6)	11 (3.5)	5 (6.6)	24
Total	76 (100)	141 (100)	194 (100)	317 (100)	76 (100)	804

4.32 The number (with percentages in parentheses) of study participants (n = 804) segmented by age who agreed with the statement "The use of their personal communication device for non-work activities has negatively affected my performance while working."

Older respondents were less likely than younger respondents to believe that the use of their personal communication device at work for non-work related activities had reduced their work-related stress (Table 4.33). The relation between these variables was significant X^2 (16, N = 801) = 115.323, p < .000.

Table 4.33 Stress and Age Group number

Use of personal communication devices at work for non-work related activities reduces work-related stress.	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*
Strongly disagree	12 (15.8)	24 (16.8)	63 (32.8)	110 (34.7)	34 (46.6)	243
Disagree	3 (3.9)	22 (15.4)	41 (21.4)	81 (25.6)	15 (20.5)	162
Neutral	21 (27.6)	36 (25.2)	53 (27.6)	62 (19.6)	14 (19.2)	186
Agree	24 (31.6)	52 (36.4)	25 (13)	56 (17.7)	9 (12.3)	166
Strongly agree	16 (21.1)	9 (6.3)	10 (5.2)	8 (2.5)	1 (1.4)	44
Total	76 (100)	143 (100)	192 (100)	317 (100)	73 (100)	801

4.33 The number (with percentages in parentheses) of study participants (n = 801) by age group who agreed with the statement, "Use of personal communication devices at work for non-work related activities reduces work-related stress."

A chi-squared test was performed to examine the relation between age and the respondents' opinion about whether personal communication device use by registered nurses on hospital units had a more negative or positive affect on patient care. The relation between these variables was significant X^2 (4, N = 797) = 26.941, p <

.000. Compared to younger respondents, older respondents were more likely to believe that personal communication devices on hospital units had a negative effect on patient care (Table 4.34).

Table 4.34 Positive/Negative Effect and Age Group number

On balance, do you think the use of personal communication device use by nurses on the unit has a more negative or positive effect on patient care?	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*
More negative	45 (59.2)	81 (57.9)	140 (73.3)	243 (77.4)	61 (80.3)	570
More positive	31 (40.8)	59 (42.1)	51 (26.7)	71 (22.6)	15 (19.7)	227
Total	76 (100)	140 (100)	191 (100)	314 (100)	76 (100)	797

Table 4.34 The number (with percentages in parentheses) of study participants (n = 797) by age who believe that, "On balance, personal communication device use by nurses on hospital units has a more negative or positive effect on patient care."

Over 60% of respondents have a negative opinion of a registered nurse they see using their personal communication device on a hospital unit. The relation between age and the respondents' feelings about how they feel when they see a registered nurse using their personal communication device at work was investigated. The relation between these variables was significant X^2 (16, N = 811) = 62.732, p < .00. Older respondents were more likely than younger respondents have a negative opinion of a registered nurse who is using his/her personal communication device at work (Table 4.35).

Table 4.35 Professional Behavior and Age Group number

How do you feel about a nurse when you see them using their personal communication device on the unit?	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	*n*
Strongly negative	12 (15.8)	27 (18.6)	56 (28.9)	118 (36.9)	35 (46.1)	248
Slightly negative	22 (28.9)	47 (32.4)	76 (39.2)	122 (38.1)	23 (30.3)	290
Neutral	38 (50)	63 (43.4)	60 (30.9)	73 (22.8)	17 (22.4)	251
Slightly positive	4 (5.3)	6 (4.1)	2 (1)	6 (1.9)	1 (1.3)	19
Strongly positive	0 (0.0)	2 (1.4)	0 (0.0)	1 (0.0)	0 (0.0)	3

Total	76 (100)	141 (100)	194 (100)	320 (100)	76 (100)	811

Table 4.35 The number (with percentages in parentheses) of study participants (n = 811) by age and the answer to the question, "How do you feel about a nurse you see them using their personal communication device on the unit?"

A very high percent of respondents believe that personal communication devices on hospital units are a serious distraction (Table 4.22). To examine the relationship between age and the respondents' opinion about whether personal communication device use by registered nurses on hospital units can be a serious distraction a chi-squared test was done. The relation between these variables was significant X^2 (16, N = 798) = 63.717, p < .00. Older respondents were more likely than younger respondents to believe that personal communication devices use by registered nurses on hospital units can be a serious distraction (Table 4.36).

Table 4.36 Serious Distraction and Age Group

Do you think that personal communication devices can be a serious distraction during work?	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	n
Never	3 (3.9)	1 (0.7)	3 (1.5)	3 (1)	0 (0.0)	10
Rarely	8 (10.5)	24 (16.9)	19 (9.7)	21 (6.8)	0 (0.0)	72
Sometimes	47 (61.8)	76 (53.5)	92 (28.1)	125 (35)	26 (34.7)	366
Often	12 (15.8)	33 (23.3)	55 (28.1)	108 (35)	35 (46.7)	243
Always	6 (7.9)	8 (5.6)	27 (13.8)	52 (16.8)	14 (18.7)	107
Total	76 (100)	142 (100)	196 (100)	309 (100)	75 (100)	798

Table 4.36 The number (with percentages in parentheses) of study participants (n = 798) by age who answered the question, "Do you think that personal communication devices can be a serious distraction during work?"

A chi-squared test was performed to examine the relation between age and respondents' self reported multitasking behavior. The relation between these variables was significant X^2 (12, N = 799) = 27.161, p < .007. Older respondents were more likely than younger respondents to say that they have never multitasked or consider themselves a light multitasker (Table 4.37).

Table 4.37 Multitasking Behavior and Age Group

If multitasking is consuming more than one stream of media content at the same time, how would you characterize yourself?	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	n
Heavy multitasker	14 (18.4)	19 (13.5)	19 (9.9)	28 (8.9)	12 (16)	92
Average multitasker	36 (47.4)	67 (47.5)	77 (40.3)	111 (35.1)	25 (33.3)	316
Light multitasker	20 (26.3)	38 (27)	71 (37.2)	115 (36.4)	23 (30.7)	267
Never multitask	6 (7.9)	17 (12.1)	24 (12.6)	62 (19.6)	15 (20)	124
Total	76 (100)	141 (100)	191 (100)	316 (100)	75 (100)	799

Table 4.37 The number (with percentages in parentheses) of study participants by (n = 799) by age who answered the question, "If multitasking is consuming more than one stream of media content at the same time, how would you characterize yourself?"

To investigate the differences in social norms surrounding the use of personal communication devices on a hospital unit, a chi-squared test was performed examining the relation between age and respondents' description of how registered nurses should use their personal communication devices at work. The relation between these variables was significant X^2 (12, N = 808) = 61.540, p < .000. Older respondents were more likely than younger respondents to say personal communication devices should never be used while working (Table 4.38).

Table 4.38 Professional Behavior and Age Group

What best describes your opinion of how nurses should use their personal communication devices at work (excluding breaks and meal times)?	Age Group (years)					
	21-30	31-40	41-50	51-60	61-70	n
Personal communication devices should never be used while working	9 (11.8)	10 (6.9)	30 (15.5)	63 (19.8)	22 (28.9)	134
Personal communication devices should only be used at work for work-related activities	21 (27.6)	40 (27.8)	57 (29.4)	112 (35.2)	28 (36.8)	258
Personal communication devices should only be used at work for urgent personal reasons	17 (22.4)	41 (28.5)	68 (35.1)	91 (28.6)	21 (27.6)	238
Personal communication device use at work is fine, as long as one uses	29 (38.2)	53 (36.8)	39 (20.1)	52 (16.4)	35 (6.6)	208

common sense and good judgment						
Total	76 (100)	144 (100)	194 (100)	318 (100)	76 (100)	808

Table 4.38 The number (with percentages in parentheses) of study participants (n = 838) by age who selected answers to the question, "What best describes your opinion of how nurses should use their personal communication devices at work (excluding breaks and meal times)?"

Gender. There are few statistically significant differences in the responses to the questions between males and females. In particular, males are statistically significantly more likely to have accessed work related apps that help in patient care X^2 (4, N = 806) = 13.818, p < .008 and more likely to read online news X^2 (4, N = 808) = 14.787, p < .005. Males are also more likely to strongly agree that they witnessed a registered nurse whose personal communication device use was negatively affecting his/her performance while working X^2 (1, N = 803) = 6.694, p < .010. However, these differences are not universal and for the majority of the questions gender was no significant differences. Histograms of the results of these investigations are presented in Appendix H.

A chi-squared test was performed to examine the relation between gender and respondents' description of how personal communication devices had effected their performance at work. There was no significant difference between the number of men and women who believe that the use of their personal communication device had distracted them X^2 (1, N = 794) = .005, p < .947. There is also no significant difference between how they feel their personal communication device has effected their performance as a registered nurse X^2 (1, N = 808) = .092, p < .762, or caused them to miss an important piece of clinical information X^2 (1, N = 808) = .092, p < .762. However, there was a significant difference between the number of men and women who reported witnessing another registered nurse make a medical error because they were distracted by the use of their personal communication device (Table 4.39).

Table 4.39 Gender and Witnessed Medical Error

		Have you ever witnessed a nurse make a medical error because they were distracted by the use of their personal communication device?		
		No	Yes	Total
What is your	Male	34 (73.9)	12 (26.1)	46 (100)

gender?	Female	661 (49)	96 (12.7)	757 (100)
Total		695 (86.6)	108 (13.4)	803 (100)

Table 4.39 The number (with percentages in parentheses) of study participants (n = 803) by gender who answered the question, “Have you ever witnessed a nurse make a medical error because they were distracted by the use of their personal communication device?”

There were no significant differences on self-reported performance based on gender.

Table 4.40 Gender and Self-Reported Performance

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree	n	X^2	*p*
The use of my personal communication device for non-work related activities has distracted me while working	Male	20 (45.5)	9 (20.5)	8 (18.2)	3 (6.8)	4 (9.1)	44 100)	4.62	.33
	Female	373 (49)	176 (23.1)	81 (10.6)	93 (12.2)	39 (5.1)	762 (100)		
The use of my personal communication device has negatively affected my performance	Male	28 (60.9)	8 (17.4)	5 (10.9)	4 (8.7)	1 (2.2)	46 100)	.97	.91
	Female	482 (63.5)	140 (18.4)	69 (9.1)	44 (5.8)	24 (3.2)	759 100)		
The use of my personal communication device for non-work related activities has helped me focus on my work	Male	17 (37)	8 (17.4)	14 (30.4)	4 (8.7)	3 (6.5)	46	7.66	.11
	Female	288 (37.8)	175 (23)	200 (26.2)	88 (11.5)	11 (1.4)	762		
The use of personal communication devices has enabled better coordination of patient care	Male	10 (23.1)	7 (14.9)	17 (36.2)	9 (19.1)	4 (8.5)	47	5.52	.24
	Female	261 (34.3)	146 (19.2)	196 (25.8)	113 (14.8)	45 (5.9)	761		

Table 4.40 The number (with percentages in parentheses) of study participants by gender who selected answers to questions concerning the impact of personal communication devices on the work of nurses.

Region. In general, across all questions, there are clear statistical differences in responses between different regions. For example, respondents in the New England region were more likely to indicate that they never access work related drug references or work related nursing/medical information compared to their counterparts in the Pacific, South Atlantic and the West South Central regions. Histograms of the results of these investigations are presented in Appendix I.

A chi-squared test was performed to examine the relation between region and respondents' belief that they had been distracted by their non-work related use of their personal communication device. The relation between these variables was not significant X^2 (9, N = 789) = 11.269, p < .258. Respondents from different regions were equally likely to believe that the use of their personal communication device had not distracted them at work (Table 4.41).

Table 4.41 Distraction and Region

	The use of my personal communication device for non-work related activities has distracted me while working					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	n (%)
New England	17 (60.7)	6 (21.4)	3 (10.7)	2 (7.1)	0 (0.0)	28 (100)
Middle Atlantic	59 (51.3)	28 (24.3)	9 (7.8)	11 (9.6)	8 (7)	115 (100)
East North Central	88 (49.4)	41 (23)	24 (13.5)	17 (9.6)	8 (4.5)	178 (100)
West North Central	26 (51)	12 (23.5)	4 (7.8)	6 (11.8)	3 (5.9)	51 (100)
South Atlantic	60 (43.8)	32 (23.4)	14 (10.2)	24 (17.5)	7 (5.1)	137 (100)
East South Central	10 (43.5)	7 (30.4)	4 (17.4)	2 (8.7)	0 (0.0)	23 (100)
West South Central	36 (42.4)	21 (24.7)	11 (12.9)	13 (15.3)	4 (4.7)	85 (100)
Mountain	23 (46.9)	10 (20.4)	8 (16.3)	3 (16.1)	5 (10.2)	49 (100)
Pacific	68 (52.3)	29 (22.3)	12 (9.2)	14 (10.8)	7 (5.4)	130 (100
Total	388	186	89	95	42	800

Table 4.41 The number (with percentages in parentheses) of study participants (n = 800) by region who believe that the use of their personal communication device for non-work activities has distracted them while working.

To examine whether the relation between region and respondents' belief that their performance as a registered nurse had been negatively affected by their personal communication device a chi-squared test was done. The relation between these variables was significant X^2 (36, N = 799) = 54.366, p < .025. Respondents from different regions were equally likely to believe that their performance as a registered nurse had been negatively affected by their personal communication device (Table 4.42).

Table 4.42 Performance and Region

	The use of my personal communication device for non-work related activities has negatively affected my performance while working n (%)					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	n (%)
New England	17 (60.7)	6 (21.4)	3 (10.7)	2 (7.1)	0 (0.0)	27 (100)
Middle Atlantic	59 (51.3)	28 (24.3)	9 (7.8)	11 (9.6)	8 (7)	114 (100)
East North Central	88 (49.4)	41 (23)	24 (13.5)	17 (9.6)	8 (4.5)	178 (100)
West North Central	26 (51)	12 (23.5)	4 (7.8)	6 (11.8)	3 (5.9)	51 (100)
South Atlantic	60 (43.8)	32 (23.4)	14 (10.2)	24 (17.5)	7 (5.1)	138 (100)
East South Central	10 (43.5)	7 (30.4)	4 (17.4)	2 (8.7)	0 (0.0)	23 (100)
West South Central	36 (42.4)	21 (24.7)	11 (12.9)	13 (15.3)	4 (4.7)	85 (100)
Mountain	23 (46.9)	10 (20.4)	8 (16.3)	3 (6.1)	5 (10.2)	49 (100)
Pacific	68 (52.3)	29 (22.3)	12 (9.2)	14 (10.8)	7 (5.4)	130 (100)
Total	507	147	74	47	24	799

Table 4.42 The number (with percentages in parentheses) of study participants (n = 799) by region who believe that the use of their personal communication device for non-work activities negatively affected their performance while working.

Race/Ethnicity. In general, there were statistically significant differences in some questions between Asians and White respondents and between Black/African American and White respondents. For example, White respondents were more likely to indicate that they never access work related protocols, sites for professional education and development or sites for patient handouts and teaching compared to their Black/African American counterparts (JI). White respondents are also more likely to strongly disagree that the use of personal

communication device for non-work related activities had distracted them while working compared to Asian respondents X^2 (24, N = 788) = 85.360, p < .000 (Table 4.43). Histograms of the results of these investigations are presented in Appendix J.

Table 4.43 Distraction and Race/Ethnicity

	The use of my personal communication device for non-work related activities has distracted me while working.					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	n (%)
American Indian or Alaska Native	0 (0.0)	0 (0.0)	0 (0.0)	1 (33.3)	2 (66.7)	3 (100)
Asian	11(20.8)	11(20.8)	10 (18.9)	11 (20.8)	10 (18.9)	53 (100)
Black African American	18 (38.3)	18 (38.3)	4 (8.5)	2(4.3)	5 (10.6)	47 (100)
Hispanic or Latino	12 (35.3)	12 (35.3)	4 (11.8)	6 (17.6)	0 (0.0)	34 (100)
Native Hawaiian or Pacific Islander	4 (80)	0 (0.0)	0 (0.0)	0 (0.0)	1 (20)	5 (100)
White/Caucasian	329 (52.2)	139 (22.1)	67 (10.6)	71 (11.3)	24 (3.8)	630 (100)
Other	9 (56.3)	2 (12.5)	2 (12.5)	2 (12.5)	1 (6.3)	16 (100)

Table 4.43 The number (with percentages in parentheses) of study participants (n = 805) by race/ethnicity who answered the question, “The use of my personal communication device for non-work related activities has distracted me while working.”

