Use of Personal Electronic Devices by Nurse Anesthetists and the Effects on Patient Safety

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Certified Registered Nurse Anesthetists (CRNAs) provide high-quality patient care to ensure patient safety. Strict vigilance and prompt response is required of the CRNA to make critical decisions. Distractions during anesthesia delivery may threaten patient safety. Personal electronic devices (PEDs) have become an integral tool used by 90% of adults. Adaptation of PEDs has permitted their integration into current anesthesia practice. Although technologic advancements have improved accessibility to resources and communication, they also serve as a source of distraction. Inappropriate PED use while administering anesthesia remains grossly underreported and understudied related to its impact on patient safety. The purpose of this article is to illustrate the critical need for further research in order to analyze safety risk, appropriately guide CRNA education, and properly develop and enforce media policies within organizations. Currently, PED use by the CRNA exists in ethically blurred boundaries, with potentially major patient safety and legal consequences.

Keywords: Anesthesia, media policy, operating room, patient safety, personal electronic devices.

Certified Registered Nurse Anesthetists (CRNAs) are qualified providers entrusted to make critical, time-sensitive decisions regarding all aspects of anesthesia care. Patient outcomes rely on strict vigilance by the anesthetist and quick execution of interventions. When any amount of attention is diverted from patient care, patient safety may be breached. Through the evolution of pharmacology, technology, and advancement in monitoring equipment, anesthesia is much safer compared with years past. However, lack of research regarding inappropriate use of personal technology introduces a new potential threat for patient safety.

Limited research has been conducted regarding the influence of inappropriate personal electronic devices (PEDs) use on provider vigilance and the effect on patient safety. Existing studies reveal that PEDs negatively affect the quality of care and infringe on patient privacy. The term addiction also surfaces with PED use, implying an undesirable habit that could ultimately mean life or death for a vulnerable patient who is relying on the attentiveness of his or her anesthesia provider. As healthcare progresses, one must not spur the regression of patient standards of care. To preserve high standards of patient care and ensure professional integrity, research and education must address PED use by the anesthetist.

History and Review of the Literature

Identification of relevant literature was conducted using the electronic databases of The Cochrane Library, MEDLINE/PubMed, and EBSCOhost. The following keywords were used alone and collectively: personal electronic devices, operating room, media policy, anesthesia, and patient safety. The American Association of Nurse Anesthetists (AANA) and the Association of periOperative Registered Nurses (AORN) guidelines were also searched. The international search was limited to English-language, peer-reviewed articles published between 2011 and 2014. To acquire the largest number of pertinent citations available, the authors completed a manual search through the reference lists of all obtained articles for research not already identified. Selected literature was screened based on the following criteria: items addressing 3 or more keyword subjects, research, surveys or commentaries offering research findings from an original study. All articles were published manuscripts and were read in their entirety. Of 29 articles found in the search, 11 were retained based on these criteria. The literature emphasized the evolving role of PEDs to anesthesia providers and the uncertainty that surrounds their impact on patient safety. The prevalence of PEDs permeates all aspects of life; therefore, education and enforcement of acceptable use needs to be clearly established in the anesthesia community. Because of a lack of policies with emerging technology use, maintaining patient privacy and safety is an ever-growing concern that necessitates investigatory efforts.

The purpose of this literature review is to educate CRNAs on the possible patient safety, ethical, and legal risks that exist surrounding improper PED use and the need for further research to ensure the preservation of patient safety.

- Historical Trends of Adaptation in Patient Care: Issues Regarding Distractions. Patient safety has been and remains the foremost priority of anesthesia. Research has
been conducted to identify and reduce distractions that adversely affect the safety of patients.\textsuperscript{1,2,15-20} Collectively, current data lend a list of mutually accepted conclusions. Significantly more negative than positive outcomes result from distractions.\textsuperscript{15,17} Critical timing points exist during anesthetic delivery when distractions present greater safety risks.\textsuperscript{15-17} One example of distraction is noise. Noise created by staff in the surgical arena is a proven disturbance, directly correlating to communication quality and errors.\textsuperscript{15,17} Evidence-based research\textsuperscript{1,2,15-20} continues to support and solidify these established concepts.