A chi-squared test was performed to examine the relation between race/ethnicity and respondents’ belief that their performance had been negatively affected by their personal communication device. There were no significant differenced based on race/ethnicity. Respondents from different races and ethnicities were equally likely to believe that their performance had been negatively affected by their personal communication device (Table 4.44).

Table 4.44 Performance and Race/Ethnicity

	The use of my personal communication device for non-work related activities has negatively affected my performance while working					
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	n (%)

American Indian or Alaska Native	1 (33.3)	0 (0.0)	1 (33.3)	1 (33.3)	0 (0.0)	3 (100)
Asian	23 (42.6)	8 (14.8)	5 (9.3)	10 (18.5)	8 (14.8)	54 (100)
Black African American	29 (63)	9 (19.6)	3 (6.5)	4 (8.7)	1 (2.2)	46 (100)
Hispanic or Latino	17 (50)	11 (32.4)	3 (8.8)	3 (8.8)	0 (0.0)	34 (100)
Native Hawaiian or Pacific Islander	3 (60)	1 (20)	0 (0.0)	0 (0.0)	1 (20)	5 (100)
White/Caucasian	415 (65.9)	116 (18.4)	58 (9.2)	28 (4.4)	13 (2.1)	630 (100)
Other	9 (60)	1 (6.7)	3 (20)	1 (6.7)	1 (6.7)	15 (100)

Table 4.44 The number (with percentages in parentheses) of study participants (n = 805) by race/ethnicity and the respondents who answered the question, "The use of my personal communication device for non-work related activities has negatively affected my performance while working."

Crosstabulations were used to correlate the response of registered nurses to different questions in the survey. These crosstabulations included performance, multitasking behavior, nursing position and hospital policy regarding the use of personal communication devices.

Use of Personal Communication Devices. Chi-square tests were done to test for correlations between the frequency of use of personal communication devices at work (Table 4.15) and self-reported and witnessed performance including performance decrement, medical errors and missing important clinical information. Although no significant results were found for self-reported behaviors, significant results were found for all witnessed behaviors (Table 4.45). Non-significant correlations were found for "Has the use of a personal communication device ever negatively affected your performance as a nurse?", "Have you ever made a medical error because you were distracted by the use of your personal communication device?" and "Do you think you have every missed an important piece of clinical information because you were distracted by the use of your personal communication device?" (Table 4.45). Significant results were calculate for the questions, "Have you ever witnessed another nurse's personal communication device use negatively affect their performance?" "Have you ever witnessed a nurse make a medical error because they were distracted by the use of their personal communication device?" and "Have you ever witnessed a nurse miss an important piece of clinical information because they were distracted by their personal communication device while working?" (Table 4.45).

Table 4.45 Frequency of Use and Performance

		How often do you use your personal communication device while working (excluding lunch and breaks)?							
		Never	Rarely	Sometime	Often	Always	X^2	*n*	*p*
Has the use of a personal communication device every negatively affected your performance as a nurse?	no	45 (88.2)	99 (94.3)	126 (92)	278 (90.8)	184 (96.3)	7.24	790	.124
	yes	6 (11.8)	6 (5.7)	11 (8)	28 (9.2)	7 (3.7)			
Have you ever witnessed another nurse's personal communication device use negatively affect their performance?	no	7 (13.7)	21 (20)	40 (29.4)	86 (28.1)	66 (34.6)	12.72	789	.013
	yes	44 (86.3)	84 (80)	96 (70.6)	220 (71.9)	125 (65.4)			
Have you ever made a medical error (defined as an adverse effect of care, including a near miss or a sentinel event) because you were distracted by the use of your personal communication device?	no	46 (97.9)	99 (99)	132 (99.2)	301 (99.3)	186 (98.6)	1.08	771	.897
	yes	1 (2.1)	1 (1)	1 (.8)	2 (.7)	2 (1.1)			
Have you ever witnessed a nurse make a medical error because they were distracted by their personal communication device?	no	36 (72)	83 (81.4)	123 (90.4)	261 (85.6)	178 (92.7)	19.94	785	.001
	yes	14 (28)	19 (18.6)	13 (9.6)	44 (14.4)	14 (7.3)			

		How often do you use your personal communication device while working (excluding lunch and breaks)?							
		Never	Rarely	Sometime	Often	Always	X^2	*n*	*p*
Do you think you have ever missed an important piece of clinical information because you were distracted by the use of your personal communication device?	no	48 (90)	102 (98.1)	132 (97.1)	285 (95)	177 (94.7)	3.58	776	.465
	yes	1 (2)	2 (1.9)	4 (2.9)	15 (5)	10 (5.3)			
Have you ever witnessed another nurse miss an important piece of clinical information because they were distracted by their personal communication device?	no	28 (52)	69 (67.6)	97 (70.8)	204 (67.1)	149 (77.6)	14.25	785	.007
	yes	24 (48)	33 (32.4)	40 (29.2)	100 (32.9)	43 (22.4)			

Table 4.45 The number (with percentages in parentheses) of study participants segmented by frequency of use and performance

Multitasking Behavior. The relationship between heavy multitaskers and light multitaskers related to three questions concerning the effect of personal communication device use on performance was non-significant. Self-reported light multitaskers were no more likely to report that they were affected by the use of their personal communication device than heavy multitaskers. Table 4.45 reports the number (with percentages in parentheses) of study participants whose performance was affected by personal communication devices segmented by self-identified as heavy and light media multitaskers.

Table 4.46 Multitasking Behavior and Performance

	Heavy Multitasker			Light Mulitasker				
	Yes	No	n	Yes	No	*n*	X^2	*p*
Has the use of a personal communication device every negatively affected your performance as a nurse?	7 (7.7)	85 (92.4)	92 (100)	20 (7.5)	247 (92.5)	267 (100)	4.65	.20
Have you ever made a medical error (defined as an adverse effect of care, including a near miss or a sentinel event) because you were distracted by the use of your personal communication device?	1 (1.1)	90 (98.9)	91 (100)	3 (1.1)	259 (98.9)	262 (100)	1.41	.70
Do you think you have ever missed an important piece of clinical information because you were distracted by the use of your personal communication device?	7 (7.7)	84 (92.3)	91 (100)	9 (3.4)	253 (96.6)	262 (100)	7.08	0.69

Table 4.46 The number (with percentages in parentheses) of study participants by heavy and light multitasking behavior and performance

Professional Behavior. A Z test was performed to examine the relation between staff position and opinions about professional behavior related to personal communication device use by registered nurses on in-patient units. The strongly negative opinions of staff registered nurses and nurse managers were compared concerning their feelings towards a registered nurse they see using his/her personal communication device on a hospital unit, their feelings about what patients feel about a registered nurse using their personal communication device and what other healthcare team members feel about a registered nurse who is seen using their personal communication device on an in-patient hospital unit. Differences were significant with nurse managers having a higher rate of strongly negative opinions toward personal communication devices on hospital units compared to staff registered nurses and believing that patients had strongly negative feelings when they saw a registered nurse using their personal communication device at work (Table 4.57). There was a non-significant result comparing nurse managers' and staff nurses' beliefs about how other staff feel about nurses who use their

personal communication devices at work (Table 4.47)

Table 4.47 Position and Professional Behavior

	Nurse Manager		Staff Nurse		Z	*p*
	Strongly negative	*n*	Strongly negative	*n*		
How do you feel about a nurse when you see them using their personal communication device on the unit?	35 (48.6)	72	154 (30.1)	511	3.14	0.00
How do you think patients feel when they see a nurse using their personal communication device on the unit?	48 (66.7)	72	265 (51.8)	512	2.38	0.02
How do you think other healthcare staff feels when they see a nurse using their personal communication device on the unit?	26 (36.1)	72	146 (28.5)	513	1.22	0.18

Table 4.47 The number (with percentages in parentheses) of study participants perceptions concerning attitudes towards nurses who use their personal communication devices on a nursing unit segmented by nursing position.

Hospital policy

A Z test was conducted to see if the presence of a hospital policy discouraged registered nurses from using their personal communication devices while working. The relation between these variables was significant, X^2 (1, N = 789) = 6.060, p < .014. In hospitals with a policy on the use of personal communication at work, fewer registered nurses reported seeing another registered nurse negatively affected by the use of a personal communication device (Table 4.48). None of the other performance questions, both self-reported and witnessed, correlated with the presence of a hospital policy.

Table 4.48 Hospital Policy and Witnessed Performance

		Does your employer have a policy on the use of personal communication devices at work?		
		no	yes	Total n (%)
Have you ever witnessed another nurse's personal communication device use negatively affect their performance?	no	43 (37.1)	73 (62.9)	116 (100)
	yes	175 (26)	498 (74)	673 (100)

Table 4.48 The number (with percentages in parentheses) of respondents reporting the presence of a hospital policy and witnessed performance decrement.

The results of these correlations are discussed in chapter 5.

CHAPTER 5. DISCUSSION

The results of the survey are discussed in the following pages in relation to the two questions this study sought to answer:

(1) What is the frequency of use of personal communication devices among hospital registered nurses?

(2) What are the concerns and opinions among registered nurses regarding the use of personal communication devices on in-patient units?

This chapter will also address the strength and weaknesses of the study.

The Frequency of Use of Personal Communication Devices Among Hospital Registered Nurses

Personal communication devices are pervasive in hospitals, with close to eighty percent (78.1%, n = 645) of respondents reporting using their personal communication device (always, often, sometimes) while working. Only 6.4% (n = 53) of respondents report never using their personal communication device at work (Table 4.15). These results agree with earlier research that reported high rates of personal communication device use by healthcare providers (Smith et al., 2009; Katz-Sidlow et al., 2012, Wu et al. 2011). As personal communication devices become more integrated into the clinical setting as the primary mode of communication, added features are being introduced in the hospital. These features support both work-related and non-work-related activities

Registered nurses in the study frequently used their personal communication devices to access the myriad of medical apps and Internet resources that exist to support the work of registered nurses, with the prevalence ranging from 15.4% (n = 124) (always, often, sometimes) ("I access work-related protocols") to 44.5% (n = 367) (always, often, sometimes) ("I use the device as a calculator for nursing/medical formulas") (Table 4.17). However, of the activities listed in the survey, registered nurses reported using their personal communication devices at work primarily to call or check/send text messages or emails, in other words to support and maintain relationships with friends, family and other healthcare team members (Table 4.17). Calling or checking and sending emails to family and friends was the most frequently selected non-work-related activity with

38.6% (n = 318) (always, often, sometimes) of registered nurses reporting using their personal communication device for this activity. Similarly, calling or checking/sending emails to other members of the healthcare team was one of the most commonly selected work-related activities of the registered nurses with 35.6% (n = 294) (always, often, sometimes) reporting this use of their personal communication device for this while working (Table 4.17). These results support Sherry Turkle's theory of a "tethered self," where humans use their personal communication devices to be constantly connected to other people and places, needing the continuing reassurance of always developing and maintaining their group membership, but also always distracted by email and instant messaging (Turkle, 2008). The dark side of seeking constant control and convenience in our interpersonal relationships through our personal communication devices was analyzed by Turkle. She found that the use of these devices often leads to a loss of rich and demanding social interactions and meaningful face-to-face conversations. The high rate of concern reported by registered nurses about the decrement in nursing performance they saw as related to personal communication device use supports Turkle's theory that the overuse of computers damages our face-to-face relationships. Other researchers have speculated about the constant emotional reassurance that comes from interacting with others though a personal communication device and how it helps alleviate the "fear of missing out," which is defined as a form of social anxiety that results from "a compulsive concern that one might miss out on an opportunity for social interaction, a novel experience, a profitable investment or other satisfying event" (Przybylski, Murayama, Dehaan, & Gladwell, 2013, p. 1814). Emails, instant texting and postings on social media sites such as Facebook and LinkedIn provide registered nurses with opportunities to meet their emotional needs by constantly checking in with friends, family and coworkers. An alternative explanation for this use of personal communication devices was reported by Lin et al. who studied the association between fatigue and Internet addiction in hospital nurses. They classified 6% to 10% of their study participants as Internet addicts whose use of the Internet is associated with fatigue and a possible degradation of performance. They define "nurse fatigue" as a subjective feeling of tiredness that persists despite periods of rest which can be the result of a multitude of contributing factors, such as high job demands, shift rotation work schedule, extended work shifts and poor sleep quality. They speculated that personal

communication devices are used by registered nurses to recover from work-related fatigue. Coker (2011) also speculated that use of personal communication devices for workplace Internet leisure browsing allows workers to take short, unobtrusive breaks which enables concentration to restore their ability to focus. He found that use of personal communication devices at work to access the Internet had a positive effect on productivity. The present study challenged this theory. The most frequent use of personal communication devices by registered nurses was to maintain interpersonal relationships, with relatively few study participants using their personal devices to do distracting activities such as playing games (6.7%, n = 4), shopping (6.7%, n = 5) or checking social media sites (4%, n = 3).

In the survey there are clear generational differences in responses between younger and older age groups. Respondents in older age groups are much more likely to say that they have never used their personal communication device to access pharmaceutical guides, work-related nursing/medical information or work related protocols (Table 4.30). Generational differences were also evident with younger registered nurses significantly more likely to use their personal communication devices to do non-work activities including checking and posting on social media sites, and calling or checking/sending emails or text messages to friends and family while at work (Table 4.30).

This could be the result of inexperience and lack of comfort with personal communication devices in general on the part of the older respondents. Certain features, for example texting, could be beneficial as a mode of communication within the hospital, but could be daunting to learn, especially in a high-stress environment. Other features of personal communication devices may not be pertinent to patient care, for example shopping online or playing games. These were more likely to occur in younger age groups than older groups. (Table 4.30) This may be the result of a greater sense of security and ease of use among younger respondents when using personal communication devices due to their experience with them.

These generational differences may reflect younger staff registered nurses' willingness to multitask and self-interrupt while working. Alternatively, it may be a deliberate role-modeling of desired conduct at work by older registered nurses who adhere to a social norm which discourages use of personal communication devices at

work for non-work purposes. Similar generational results were reported in national traffic safety research that found that younger drivers were more likely to text and make cellular phone calls while driving. Close to 30% of drivers under the age of 30 years reported texting while driving a car, compared to 9% of respondents over the age of 30 (National Highway and Traffic Safety Administration [NHTSA], 2012). The new technologies appear to be particularly attractive to young people who enter the workplace with personal communication devices and wired technology which moves them towards less focused cognitive behavior. Long term exposure to this type of behavior is expected to have both positive and negative effects on the performance of registered nurses working in hospitals.

The different rates of personal communication device use by registered nurses while working may also reflect attitudinal differences between the two age groups as reflected in the questions about the benefits of personal communication device use. Younger registered nurses rated the benefits of personal communication devices while working more highly than older registered nurses, including improving coordination of patient care and helping them to focus on their work (Table 4.33). Younger registered nurses were also much more likely to think that, on balance, personal communication devices on the in-patient hospital units had a positive impact on patient care, compared to older registered nurses (Table 4.34). In contrast, older registered nurses overwhelmingly reported that personal communication devices on nursing units were a serious distraction and have a negative effect on patient care (Table 4.36).

Registered nurses under the age of 30 years in the study were less likely to acknowledge that their personal communication device use distracted them while working than registered nurses over the age of 30, however they were equally likely to report observing other registered nurses whose performance was negatively affected by the use of their personal communication devices (Table 4.43). In addition, in the current study, older registered nurses had a much more negative opinion of a registered nurse that they saw using their personal communication device on a nursing unit than younger registered nurses (Table 4.44). Older registered nurses were also more likely to believe that patients and other healthcare staff had a negative opinion of registered nurses who they saw using their personal communication device on a hospital unit (Table 4.45). This could be a

reflection of a different social norm about what is acceptable personal communication device use, sometimes called “netiquette,” which involves how personal communication devices should be used in public areas. Although the societal opinion appears to have become more tolerant of personal communication devices in public, it is still evolving with the increasing use within the home and in other institutional settings, it is still unclear how socially acceptable it is within the hospital.

Looking at the differences in opinions about personal communication device use and patient safety, in general older study participants are less familiar with these devices than younger respondents (Table 4.31 and 4.32). The study data supports the idea that there is a generational divide between registered nurses under the age of 30 and those over the age of 30 concerning professional behavior and the acceptability of multitasking at work (Table 4.37).

The Concerns and Opinions Among Hospital Registered Nurses

The findings of this study demonstrate that registered nurses who are involved with patient care on in-patient units are concerned about the negative effects of personal communication devices on nursing performance and they report that personal communication devices raise significant safety issues on in-patient hospital units, although a majority of registered nurses continue to use their personal communication devices while working (Table 4.22 and Table 4. 18).

Only 7.4% (n = 61) of survey respondents believe that their personal communication device had negatively affected their performance as a registered nurse (Table 4.19). Four percent (n = 33) believed that they had missed important clinical information because of distraction by their personal communication device (Table 4.21). Less than one percent (0.8%, n = 7) admitted to making a medical error because their personal communication device distracted them (Table 4.20). However, when asked if they had ever witnessed another registered nurse’s performance negatively affected by the use of their personal communication device, 70.9% (n = 749) answered yes, 29.9% (n = 247) reported seeing another registered nurse miss important clinical information because of their personal communication device and 13.1% (n = 108) reported witnessing another registered nurse made a medical error due to the use of their personal communication device (Tables 4.19, 4.20

and 4.21). One plausible reason for this discrepancy is that personal communication device users may not be aware of their own mistakes or may not believe that they are distracted. Lesch and Hancock (2004) not only reported that drivers were oblivious to their reduced driving abilities resulting from simultaneous cell phone use, but there was a discordant pattern of confidence level and actual performance for drivers. Older female drivers in particular expressed a high level of confidence in their ability to use their cell phone and drive which did not correlate with their performance on a brake response time test. The authors speculated that the high confidence in dealing with distractions while driving derived, in part, from a belief that it is possible to compensate for the effects of distraction, in spite of the evidence that this is not the case. Similarly, registered nurses may have a false sense of confidence in their ability to handle distractions from personal communication devices while they work. The present survey asked registered nurses how they felt that personal communication devices should be used at work. Although the majority responded that they should only be used for work-related activities (31.4%, n = 259) or should only be used for urgent personal reasons (29.1%, n = 240), (21.6% (n = 178) responded that "personal communication device use at work for any reason is fine, as long as one uses common sense and good judgment" (Table 4.29). This approach maintains that registered nurses recognize that there is some risk associated with using personal communication devices at work but that they have the ability to modify their behavior accordingly and should be given responsibility for deciding when and how to use these devices. It presumes that registered nurses can accurately assess the risks associated with the use of their personal communication devices at work. The results of this study indicate that registered nurses express a disproportionately high confidence in their ability to manage the risk associated with the use of personal communication devices at work relative to other registered nurses' performance. The results of the performance questions suggest that many registered nurses are unaware of their own performance decrement resulting from concurrent personal communication device use. The high number of study participants in the current study who reported witnessing a distracted registered nurse, while at the same time minimizing the impact of their own use is an area of concern as this could potentially lead to significant patient safety issues.

Somewhat similar results were reported by Katz-Sidlow, et al. (2012) who found that 57% (n = 59) of medical residents self-reported using their smartphones during attending rounds. However, 91% (n = 103) reported observing another resident using their smartphone during attending rounds and 43% (n = 49) reported observing attending physicians using their smartphone during hospital rounds. Although the majority of time medical residents used their smartphones for patient care activities 89% (n = 76) during rounds, the respondents also reported reading or responding to personal texts or emails 37% (n = 32) and other non-patient care related use, including Web surfing 15% (n = 13).

A possible explanation for the difference in self-reported and witnessed use of personal communication devices for non-work related communication, is that while registered nurses and medical residents may use their personal communication devices at work, they retain some commitment to the social norm that it is generally not acceptable for them to use their devices while they are working. By rationalizing that they are better able to use their devices without a concurrent decrement in performance compared to their co-workers, they are able to justify their behavior without feeling guilty (Lim, 2002).

This study demonstrated that although registered nurses recognize the benefits of personal communication devices, they are concerned that these devices are a serious distraction on hospital units (Table 4.18). Previous research established that mobile communication devices, including smartphones, cellular phones and computer tablets, have a detrimental effect on workload and cognitive performance. Their use increases reaction time, reduces the ability to focus on tasks and lowers performance on tasks that require concentration and decision-making (Ophira et al., 2009; Maples et al., 2008; Strayer et al., 2003).

The results of this study demonstrated that registered nurses believe that the use of personal communication devices on hospital units diverts attention away from patient care and negatively affects nursing performance. This supports Goldhaber's thesis that attention is a limited resource and the use of personal communication devices and their attendant task switching costs can result in the reconfiguration of the attentive capacities of the subject in ways that constitute attention as a scarce, and hence a valuable, resource (Goldhaber, 2006). Goldhaber's hypothesized that humans can only attend to a limited amount of information at

one time, and that use of a personal communication device diverts scarce attention resources away from other tasks, producing an attention-impoverished subject. The results of this study support the theory that people have only a limited amount of cognitive resources which allows them to focus on one thing at a time. When people use their personal communication devices while working, their performance suffers. A large number of participants in the present study reported observing registered nurses attempting to process multiple incoming streams of information as a result of personal communication use with a resulting decrement in performance. This observed rate of personal communication device use correlated positively with the rate of observed impaired performance, missed clinical information and increased medical errors (Table 4.45). Registered nurses reported seeing other registered nurses using their personal communication device at work and impairing their performance as a registered nurse, causing them to miss important clinical information and leading them to make medical errors. The results of this study supports the idea that in-patient nursing care involves the allocation of attention on a range of tasks simultaneously and the addition of personal communication devices on the hospital unit is likely to have a role in the genesis of medical errors.

This study found that there were clear generational differences between the ways registered nurses felt that personal communication devices should be used when caring for patients. Personal communication devices use by registered nurses is widespread, especially by younger registered nurses for both work and non-work related purposes. Awareness and interest in the use of these devices, particularly the potential misuse of these devices in ways that could endanger patient safety is growing. Concerns regarding personal communication devices by registered nurses frequently center on distraction on devices, away from patient care. This can be particularly difficult for younger registered nurses who bring to the unit established media habits and a "digital footprint" which may include an online identify. This may make it difficult to separate personal and professional activities. Generational trends imply an increase in personal communication device use by the next generation of registered nurses, and that inappropriate use could pose a serious threat to patients.

Future Research

An area of future research regarding the use of personal communication devices by registered nurses in

clinical settings pertains to the reasons why registered nurses use their personal communication devices at work. Although there are many work-related benefits, less well recognized are the social benefits that result from the use of personal communication devices have for registered nurses. Close to one-quarter (24.6%) (n = 203) of registered nurses in the present study agreed or strongly agreed that the use of personal communication devices was beneficial to patient care and 15.5% (n = 211) agree or strongly agreed that they improved patient safety (Table 4.18). In addition to supporting work-related activities, study participants 16.6% (n = 137) agree or strongly agreed that use of their personal communication devices reduced work-related stress and improved their ability to focus on their work (Table 4.18). On balance, however, 69.5% (n = 573) believe that the use of personal communication devices by registered nurses while working has a more negative impact on patient care (Table 4.23).

There is a considerable amount of interest concerning whether the use of the personal communication devices have improved interprofessional relationships among members of healthcare teams. A Canadian study found that after the introduction of smartphones for medical residents there was a perceived increase in efficiency of communication between physicians and registered nurses. However, there was also a perceived decrease in the quality of interprofessional relationships due to the overreliance on electronic communication (Wu et al., 2010). The present study asked participants how personal communication devices had affected their relationships with their co-workers and patients. Over half (57.4%) (n = 475) disagreed or strongly disagreed with the statement that they improve unit cohesion and teamwork, 51.3% (n = 424) disagreed or strongly disagreed that it enabled better coordination of patient care among team members (Table 4.18). Future studies could investigate the effect of different types of personal communication use on interprofessional relationships.

Registered nurses' relationships with their personal communication devices are changing, requiring them to develop more self-discipline. These findings support previous research that showed that while communication appeared to be made more efficient by personal communication devices, the authors observed that some healthcare workers using the devices are more globally connected but less locally present (Wu, et al 2013). The new technology also facilitated the interruption of normal patient care activities and was observed to

be detrimental to team relationships. Coworkers preferred face-to-face communication in person to texting and objected to the interruption of important conversations and patient care by calls and messages on their personal communication devices. Additional research should be conducted to determine if there are different types of presence and knowledge that are required to work as a registered nurse and to provide safe patient care.

The responses to the survey indicate that registered nurses feel that personal communication device use while caring for patients raises significant safety concerns that should be addressed by hospital policies limiting the use of these devices on hospital units. Over eighty percent (82.1%) (n = 677) of study participants were aware that their employer had a policy on the use of personal communication devices at work. Policies concerning personal communication device use at work are supported by the study with only 5.4% (n = 48) of the study participants reporting that they did not think that their employer should establish a policy for personal communication device use at work.

Organizations should develop and implement a workplace policy governing the acceptable use of personal communication devices at work. As personal communication devices on hospital units become more inevitable, registered nurses appear to feel that boundaries need to be drawn between where and how personal communication devices can be used in hospitals. Protocols and policies that would limit personal communication device use on units would need to address what features of personal communication devices should and should not be used while working. Research in the impact of different types of policies on patient safety, interpersonal relations and employee satisfaction would be useful in designing new policies.

There are clear generational differences in registered nurses' opinions concerning how personal communication devices should be used at work. Of the four options were presented, 31.4% (n = 259) reported that personal communication devices should only be allowed to be used at work for work-related activities (Table 4.27). An additional 29.1% (n = 240) believe that personal communication devices should only be used at work for urgent personal reasons. However, generational difference occurred with older registered nurses favoring the most restrictive policies and younger registered nurses feeling that registered nurses should be allowed to use their own judgment about how to use their personal communication device while working (Table 4.38).

Close to half of the study participants indicated that personal communication devices should either not be used while working or not be used for non-work related purposes (Table 4.27). However, opinions regarding how personal communication devices should be used differed significantly according to the age of the respondent (Table 4.38). The mean age of study participants who thought personal communication device use at work was fine as long was one uses common sense and good judgment was 42.75 years, while the mean age of study participants who thought that personal communication devices should never be used while working was 51.08 years.

Study participants who had managerial or administrative positions had different attitudes towards using personal communication devices in clinical practice. Nurse managers and staff nurses had different attitudes towards registered nurses using their personal communication devices on hospital units. Compared to staff nurses, managers had a higher rate of negative or very negative feelings about a registered nurse using their personal communication device on a nursing unit and were more likely to believe that patients and other healthcare staff had negative feelings about a registered nurse using their personal communication devices on the nursing unit (Table 4.47).

It is beyond the purview of this study to discuss the types of encryption, malware protection and issues surrounding the ownership of data stored on personal communication devices. These are issues that healthcare organizations will need to address before allowing registered nurses to use their personal communication devices to access the company network. Other issues that have been identified as pertinent include identifying where personal devices should be stored, creating no cellular/no smartphone zones in sensitive areas including operating rooms and intensive care units, regulating kinds of ring tones or other tones to minimize disturbing patients, ensuring that all data is encrypted and password-protected, regulating access to social networking sites like Facebook, Twitter and YouTube and clarifying who owns the data on personal communication devices (Gill et al., 2012). Halamka (2011) noted that personal communication devices are easy to lose, possibly leading to loss or inappropriate access to protected health information. Personally owned devices are not as likely to have the

security controls that are built into a healthcare organization's computer system and data on them may not be encrypted.

Strengths and Limitations of the Study

Strengths

There are several strengths of this study. It was the first study to look at the use of personal communication devices on in-patient units by registered nurses and to identify their concerns about the use of these devices on patient safety. Compared to previous research on the use of personal communication devices by healthcare workers, the sample size was large. Nine hundred and fifty registered nurses belonging to the Academy of Medical Surgical Nurses responded to the survey. The demographic characteristics of the responding registered nurses were representative of the larger population of nurses in the United States. This study identified specific concerns of registered nurses associated with the use of personal communication devices on patient care including performance, medical errors and missing important clinical information. Opinions of registered nurses concerning the importance of hospital rules governing use of personal communication devices was reported and these opinions can contribute to the development of guidelines for developing hospital rules. Finally, this study discussed the benefits of personal communication devices on hospital units and the need to find a balance between the positive and negative impacts of personal communication device use.

Limitations

There are limitations to this study. The research focused specifically on staff nurses working on in-patient units in many different settings and at all times of the day. Personal communication device patterns of use at specific times in the workday, for example, during handoffs or at a patient's bedside, may differ. General questions about personal communication device use were specifically chosen to study the overall impact of these devices on patient care, not during specific discrete time frame such as during handoffs or teaching events because these types of activities do not encompass the entire effect of these devices on patient care.

There were a number of methodological issues. This included that since the survey could be completed without answering every question, response rates for items varied slightly. There was a substantial reduction in the number of study participants who answered the questions concerning medical errors and performance. While the flexibility in survey completion was intended to encourage survey participation, it is unknown how non-responders might have affected the study results. Therefore, these results should be interpreted with some caution.

In addition, the survey results were based on respondents' retrospective recall and may not accurately reflect true usage patterns. Real-time observation of personal communication device use by nurses would provide more objective and accurate data. Relying entirely on self-reports raises the issue of whether results may be been inflated due to common method bias. Thus, future research could supplement reports from other sources to give a clearer picture of the issues. Obtaining managerial responses with regard to this issue may be helpful.

Additional limitations include that the use of a large professional society database which come with inherent limitations such as the risk that the membership of a society may not be representative the entire U.S. nursing workforce, and that some members have not provided an email contact, biasing the sample towards technologically proficient respondents. Response bias is therefore likely; non-users of technology would be anticipated to be less likely to respond to a survey about personal computing devices. To identify problems of sampling bias, a comparison of the characteristics of the study participants with the characteristics of the typical registered nurse was done. It found that the study participants in the study were not systematically different from those of the average U.S. registered nurse in terms of age, gender, race/ethnicity or state of residence (Table 3.1).

In addition, the use of an online survey methodology has an inherent bias because study participants who participated in the survey may also be the kind of employees who are likely to use their personal communication devices while at work. The choice of data collection method was guided by the consideration that respondents who participated in the survey were able to provide a clear and relevant opinion on this issue. Since personal communication device use will be a relevant issue primarily for individuals who have access to a

personal communication device in the workplace and because the topic of personal communication device use in the workplace will be of high salience to such individuals, they will be better able to provide a clear and relevant opinion on this issue.

The study was restricted to individuals that have Internet access because the questionnaire was only available online. It is likely that individuals who lack internet access are less favorable to the concept of nurses using their personal communication devices while working than those reported here simply because they are less familiar with it.

An online electronic questionnaire was determined to be appropriate for several reasons. As reported by Cheyne and Ritter (2001), in online surveys, as in traditional paper surveys, the quality of the results depends on the careful selection of the study participants. The use of the AMSN membership provided access to a large pool of employed registered nurses who are Internet-savvy and whose technological skills make it possible for them to use their personal communication devices for non-work related activities, if they chose to do so. Second, previous research has shown that study participants demonstrate lower social desirability when they respond to a online survey compared to a paper questionnaire (Joinson, 1999; Cheyne & Ritter, 2001). Some researchers have found that online surveys can produce higher quality responses than paper surveys for some topics. Sproull and Kiesler (1991) found that study participants to an online survey on drug use reported higher drug use compared to a mail questionnaire. This may be because online surveys provided a greater sense of privacy than paper surveys. This is particularly important for socially undesirable behaviors where an online survey may be preferable because people would be less inhibited in their responses. This survey concerns making medical errors and missing important clinical information, which could reflect badly on study participants, therefore, an online survey was used to ensure that the impact of social desirability was kept to a minimum and anonymity was protected.

An additional potential limitation of this study is the possibility that multiple nurses worked at the same location and witnessed the same individual making an error, resulting in multiple reports of the same error. This would violate the chi-square test assumption of independent observations. The probability of this occurring was determined to be low because the respondents worked in many different states (19 of the states had one

respondent), and in hospitals of different sizes (number of beds), ownership (not-for-profit/for-profit/state or local government community hospital) and locations (inner city/rural/urban/suburban settings). Because of these factors, it is not likely that there were multiple reports of the same error.