With the integration of PEDs into daily professional life, the appeal of improved communication can be argued.\textsuperscript{18} Evans and Brooks\textsuperscript{19} found that proper text messaging improves communication in a noisy healthcare setting. Medical applications are another benefit, providing relatively instant access to a wide array of resources. In 2012, there were more than 40,000 healthcare applications available for PEDs with approximately 247 million reported downloads.\textsuperscript{20} Advantages of intended technology use are not in question, but rather the impact on patient safety surrounding improper use. Inappropriate PED use is any activity that is not patient centered and consists of, but is not limited to, accessing social media sites, personal text messaging, browsing the Internet, and/or unlawfully photographing or disseminating data that directly violates the federal Health Insurance Portability and Accountability Act (HIPAA).\textsuperscript{21}

Ethically, personal and professional integrity may be compromised by inappropriate PED use. Although Evans and Brooks\textsuperscript{19} reported improved communication with proper text messaging, 38% of people admit to sending a wrong-person text, raising cautionary flags to the risk of unintentional breach of patient privacy. Legally, violation of HIPAA may be civil or criminal and is punishable by a monetary fine and/or federal imprisonment.\textsuperscript{21} Media policies are being adopted by more employers each year; however, enforcement and compliance of guidelines remain varied and underreported. Inappropriate PED use by anesthesia providers may lead to negative speculation of the anesthetists' limited ability to respond to critical events when seconds count. Personal electronic devices are gaining attention as hazardous distractors in other arenas, including driving and walking.\textsuperscript{22-28} Further demonstrating the possibility of deleterious effects also existing with their use in anesthesia.

\textbf{Safety Implications of Personal Electronic Devices Outside of Anesthesia.} Discussions surrounding PED safety, specifically cellular phones, have been rapidly escalating when it comes to motor vehicle safety. Cellular phone use has been proved equivalent to driving while intoxicated,\textsuperscript{24} thus portraying the severity of the issue. According to the National Highway Traffic Safety Administration, texting and driving continues to rise in frequency and is comparable to driving after consuming 4 beers.\textsuperscript{22} In 2014, the National Safety Council estimated that at least 1.2 million crashes, or 21% of all traffic crashes, had cellular phone involvement, and an additional 5% to 14% of crashes are related to text messaging.\textsuperscript{23} Thus, at minimum, 26% of all crashes were the result of a distracted driver talking or texting on a cellular phone.\textsuperscript{23} Of these crashes, greater than 50% resulted in fatalities.\textsuperscript{23}

In response to continually rising crash statistics, states have progressively developed and implemented regulations for cell phone use while operating a motor vehicle. As of July 1, 2015, a total of 37 states and the District of Columbia (DC) ban cell phone use for novice drivers; 14 states plus DC prohibit the use of cell phones for adult drivers; and 46 states plus DC have text-messaging bans for all drivers.\textsuperscript{24} Further PED regulations are in place on a state-by-state basis. Because PEDs pose risks to motor vehicle safety due to driver distraction, there is a need to better understand the applicability of these devices to safe anesthesia practice.

Personal electronic devices continue to gain national publicity regarding their distracting and addictive nature. Pew Research Center did a US survey in 2012 showing 23% of respondents reported they had physically humped into a person or object while walking due to cell phone use distraction.\textsuperscript{25} Of the total respondents, 50% admitted to bumping into another person because that person was also distracted by their cell phone.\textsuperscript{25} In 2012, a Time magazine survey portrayed a growing global cell phone addiction, with a staggering 84% of respondents stating they could not go a single day without their cell phones.\textsuperscript{26} More alarmingly, 20% of respondents admitted to checking their phone at least once every 10 minutes.\textsuperscript{26}