Finally, a limitation in the use of multiple cross tabulations includes the fact that correlations are not conclusive evidence of a causal relationship, but only provide evidence that a relationship exists. In addition, cross tabulations use categorical data on only two variables at a time and the relationship between the two variables may depend on other variables. Therefore, critical relationships may be excluded from cross tabulated data, masking a relationship that actually exists and increasing the risk of making a type II error, failing to detect an effect that is present.

Despite these limitations, the demographic included a wide diversity of registered nurses and the recurring themes were clearly established. Although the findings may not be generalizable, it is clear that personal communication devices are widespread among registered nurses and are likely to become employed in larger numbers in the future.

Conclusions

Registered nurses working on in-patient units are concerned about the impact of personal communication devices on patient care. Workplace use of personal communication devices is increasing dramatically around the world, including in the medical institutions. This rapid growth has led to much attention being focused on the impact of personal communication device use on productivity and much of the work in this area has examined positive productivity influence brought about by the Internet. This study is noteworthy in that it represents one of the first empirical endeavors to delve into the area of how personal communication devices impact hospitals by transforming, not only how the work is done, but also the ways in which personal communication device use by registered nurses impacts patient care.

Based on the findings of this study, the use of personal communication devices on in-patient units is a significant safety concern to registered nurses. With the current rates of personal communication device use on in-patient unit's, hospital policies need to be developed and implemented. The decision to allow personal

communication devices on hospital units needs to be made from a benefit versus risk standpoint.

The findings suggest that managers need to understand and fully appreciate the cumulative effects of personal communication device use on in-patient units. With the proliferation of personal communication devices, a very easy way to become distracted from patient care activities is now placed in the hands of employees. Although it is important to trust employees to utilize this productivity tool properly, managers must also understand the cognitive processes underlying these behaviors in order to effect behaviors exhibited by employees and ensure that these devices work to improve patient care and not harm patient care.

Future studies should focus on areas identified as limitations in this study. Additional studies should include an investigation into the relationships identified in this study using an objective measure of medical error. Additionally, future studies should also investigate the affect of policies on personal communication device use, expand the types of activities identified and clarify the reasons that registered nurses give for using their personal communication devices at work.

Situational variables, such as stress arising from the work of caring for patients may also influence an individual's tendency to use their personal communication devices at work. Future research may also take into account the effects of situational variables.

Lastly, the identification of performance decrements associated with using a personal communication device at work is a potential area of research. If future studies identify a significant inverse relationship between the amount of personal communication device use on hospital units and medical error rates this would be compelling evidence that hospital policies and professional societies guidelines need to be developed that guide the use of personal communication devices by registered nurses on hospital units.

APPENDIX A

Nurses' Use of Personal Communication Devices Questionnaire

Thank you for taking the time to fill out this survey. Your responses will help improve the current medical policy and practice, and reduce potential medical errors to patients.

1) What is your gender?

- ☐ Male
- ☐ Female

2) How old are you? (pull down menu)

- ☐ 19
- ☐ 20
- ☐ 21
- ☐ 22
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- ☐ 68
- ☐ 69
- ☐ 70
- ☐ 71
- ☐ 72
- ☐ 73
- ☐ 74
- ☐ > 75

3) What is your race/ethnicity? (check one)

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black/African American
- ☐ Native Hawaiian or other Pacific Islander
- ☐ White/Caucasian
- ☐ Hispanic/Latino
- ☐ Other

4. Have you been employed as a registered nurse in a medical facility sometime during the last 5 years?

- ☐ No
- ☐ Yes

5. How would you characterize the location of your primary place of employment?

- ☐ Inner city
- ☐ Rural
- ☐ Urban
- ☐ Suburban
- ☐ Other

6. Please identify the position title that most closely corresponds to your nursing practice position.

- ☐ Consultant
- ☐ Nurse Researcher
- ☐ Nurse Executive
- ☐ Nurse Faculty
- ☐ Nurse Manager
- ☐ Advanced Practice Nurse
- ☐ Staff Nurse
- ☐ Charge Nurse

☐ Other-Health Related
☐ Other-Not Health Related

7. Please select the major activity that best describes your role in your primary nursing position.
☐ Not Applicable
☐ Patient Care and Education
☐ Student/Staff-Teaching/Training/Instruction
☐ Administration/Management
☐ Quality Assurance
☐ Case Management
☐ Research
☐ Other

8. On average, how many hours per week do you have patient contact in an in-patient setting?
☐ 0-5 hours per week
☐ 6-10 hours per week
☐ 11-15 hours per week
☐ 16-20 hours per week
☐ > 20 hours per week

9. How long have you worked as a registered nurse in a medical facility?
☐ Less than 1 year
☐ 1 to 3 years
☐ More than 3 years but less than 5 years
☐ 5 or more years but less than 10 years
☐ 10 years or more
☐ Not applicable

10. What U.S. state are you currently employed in as a registered nurse?
(drop down menu of states and DC)

11. How would you characterize your primary place of employment?
☐ Not-for-profit
☐ For-profit
☐ State or local government community hospital

12. How many beds does your primary place of employment have?
☐ 6-24 beds
☐ 25-49 beds
☐ 50-99 beds
☐ 100-199 beds
☐ 200-299 beds
☐ 300-399 beds
☐ 400-499 beds
☐ 500 beds or more
☐ Other

13. In general, how do you feel about personal communication devices (cell phone, smartphone or tablet computer)?
☐ Strongly negative

☐ Slightly negative
☐ Neutral
☐ Slightly positive
☐ Strongly positive

14. How often do you use your personal communication device (cell phone, smartphone or tablet computer) while at work (excluding lunch and breaks)?

☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

15. What best describes your primary personal communication device?

☐ I don't have a personal communication device.
☐ I have a basic personal communication device (cell phone only).
☐ I have a personal communication device (cell phone and texting).
☐ I have a smart phone (cell phone, texting, email, Internet access, apps).
☐ I have a tablet computer.

16. On an average workday describe your use of your personal communication while at work (excluding breaks and meal times).

	Never	Rarely	Sometimes	Often	Always
I access work drug references.					
I access work-related nursing/medical information.					
I use the device as a calculator for nursing/medical formulas.					
I access work-related protocols.					
I access work-related apps that assist my patient care.					
I access sites for professional education and development.					
I access sites for patient handouts and teaching.					
I call or check/send work related text messages or emails to other members of the healthcare team.					
I read online news					
I call or check/send text messages or emails to family or friends.					
I shop on the internet.					
I check/post on social networking sites.					
I play online games.					

17. Please rate how your feel about the following statements about the use of personal communication devices while working (excluding breaks or meal times).

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The use of my personal communication device for non-work related activities has distracted me while working.					
The use of my personal communication device for non-work related activities has negatively effected my performance while working.					
I have witnessed another nurse whose personal communication device use was negatively effecting his/her performance while working.					
The use of my personal communication device for non-work related activities has helped me focus on my work.					
The use of my personal communication devices has enabled better coordination of patient care among the healthcare team.					
Personal communication device use has improved unit cohesion and teamwork.					
Personal communication device use has improved patient safety.					
Patient communication device use is beneficial to patient care.					
Personal communication device use at work for non-work related activities improves my ability to focus on my work.					
Use of personal communication devices at work for non-work related activities reduces work-related stress.					

18. Has the use of a personal communication device ever negatively effected your performance as a nurse?

☐ No
☐ Yes

19. Have you ever witnessed another nurse colleague's personal communication device use negatively effect their performance?

- ☐ No
- ☐ Yes

20. Have you ever made a medical error (defined as an adverse effect of care, including a near miss or a sentinel event) because you were distracted by the use of your personal communication device?

- ☐ No
- ☐ Yes

21. Have you ever witnessed a nurse colleague make a medical error (defined as an adverse effect of care, including a near miss or sentinel event) because they were distracted by cell phone/texting?

- ☐ No
- ☐ Yes

22. Do you think you have ever missed an important piece of clinical information because you were distracted by the use of your personal communication device?

- ☐ No
- ☐ Yes

23. Have you ever witnessed a colleague miss an important piece of clinical information because they were distracted by their personal communication device while working?

- ☐ No
- ☐ Yes

24. Do you think that personal communication devices can be a serious distraction during work?

- ☐ Never
- ☐ Rarely
- ☐ Sometimes
- ☐ Often
- ☐ Always

25. On balance, do you think the use of personal communication device use by nurses on the unit has a more positive or negative effect on patient care?

- ☐ More Negative
- ☐ More Positive

26. If multitasking is consuming more than one stream of media content at the same time, how would you characterize yourself?

- ☐ Heavy multitasker
- ☐ Average multitasker
- ☐ Light multitasker
- ☐ I never multitask

27. Does your employer have a policy on the use of personal communication devices at work?

- ☐ No
- ☐ Yes

28. Do you think your employer should establish a policy for personal communication device use at work?

- ☐ No Applicable, there is a policy in place
- ☐ No
- ☐ Yes

29. What best describes your opinion of how nurses should use their personal communication devices should at work (excluding breaks and meal times):

- ☐ Personal communication devices should never be used while working.
- ☐ Personal communication devices should only be used at work for work-related activities.
- ☐ Personal communication devices should only be used at work for urgent personal reasons.
- ☐ Personal communication device use at work for any reason is fine, as long as one uses common sense and good judgment.

30. Please select the column that best describes your opinion about the use of personal communication devices at work:

	Strongly negative	Slightly negative	Neutral	Slightly positive	Strongly positive
How do you feel about a nurse when you see them using their personal communication device on the unit?					
How do you think patients feel when they see a nurse using their personal communication device on the unit?					
How do you think other healthcare staff feel when they see a nurse using their personal communication device on the unit?					

Thank you for taking the time to fill out this survey.

APPENDIX B

University of Hawai'i Human Studies Program Approval

Office of Research Compliance
Human Studies Program

UNIVERSITY of HAWAI'I® MĀNOA

January 2, 2014

TO: Deborah McBride
Principal Investigator
School of Nursing & Dental Hygiene

FROM: Denise A. Lin-DeShetler, MPH, MA
Director

SUBJECT: CHS #21816- "Prevalence, Use and Impact for Personal Communication Device Use by Hospital Nurses"

This letter is your record of the Human Studies Program approval of this study as exempt.

On January 2, 2014, the University of Hawai'i (UH) Human Studies Program approved this study as exempt from federal regulations pertaining to the protection of human research participants. The authority for the exemption applicable to your study is documented in the Code of Federal Regulations at 45CFR 46.101(b)(Exempt Category 2).

Exempt studies are subject to the ethical principles articulated in The Belmont Report, found at http://www.hawaii.edu/irb/html/manual/appendices/A/belmont.html.

Exempt studies do not require regular continuing review by the Human Studies Program. However, if you propose to modify your study, you must receive approval from the Human Studies Program prior to implementing any changes. You can submit your proposed changes via email at uhirb@hawaii.edu. (The subject line should read: Exempt Study Modification,) The Human Studies Program may review the exempt status at that time and request an application for approval as non-exempt research.

In order to protect the confidentiality of research participants, we encourage you to destroy private information which can be linked to the identities of individuals as soon as it is reasonable to do so. Signed consent forms, as applicable to your study, should be maintained for at least the duration of your project.

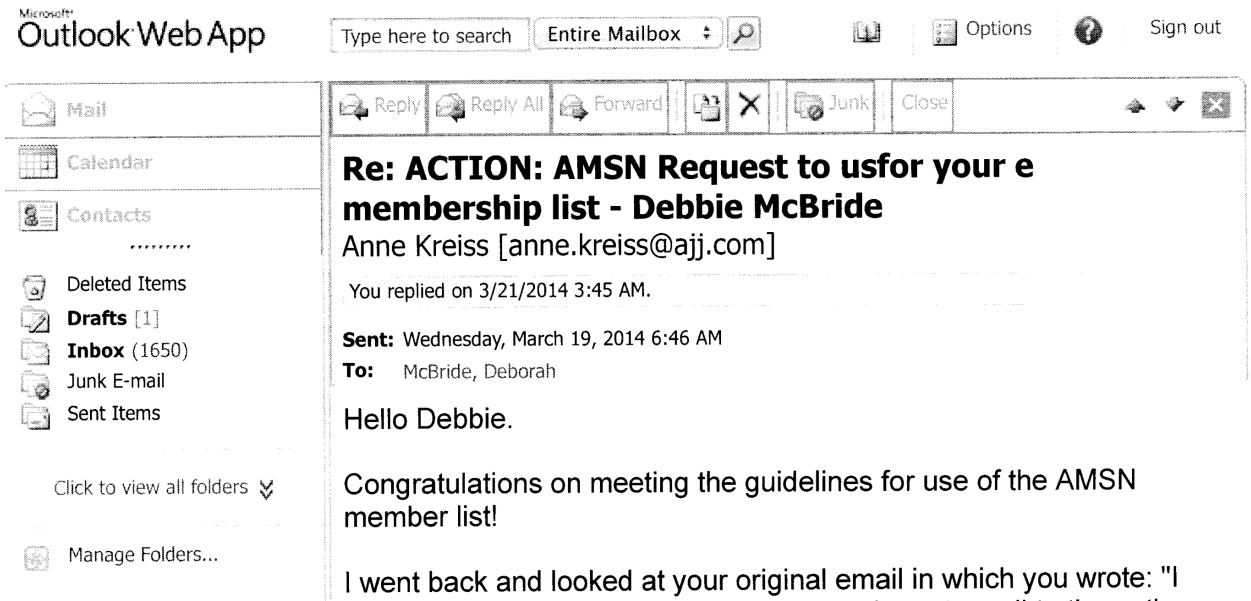
This approval does not expire. However, please notify the Human Studies Program when your study is complete. Upon notification, we will close our files pertaining to your study.

If you have any questions relating to the protection of human research participants, please contact the Human Studies Program at 956-5007 or uhirb@hawaii.edu. We wish you success in carrying out your research project.

1960 East-West Road
Biomedical Sciences Building B104
Honolulu, Hawai'i 96822
Telephone: (808) 956-5007
Fax: (808) 956-8683

APPENDIX C

Correspondence with the Academy of Medical Surgical Nurses Association Services Manager



Re: ACTION: AMSN Request to usfor your e membership list - Debbie McBride

Anne Kreiss [anne.kreiss@ajj.com]

You replied on 3/21/2014 3:45 AM.

Sent: Wednesday, March 19, 2014 6:46 AM
To: McBride, Deborah

Hello Debbie.

Congratulations on meeting the guidelines for use of the AMSN member list!

I went back and looked at your original email in which you wrote: "I would like the the AMSN to send the recruitment email to the entire AMSN membership email list on my behalf and the reminder email to be sent to the entire list 2 weeks after the initial mailing."

Would you still like to proceed this way? We can certainly do this. I have your original Word documents for the emails; however, if you have changes send them directly to me.

Additionally, we can distribute your survey through the AMSN Website, MedSurg Nursing Connection (ENews), Facebook, and Twitter if you would like us to do so. Just let me know.

Do you plan to put your primary research questions into survey format, i.e., SurveyMonkey? Once you have your survey instrument/document ready, send it to me.

I will take care of the email blasts and other details.

Please let me know if you have any questions. I am happy to help!

Anne Kreiss
Association Services Manager
Academy of Medical-Surgical Nurses (AMSN)
866-877-2676, option 7
www.amsn.org

APPENDIX D

Recruitment Email

Dear Colleague,

My name is Debbie McBride, and I am a PhD student in the School of Nursing at the University of Hawai‘i (Mānoa). I am conducting a survey to understand how smartphones, cell phones and tablet computers are impacting the work of hospital nurses. Results may help employers understand the benefits and risks of allowing employees to use their personal communication devices while working. You have been selected from the Academy of Medical-Surgical Nurses membership list to help with this study and I need your help to make the study successful.

The survey should take approximately 10 minutes to complete and no elements of this survey have foreseeable risks. No personally identifiable information will be requested.
This instrument can provide useful information, but only if your answers are frank and realistic. There is no cost to you except your time. Your participation in this study is voluntary. You have the right to change your mind and leave the study at any time without giving any reason and without penalty. Staff at the University of Hawai‘i will collect; compile and report the survey results in aggregate only. Individual survey responses will be kept confidential, and no one will see your answers.

Should you have any questions about the study, you may contact me at 510.848.1721 or mcbride3@hawaii.edu. You can also contact my faculty advisor, Dr. Sandra LeVasseur, at 808.956.0894 or sandraal@hawaii.edu. If you have any questions about your rights as a research participant, you can contact the University of Hawai‘i Committee on Human Subject at 808.956.5077 or uhirb@hawaii.edu.

The link to the survey is:
http://www.surveyshare.com/s/AYA9BAC
The deadline for completing the survey is April 10, 2014.

Thank you for your time and participation.
If you complete the survey in the link above, it means you have read the information contained in this page and you would like to be a volunteer in this study.

Sincerely,

Deborah McBride

APPENDIX E

Reminder Email

Dear Colleague,

Last week we emailed you a survey seeking a few minutes of your time to help us better understand the determinants of distraction on nursing units. If you have already completed the survey, please accept our sincere thanks. If you have not, could you do it at your earliest convenience. It doesn't take much time, participants report that it is interesting and relevant, and we will of course send participants a summary of results from this and our earlier study. Your answers are completely confidential and will be used only in aggregate across a large sample of nurses, in which no individual's answers can be identified. This survey is voluntary of course, however, you can help us--and we hope, the pursuit of science--by taking a few minutes to share your experience and opinions. The survey should take approximately 10 minutes to complete. In return for your participation we would be happy to report back our findings in aggregate, which we hope would be useful to your ongoing research efforts. If you have any questions or comments about this study feel free to contact Professor Sandra Ann LeVasseur (sandraal@hawaii.edu) or Deborah McBride (mcbride3@hawaii.edu). If you have questions regarding your rights in this study contact the Committee on Human Studies (uhirb@hawaii.edu) at the University of Hawai‘i’s Institutional Review Board. Thank you very much for helping this research project.

Follow this link to the survey
http://www.surveyshare.com/s/AYA9BAC
The deadline for completing the survey is April 10, 2014.

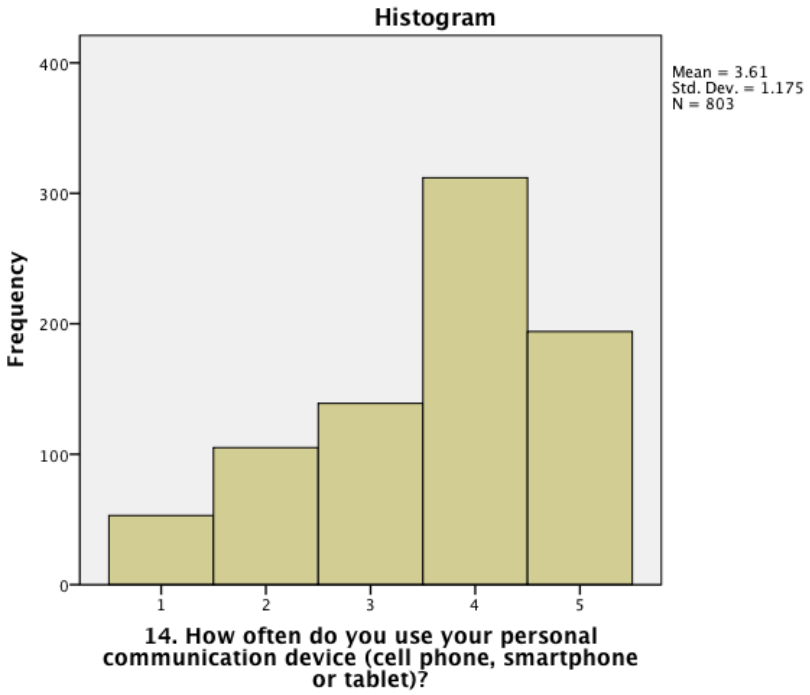
Thank you for your time and participation.

APPENDIX F

Histogram for Frequency of Use

The following charts use a 5-level Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

Frequency of Use

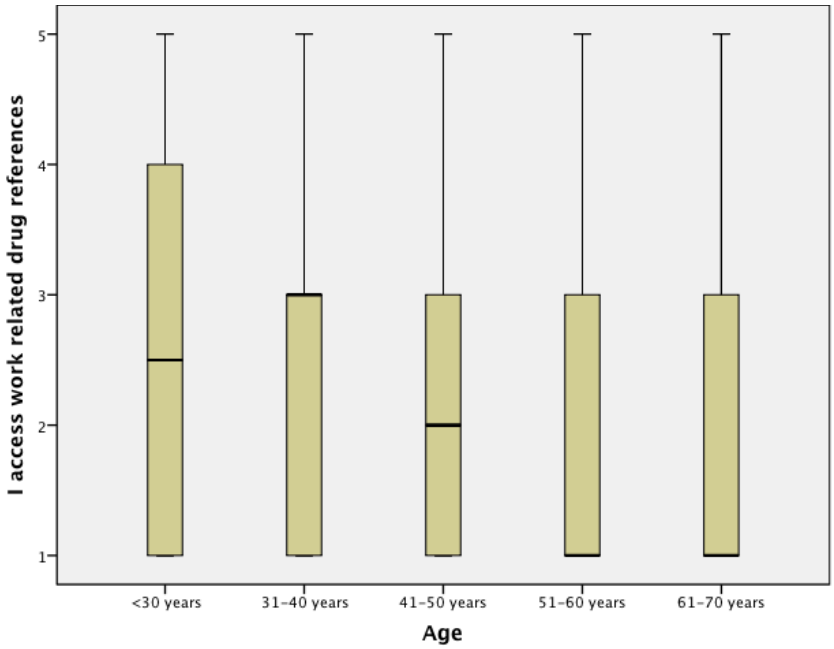


APPENDIX G

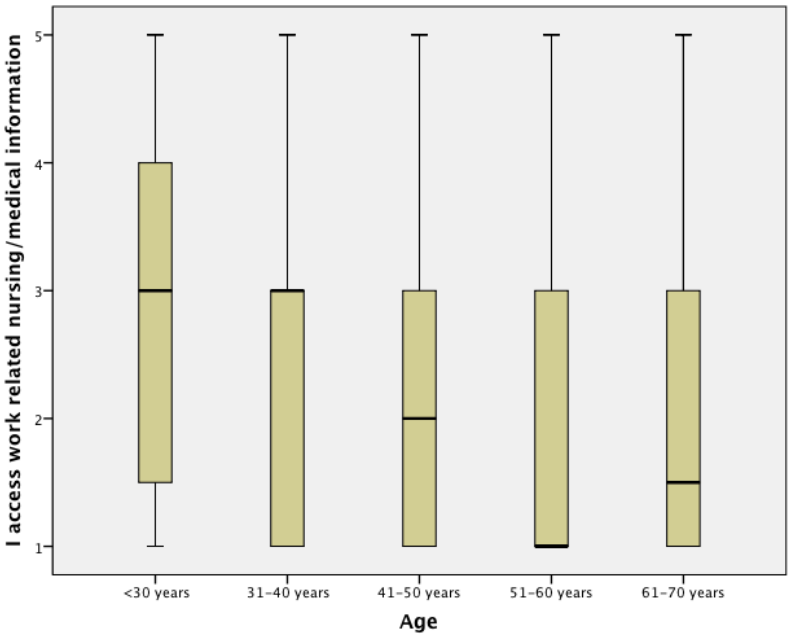
Histograms for Age Correlation Results

The following charts use a 5-level Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

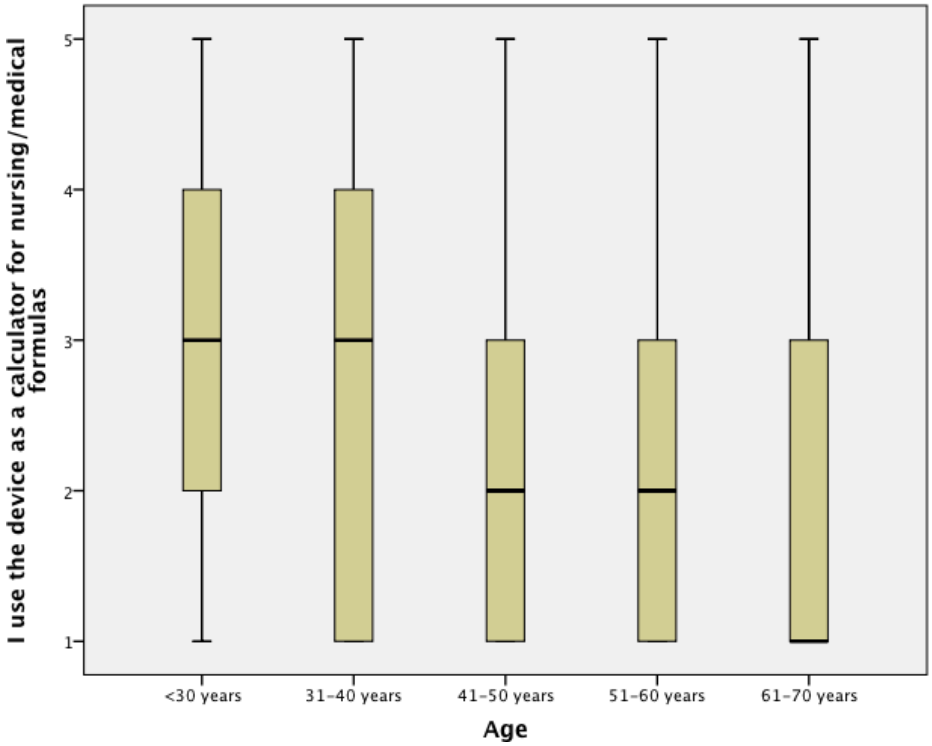
Age and Use of Personal Communication Device to Access Drug References



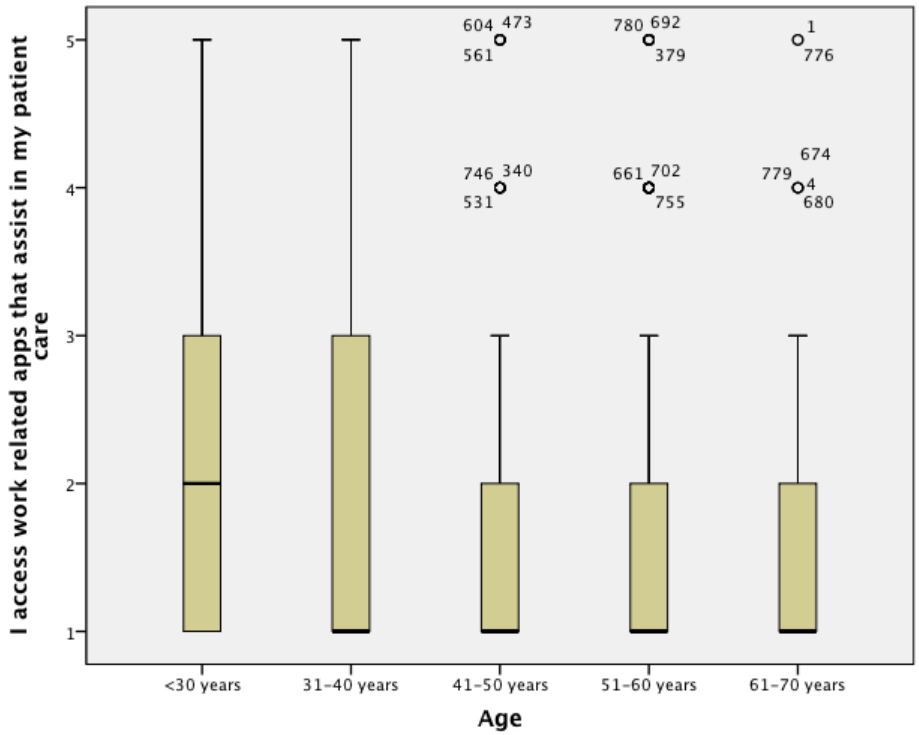
Age and Use of Personal Communication Device to Access Work-Related Medical/Nursing Information



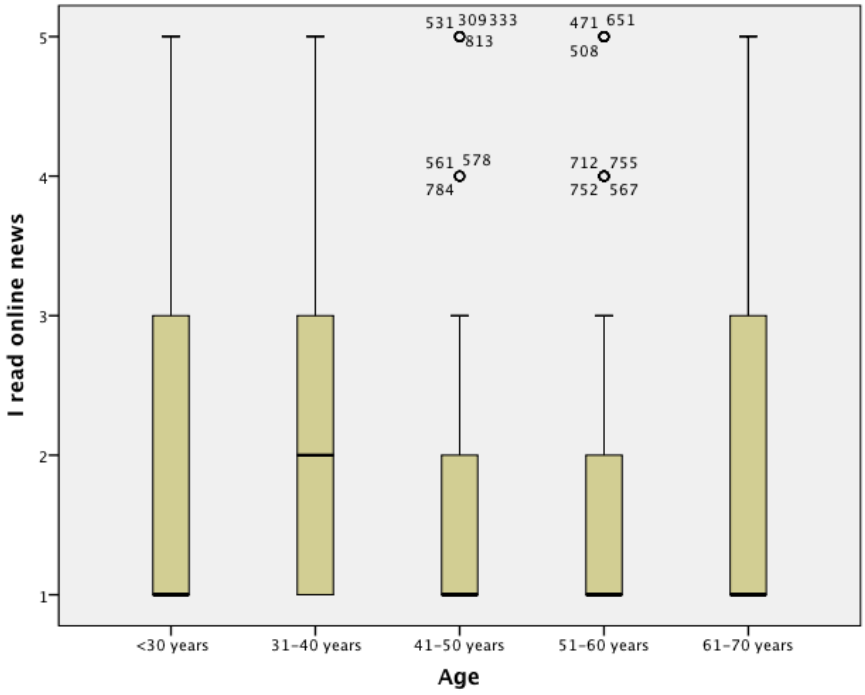
Age and Use of Personal Communication Device as a Calculator



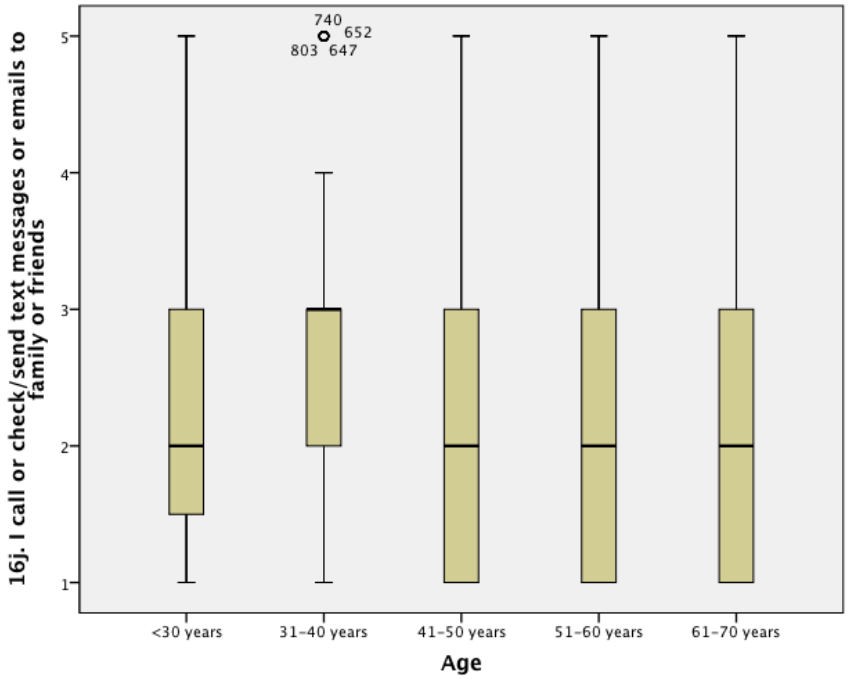
Age and Use of Personal Communication Device to Access Work-Related Apps