According to a January 2014 survey by Pew Research Center, 90% of US adults own a cell phone, of which 58% were smartphones.\textsuperscript{27} In 2013, a study found that 91% of US adults identified the primary use of their cell phone being for an activity other than making a phone call (Table).\textsuperscript{28}

Addiction to PEDs is a relatively new phenomenon with much left to be determined regarding the extent of psychological dependency. An emerging theme is that PEDs have infiltrated daily personal and professional life. However, recognition and cessation of this behavior is crucial to effectively implement workplace PED media policies. Nonanesthesia research depicts PEDs as distracting and addictive to varying degrees, potentially leading to detrimental safety consequences. May a cautionary flag be raised in the anesthesia community: PEDs may pose a patient safety threat, with negative safety implications yet to be known.

\textbf{Personal Electronic Devices in Anesthesia.} The AORN Position Statement on Managing Distractions and Noise During Perioperative Patient Care conveys concern for PEDs as distractors to a multidisciplinary
approach to patient care.\textsuperscript{29} According to the statement, PEDs serve as a distraction by the sound of ring tones and alarms, in addition to their inappropriate use, which may affect patient outcomes.\textsuperscript{29} Recognizing that distractions and noise cannot be completely eradicated, the AORN has established a critical phase definition, which signals the surgical team’s need for full attentiveness.\textsuperscript{29} This statement identifies critical phase points, but still lends support to questioning the impact of inappropriate PED use by anesthetists during noncritical phase points.

Certified Registered Nurse Anesthetists continually adapt their practice to provide safe, efficient care to patients. The AANA clearly outlines CRNA scope of practice\textsuperscript{30} and provides a code of ethics\textsuperscript{31} which delineate expectations and responsibilities of CRNAs to patients. From these guidelines, various approaches are taken to reach the uniform goal of delivering high-quality patient care. In 2013, the AANA released a Mobile Device Use position statement acknowledging the potential positive impact of PEDs in healthcare, along with supporting PED use for direct patient care contingent on maintaining safety standards.\textsuperscript{32} This statement also encourages the development of institutional policies regarding appropriate use, specifically related to social media.\textsuperscript{32}

In 1990, Weinger and Englund\textsuperscript{3} published a study advocating that “protracted periods with vigilance tasks, as during maintenance of anesthesia in a routine care, can lead to boredom and low arousal, which harms performance.” Application of Weinger and Englund’s\textsuperscript{3} argument for PEDs as evidenced-based research may compromise the integrity of patient safety given technological advancements and progression of anesthesia as a whole. Do recall that the first smartphone was not publically released until 1994, and that ownership was not widespread, nor did the smartphone have Internet capabilities until 1999.\textsuperscript{9} Addiction to PEDs was also not being speculated in 1990 because it did not exist.

A quarter century later, however, Weinger and Englund’s\textsuperscript{3} study is referenced in Domino and Sessler’s\textsuperscript{5} editorial on the effects of Internet use during anesthesia care. Research quality, methods, and publication dates of included works greatly varied, and overall the editorial\textsuperscript{3} proved grossly inconclusive. A 2012 study by Wax et al\textsuperscript{6} was also included in the editorial.\textsuperscript{3} Wax et al\textsuperscript{9} monitored whether case time spent on a nonanesthesia workstation screen correlated to hemodynamic variances, suggesting an indicator of provider vigilance. The study concluded no substantial correlation but could not account for the anesthesia provider’s PED use or other nonanesthesia-related activity’s impact on the occurrence of patient hemodynamic variances. The Domino and Sessler\textsuperscript{5} editorial portrayed non-PED-specific research that is contradictory and antiquated; therefore, its applicability to PEDs in anesthesia should be employed cautiously.