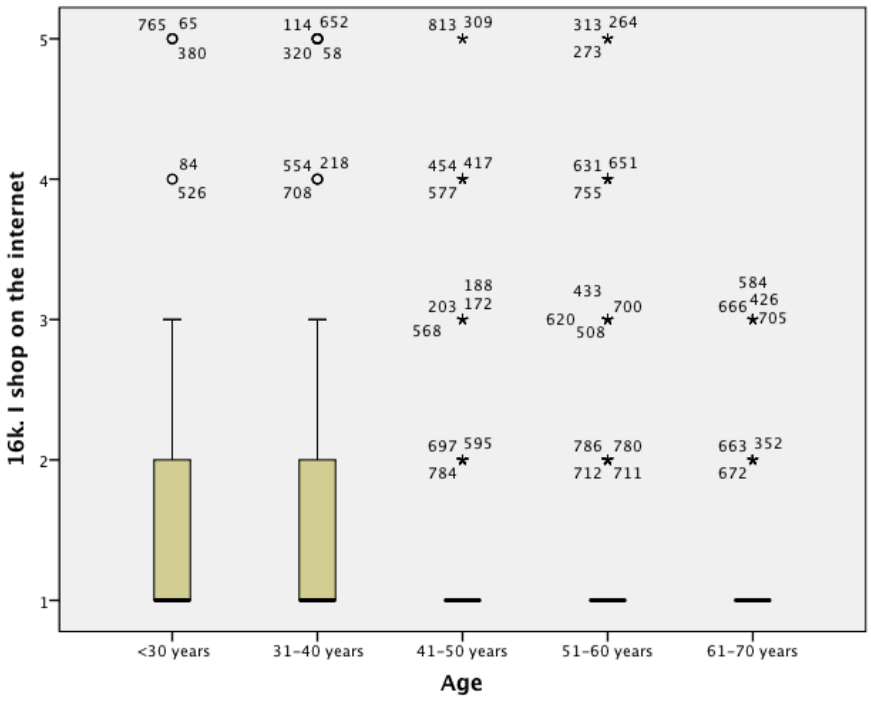
Age and Use of Personal Communication Device to Read Online News



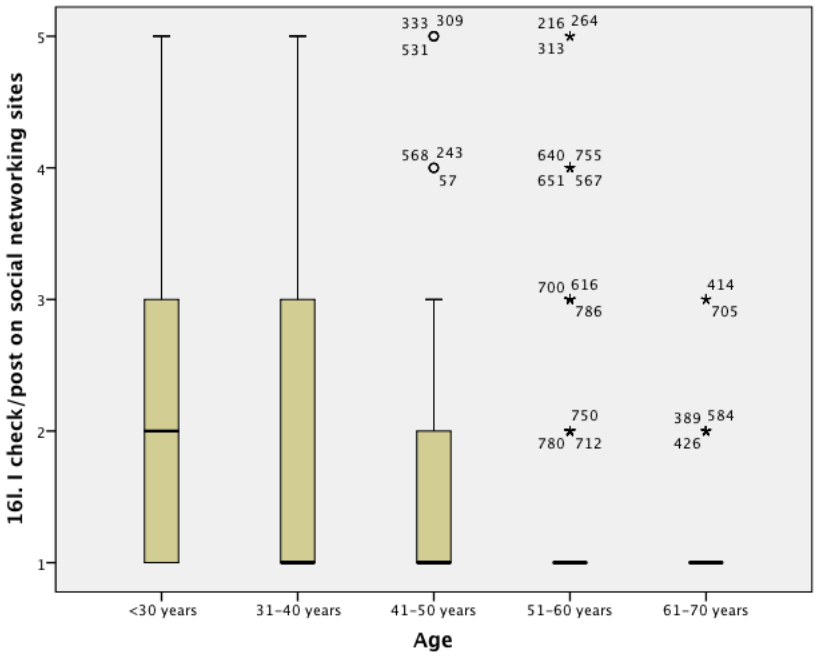
Age and Use of Personal Communication Device to Call or Check/Send Text Messages or Emails to Family of Friends



Age and Use of Personal Communication Device to Shop on the Internet

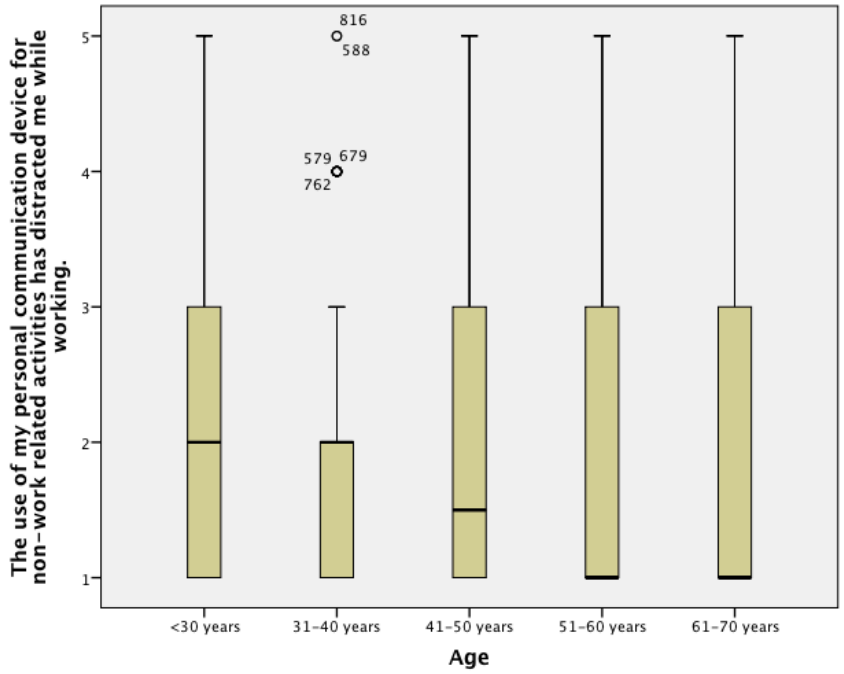


Age and Use of Personal Communication Device to Play Online Games

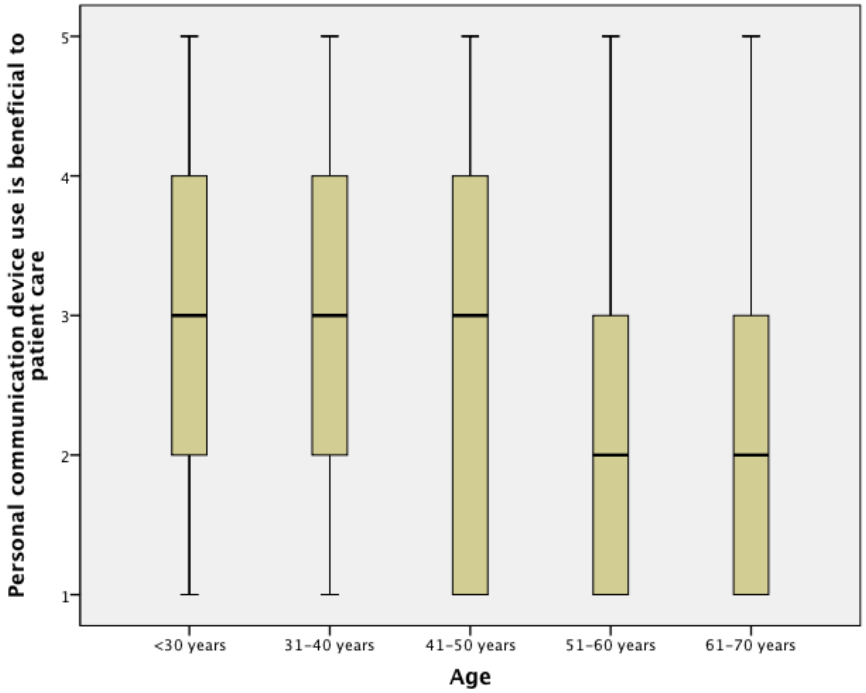


The following charts use a 5-level Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

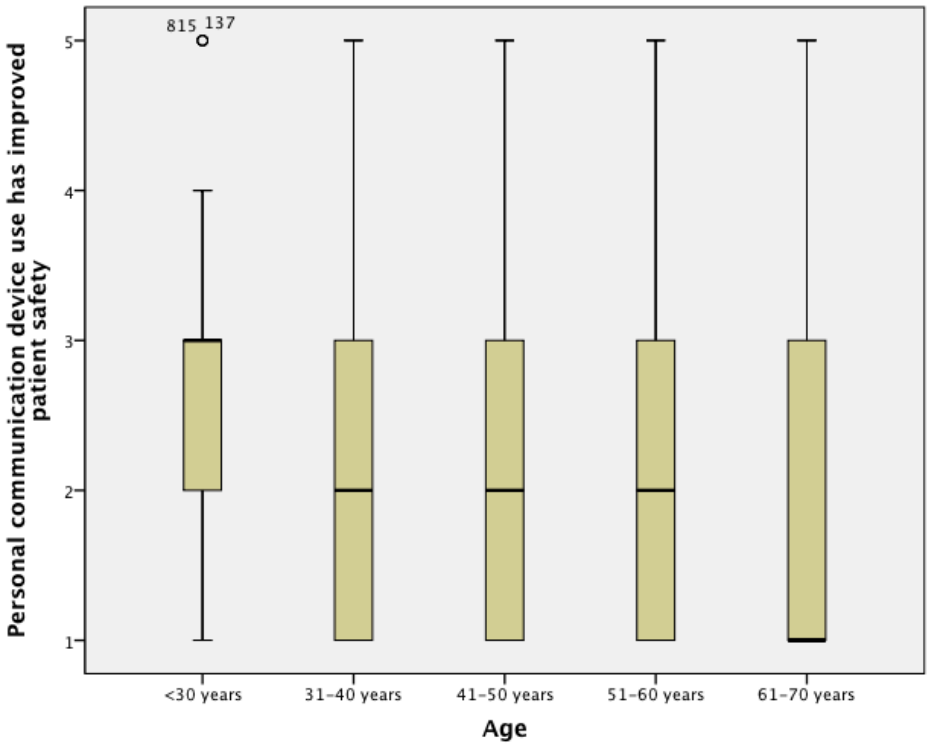
Age and Use of Personal Communication Device has Distracted Me While Working



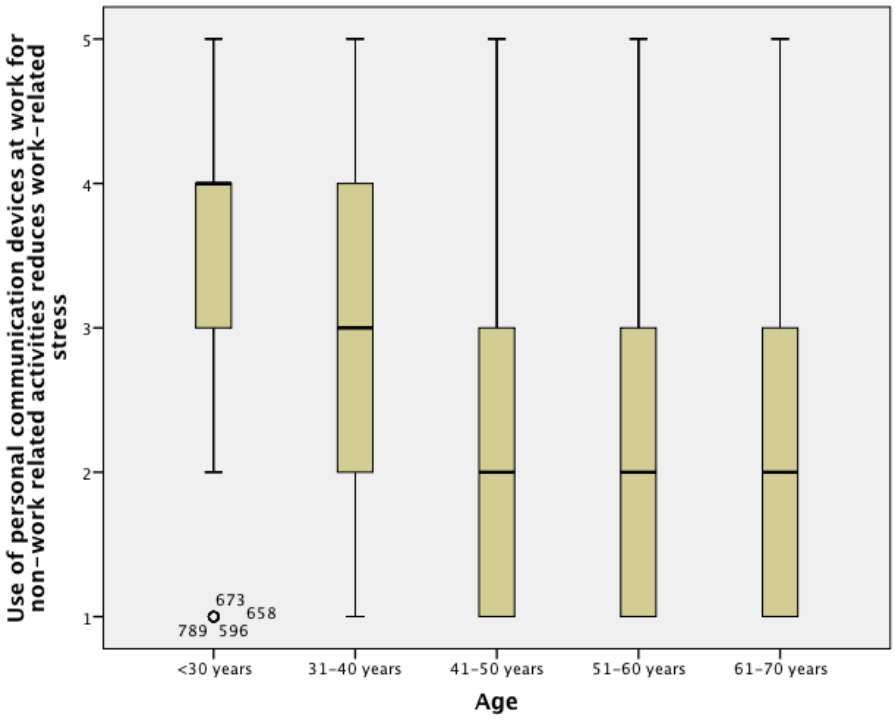
Age and Personal Communication Device Use by Nurses Has a Beneficial Impact on Patient Care



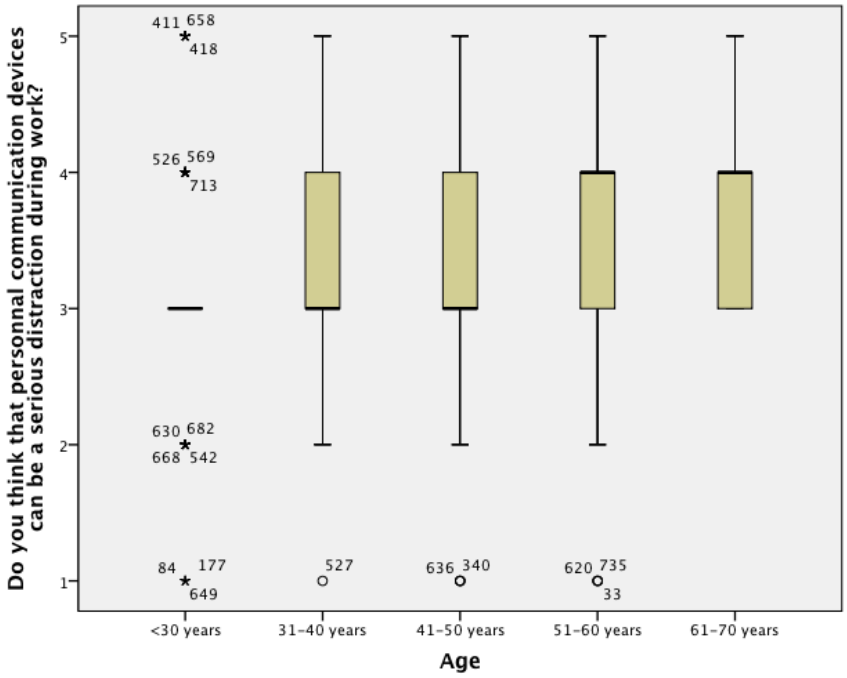
Age and Personal Communication Device Use by Nurses Has Improved Patient Safety



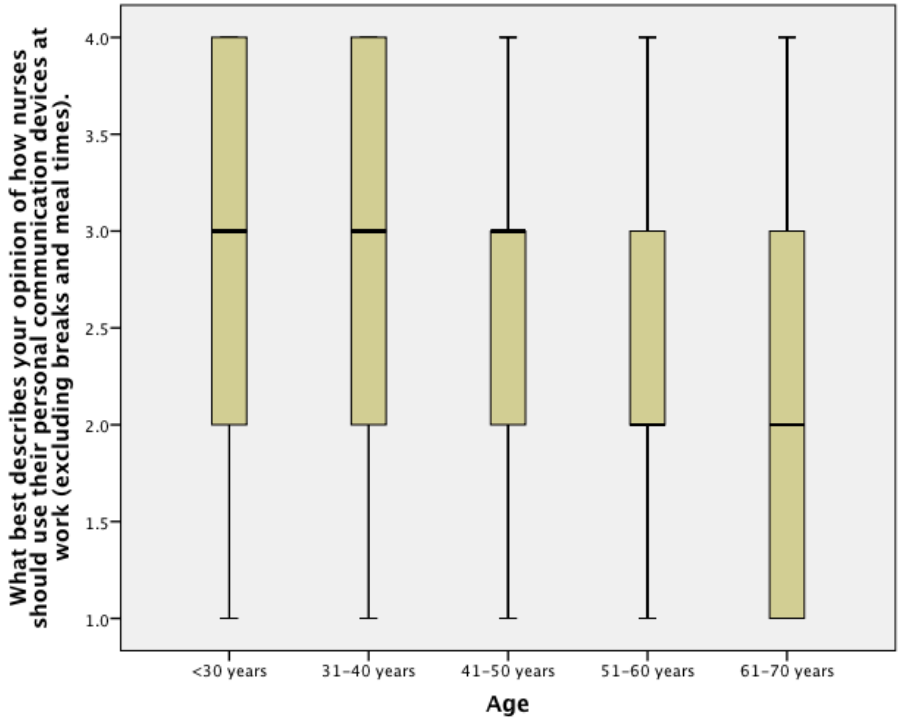
Age and Use of Personal Communication Devices at Work for Non-Work Related Activities Reduces Stress