A PED-specific 2011 survey of perfusionists gained the attention of healthcare quality improvement when results were published involving cell phone use during cardiopulmonary bypass (CPB).\textsuperscript{7} Smith et al\textsuperscript{7} revealed that 55.6% of respondents reported using their cell phone during CPB. Of those respondents, 78.3% expressed safety concerns and “believe that cell phones can introduce a potentially significant safety risk to patients.”\textsuperscript{7}

Papadakos,\textsuperscript{8} a professor of anesthesiology, cited the perfusionist survey,\textsuperscript{7} noting that survey respondents suspected PEDs were the culprit of neglecting 20% of clinically pertinent information. Papadakos\textsuperscript{8} added that 80% of healthcare professionals use PEDs in their daily work environments, leading to inevitable temptation and eventual inappropriate use. The editorial went on to address addictive tendencies linked to PEDs, stating belief that inappropriate use will indisputably have an “impact on patient care and increase medical errors.”\textsuperscript{8} Papadakos\textsuperscript{8} acknowledged the addictive component of PEDs as understudied, but having witnessed the rising trend, the author suggested incorporating tools employed for evaluation of other addictive properties to assess providers’ PED dependence. In a previous article, Papadakos\textsuperscript{8} provided similar commentary on PED distraction and addiction, targeted toward anesthesia providers. The overall message of the editorial was the need for education and research on PEDs’ distracting nature and addictive propensities.\textsuperscript{8} In both articles, Papadakos\textsuperscript{8,9} expressed that through recognition of a problem, corrective interventions will ensue, ultimately leading to improved patient safety.

Jorm and O’Sullivan\textsuperscript{10} took a different approach to discuss PEDs’ impact as a patient safety distractor. The authors placed the focus on defining and discussing vigilance and multitasking abilities of the anesthetist.\textsuperscript{10} They chose to broadly integrate PEDs into the report, articulating in the first paragraphs the lack of definitive information in the literature.\textsuperscript{10} Acknowledgment of this primary limitation foreshadowed an expected conclusion that “laptops and smartphones have the potential

<table>
<thead>
<tr>
<th>Percentage of users</th>
<th>Activities for which users report using their cell phone</th>
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<tbody>
<tr>
<td>81</td>
<td>Send or receive text messages</td>
</tr>
<tr>
<td>60</td>
<td>Access the Internet</td>
</tr>
<tr>
<td>52</td>
<td>Send/receive email</td>
</tr>
<tr>
<td>50</td>
<td>Download apps</td>
</tr>
<tr>
<td>49</td>
<td>Directions, recommendations, or other location-based information</td>
</tr>
<tr>
<td>48</td>
<td>Listen to music</td>
</tr>
<tr>
<td>21</td>
<td>Participate in a video call or chat</td>
</tr>
<tr>
<td>8</td>
<td>“Check in” or share location</td>
</tr>
</tbody>
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Table. Distribution of Cell Phone Activities
(Adapted with permission from Pew Research Center, Internet & American Life Project Spring Tracking Survey, April 17-May 19, 2013.)
to both positively and negatively impact on anaesthetic performance and should currently be employed with great caution.¹⁰

An article by Cammarata and Thomas¹¹ delivered similar generalities regarding the use of PEDs in anaesthesia. Again, PEDs were supported as beneficial to communication but were associated with conjectured uncertainties related to their exact role in anaesthesia. Other technology concerns in the operating rooms were addressed that did not pertain directly or indirectly to PEDs. In addition to noting the need for further research, the authors emphasized the importance of collaboratively establishing policies and procedures with the entire operating room team governing acceptable technology use.¹¹

In reviewing the literature, it is evident there is a paucity of detailed studies definitively affirming whether PED use by the CRNA is or is not detrimental to patient safety. If danger exists with inappropriate PED use outside the operating room, the question to how it applies to patient safety in anaesthesia remains. Lack of anesthesia-specific research inadvertently supports the continued application of dated, indirect distraction studies by subjective interpretation, then translation. This practice may elicit unsubstantiated assumptions about PEDs' impact related to patient safety in anaesthesia.