Age and Personal Communication Devices Can be a Serious Distraction at Work



Age and How Personal Communication Devices Should be Used at Work

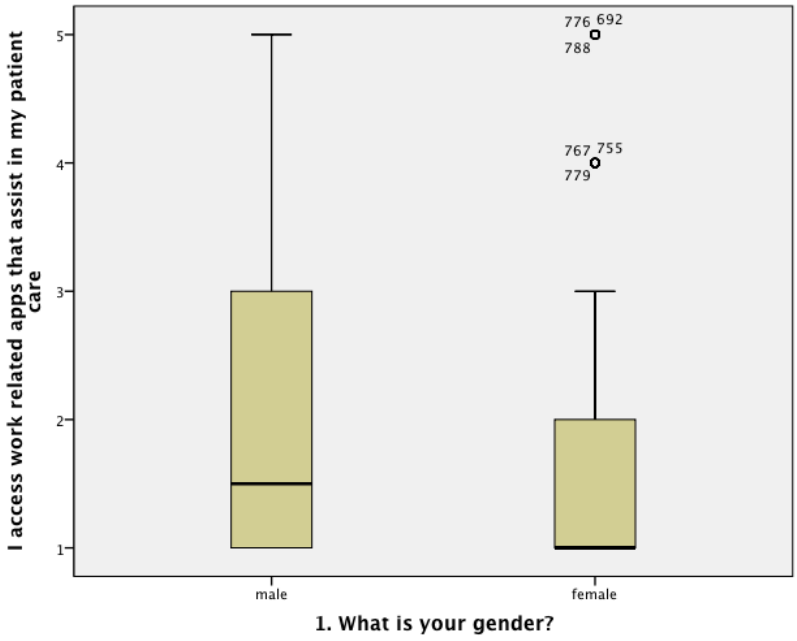


APPENDIX H

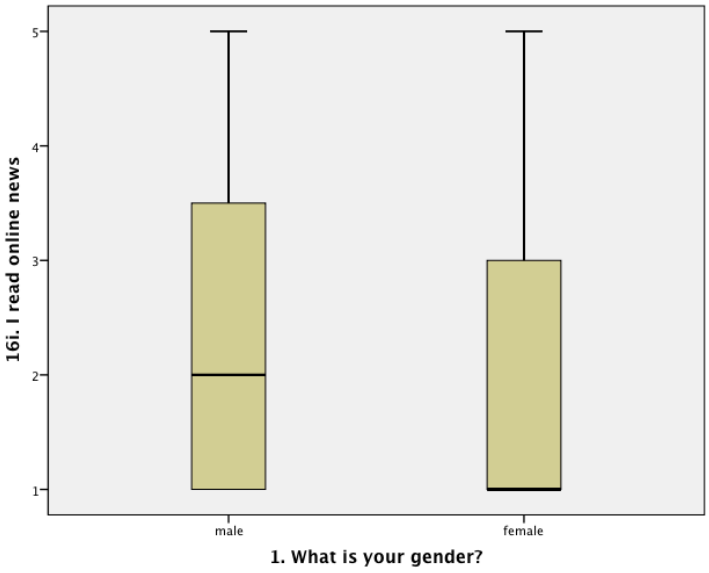
Histograms for Gender Correlation Results

The following charts use a 5-level Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

Gender and Use of Personal Communication Device to Access Work-Related Apps

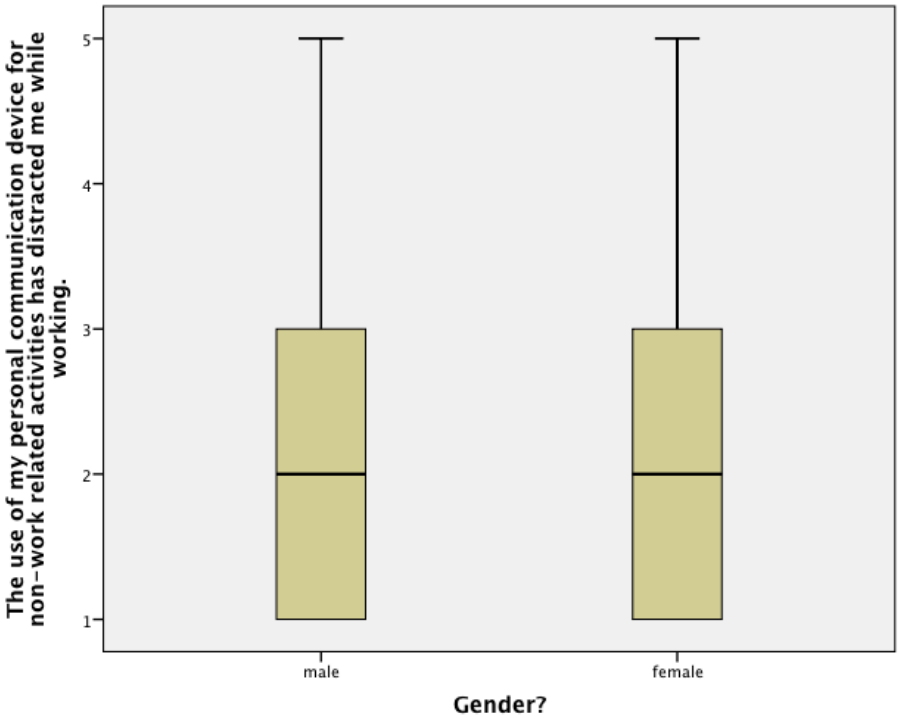


Gender and Use of Personal Communication Device to Read Online News

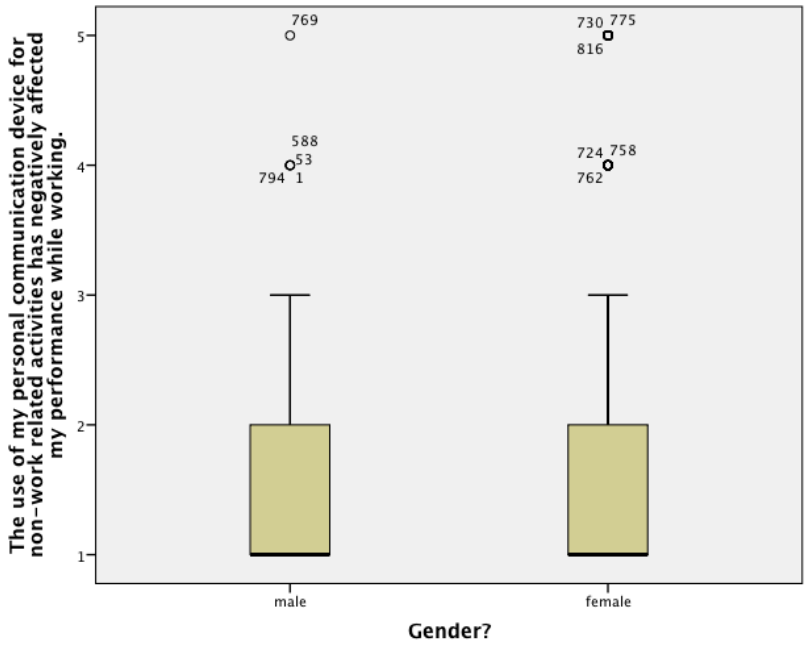


The following charts use a 5-level Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

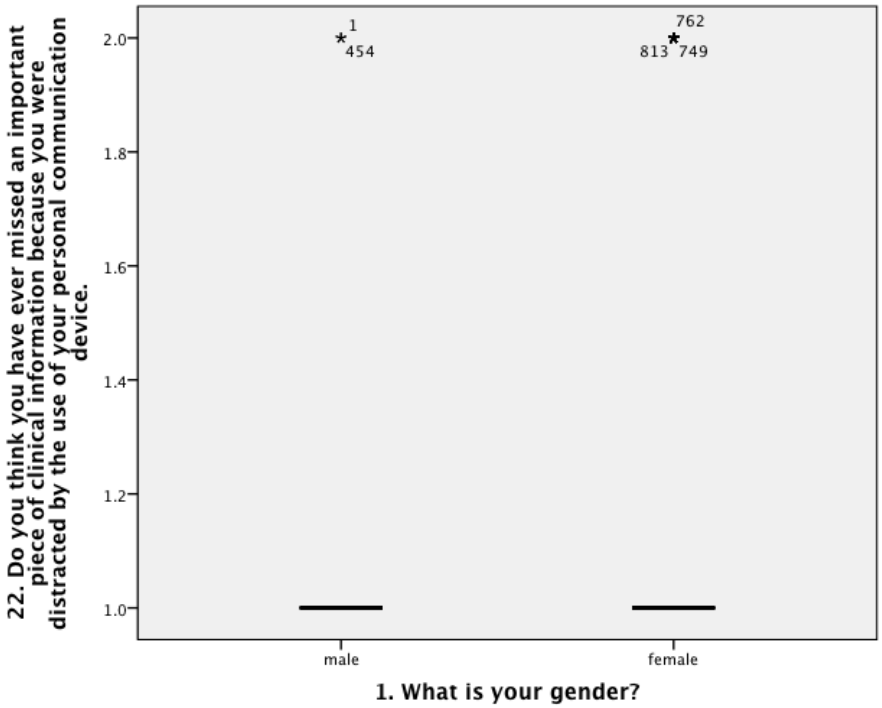
Gender and My Personal Communication Device Has Distracted Me While Working



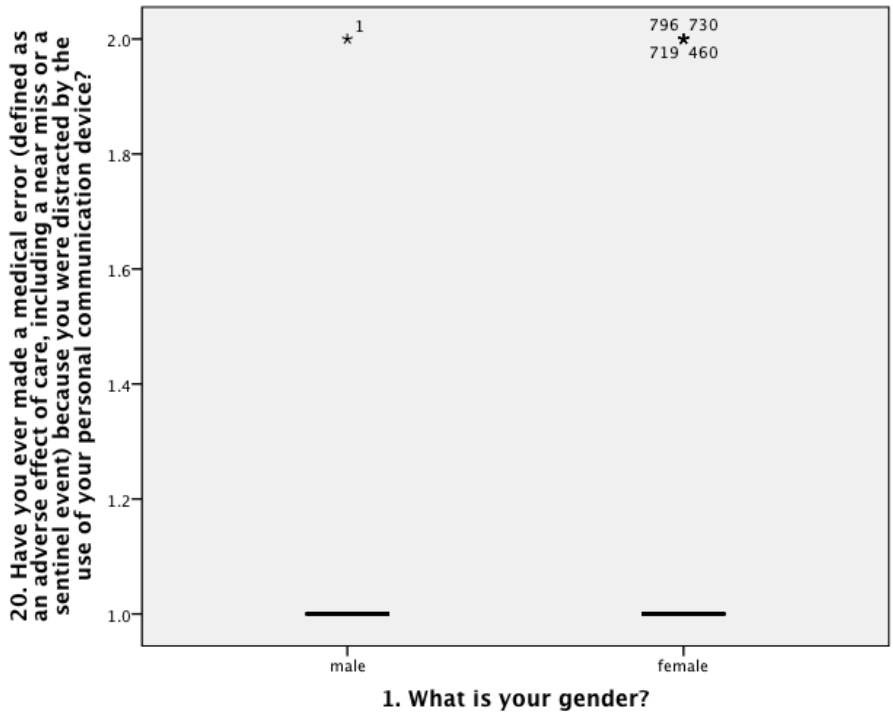
Gender and My Personal Communication Device Has Negatively Effected My Performance as a Nurse



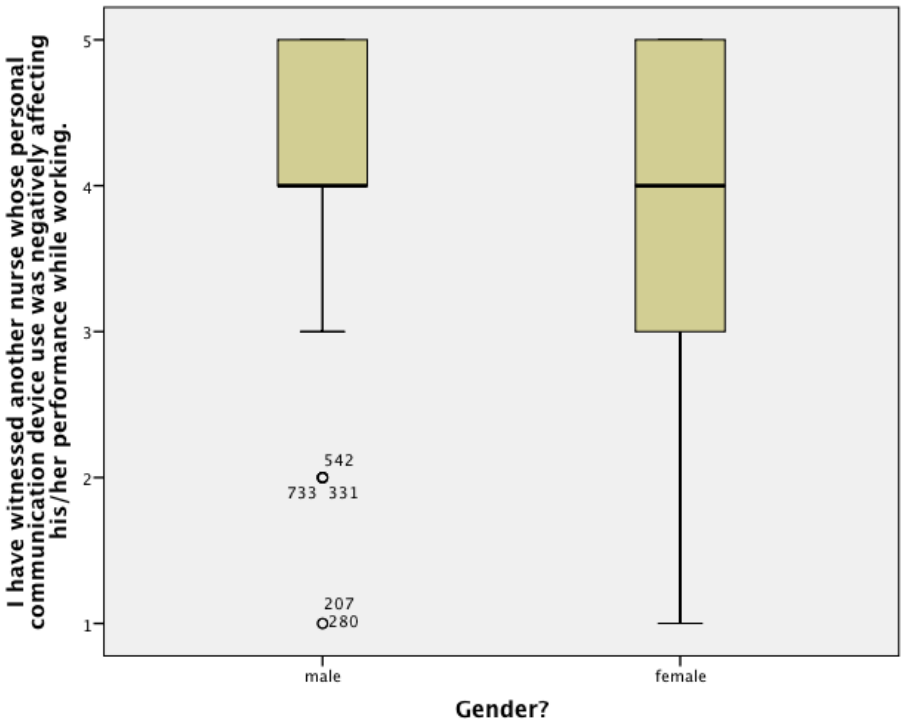
Gender and My Personal Communication Device Has Caused Me to Miss Important Clinical Information



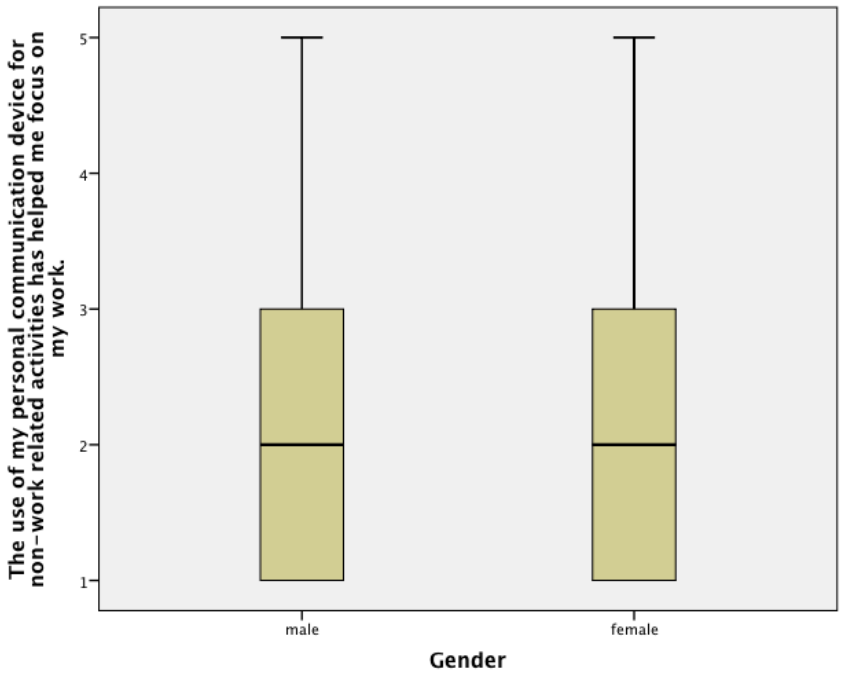
Gender and My Personal Communication Device Caused Me to Make a Significant Medical Error



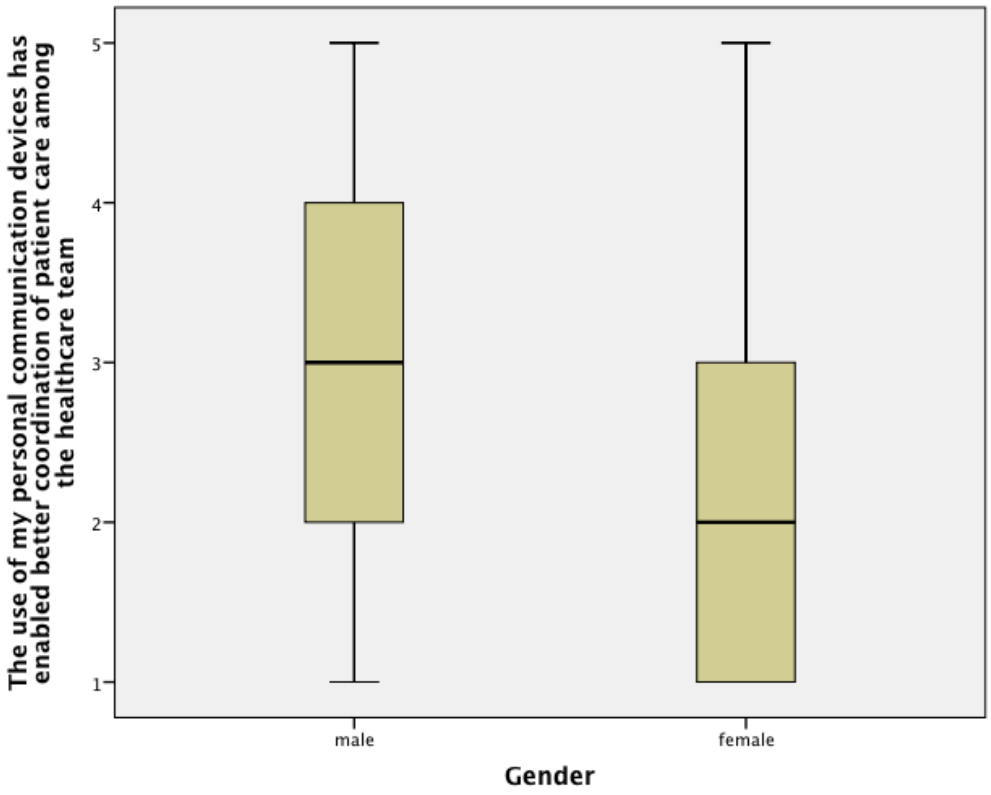
Gender and I have Witnessed Another Nurse Whose Personal Communication Device Use Was Negatively Effecting His/Her Performance as a Nurse



Gender and The Use of My Personal Communication Device Has Helped Me Focus on My Work



Gender and The Use of Personal Communication Devices Has Enabled Better Coordination of Patient Care

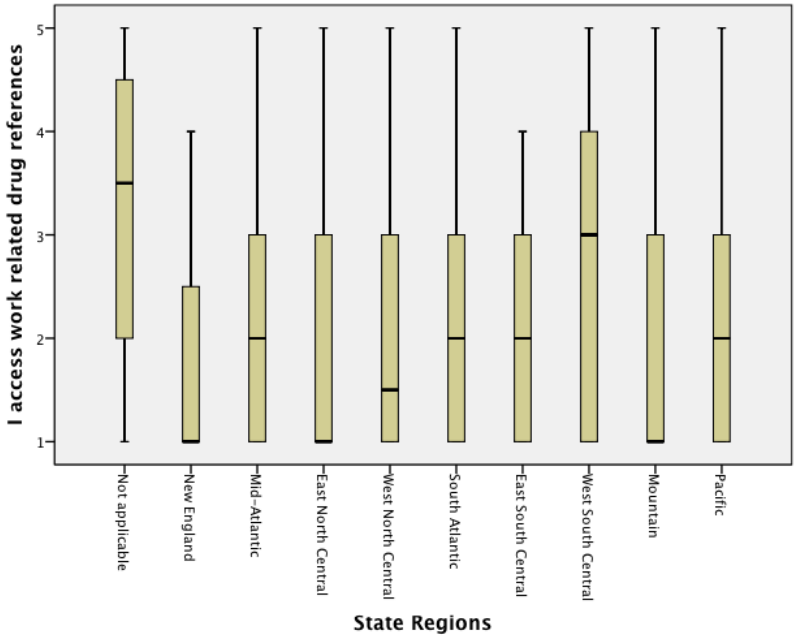


APPENDIX I

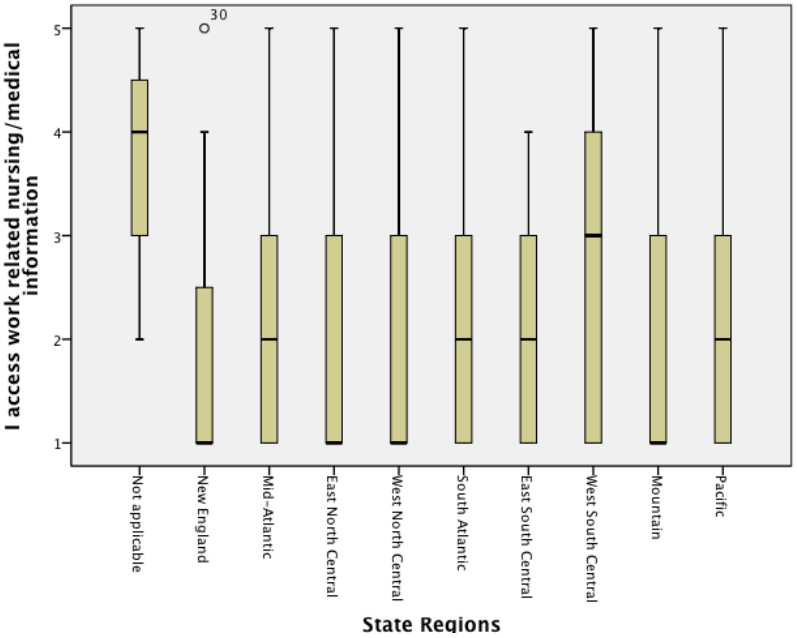
Histograms for Region Correlation Results

The following charts use 5-level Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

Region and Use of Personal Communication Device to Access Drug References



Region and Use of Personal Communication Device to Work Related Nursing/Medical Information

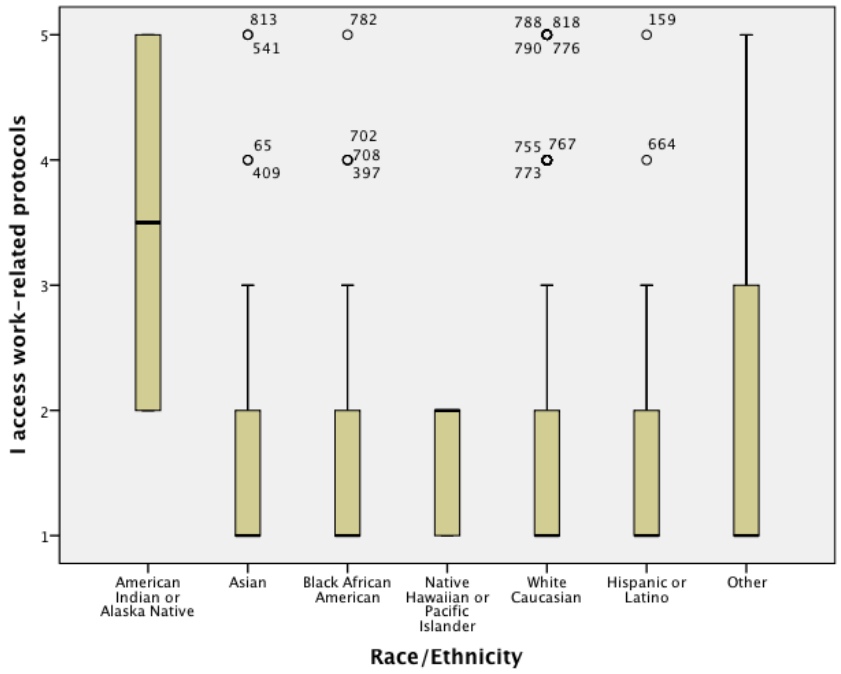


APPENDIX J

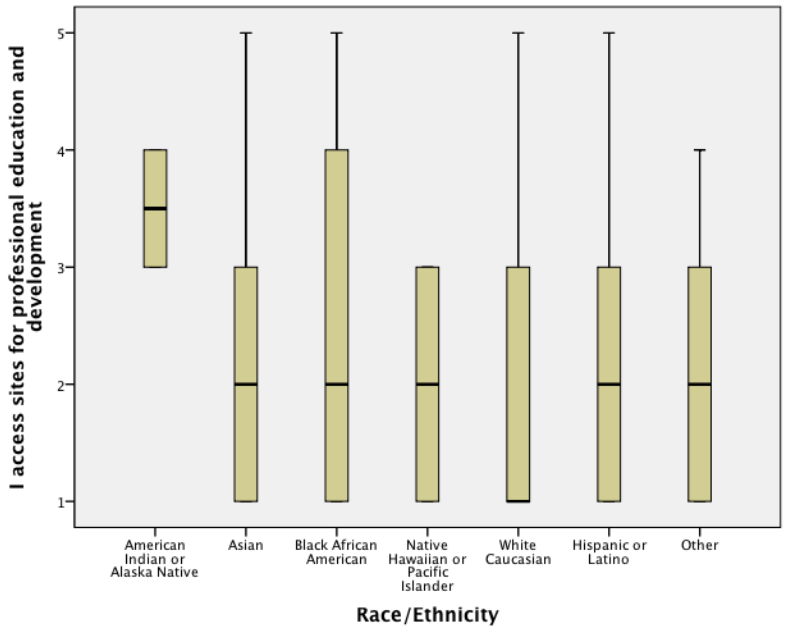
Histograms for Race/Ethnicity Correlation Results

The following charts use a 5-level Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always).

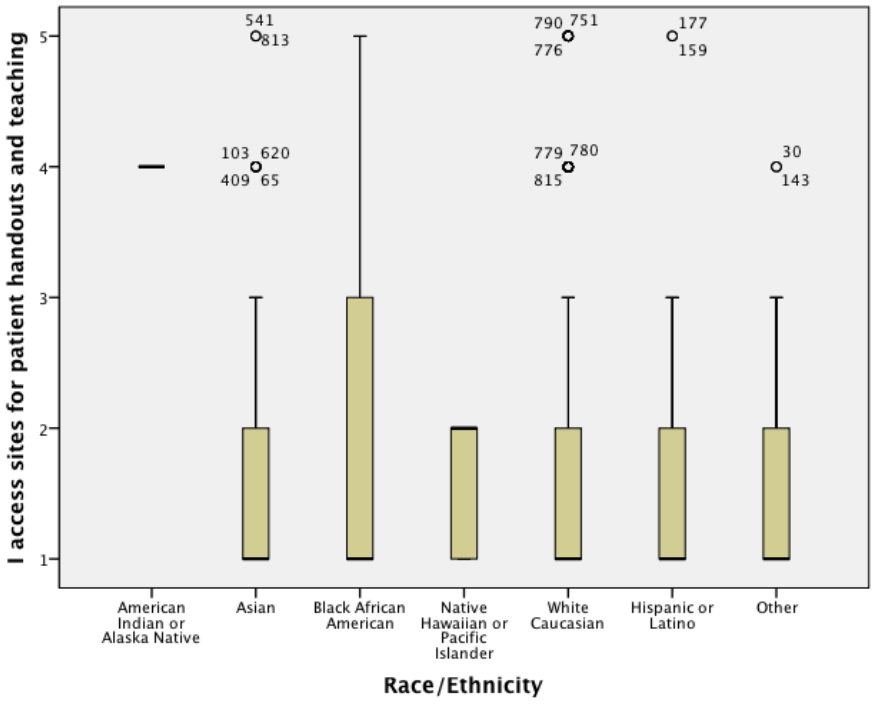
Race/Ethnicity Use of Personal Communication Device to Access Work Related Protocols



Race/Ethnicity Use of Personal Communication Device to Access Professional Education/Development

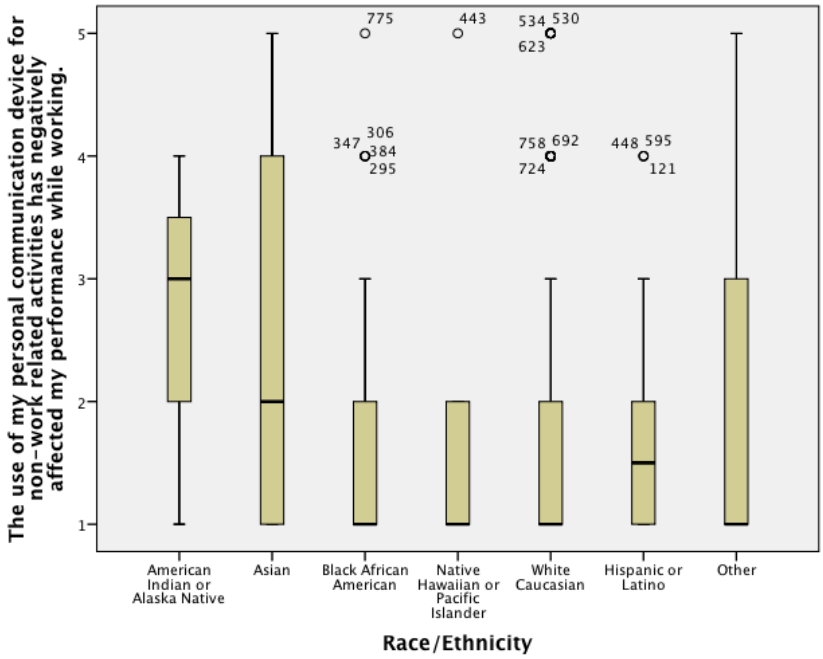


Race/Ethnicity Use of Personal Communication Device to Access Patient Handouts and Teaching

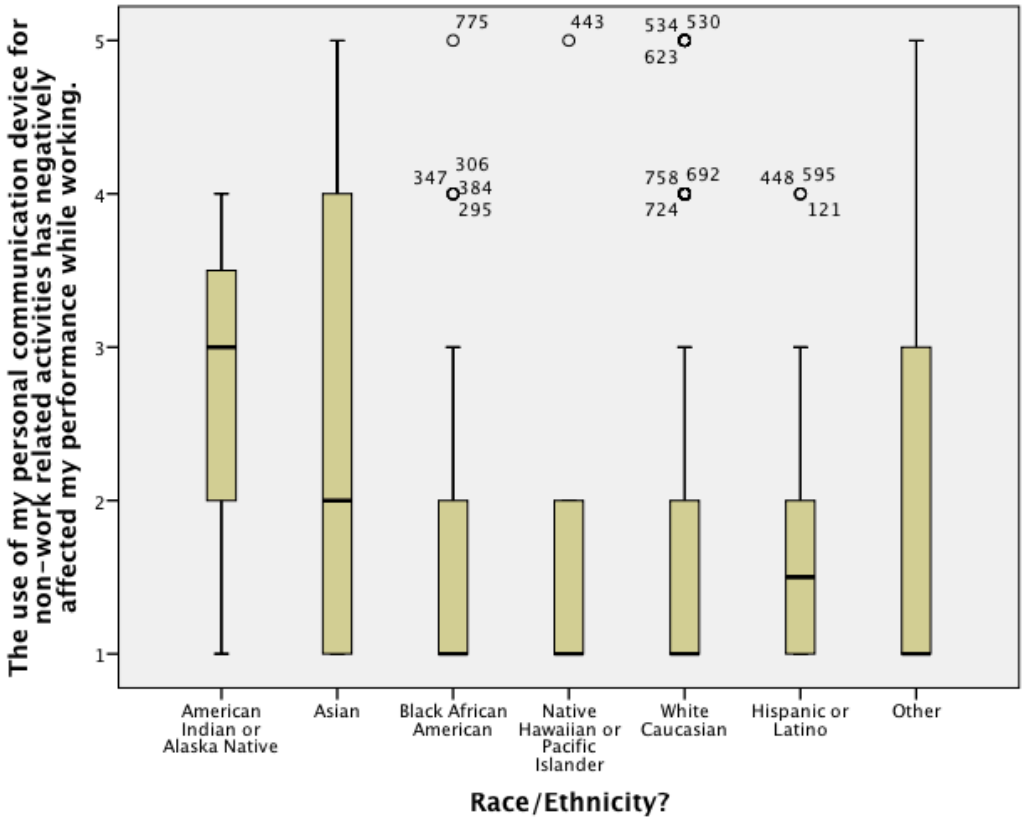


The following charts use a 5-level Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

Race/Ethnicity Personal Communication Device Use for Non-Work Related Activities Has Distracted Them



Race/Ethnicity Personal Communication Device Use for Non-Work Related Activities Has Negatively Effected Their Performance as a Nurse



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