Hypothetical suppositions concerning the safety of PEDs lead to the creation of ethically blurred PED policies within healthcare organizations. The outcomes of ethically blurred policy are blanket statements regarding suitable use, spacious room for interpretations, and weak enforcement. Until definitive, high-quality research is conducted, the indefinite safety enormities related to PED use by anesthetists will remain in theory at the potential expense of the patients.

• **Legal Implications of Personal Electronic Devices and Anaesthesia.** Lack of literature on PED use during anaesthesia care, coupled with deficiencies in organizational policy, introduces further ambiguity related to legal implications. Domino and Sessler² incorporated legal research from the American Society of Anesthesiologists' Closed Claims database. Results portrayed 13 of 5,822 claims being attributed to distractions in the operating room due to adverse intraoperative events.⁵ Although claims related to distraction initially appeared favorable, the database did not account for computer, Internet, or PED use. Distraction sources according to the database search included reading printed material, phone conversation, and loud music only,⁷ leaving safety consequenc-es of PED use wholly unknown.

Thomas,¹² a senior claims attorney and the director of risk management for a medical professional liability insurance company, describes the growing concern of PEDs as potential distractors in the operating room secondary to the recent rise in lawsuits. Lambert et al¹³ also discussed legality issues in healthcare and anticipates an increase in legal matters paralleling the upsurge of PED use. Thomas¹² warns that, unlike allegations of distractions in the past, PEDs serve as incriminating evidentiary support to plaintiff accusations by retrieving activity content that is dated and time-stamped.

Consequences of discovered PED use negatively affecting patient safety are of sizable proportion. Research shows that confirmed allegations increase the likelihood for multimillion dollar verdicts in addition to further punitive measures.¹² Additional consequences listed included (but were not limited to) the following¹²:

• Suspension or failure to renew privileges at practice facilities
• State medical licensing board investigations and sanctions
• Substantial negative media coverage
• Public relations challenges for the individual provider and associated practice group
• Loss of employment
• National Practitioner Data Bank reporting

To avoid legal ramifications, Thomas¹² stated that "policies should have the goal of educating the medical staff about distractions from PED use and its potentially devastating effect on patient safety." Despite the limited research published on patient safety being jeopardized by PED use, he makes a compelling recommendation. Thomas recognizes that evidence-based research is preferred, but until it is available, he suggests employing risk management strategies to decrease operating room distractions (Figure).¹²

Gill et al¹⁴ conducted an assessment, analyzing PEDs as a source of distraction. Core benefits and limitations of PEDs in healthcare corresponded to data included in this review. The article proposed that healthcare organizations implement a SWOT analysis to assess PED use, which entails categorizing areas of analyses into 4 main subgroups: strengths, weaknesses, opportunities, and threats (SWOT).¹⁴ Expounded in the assessment to minimize distractions in healthcare⁴ is the subdivision of each subgroup containing comprehensive considerations and recommendations for healthcare organizations to contemplate. Based on the organization's conclusion utilizing the proposed SWOT framework, a decision regarding a specific application or PED issue can be objectively reviewed as either providing or diminishing value to their patient care and organizational goals.¹⁴ The bottom line of the article is that future studies on PEDs as distractions to healthcare are required. Gill et al¹⁴ desire qualitative and/or quantitative studies by healthcare organizations that have implemented their proposed framework approach to evaluate the conduciveness of PED in future clinical practice.

**Discussion**

Personal electronic devices have irrefutably transformed
Review and comply with practice facilities’ PED guidelines and/or policies
Implement a protocol identifying expected behavior during critical periods
Eliminate nonessential sources of noise during critical periods

• Avoid loud or distracting music
• No radio during time-outs
• Limit personal telephone calls and text messages to urgent or emergent situations
• Forward cell phone calls to voicemail or memory

Silence ring tones
Keep all telephone calls to a minimum and as brief as possible
Limit internet use to patient-care related websites only
Refrain from discretionary internet activities and browsing

• Minimize nonessential conversation, enhance communication
• Limit interruptions from outside staff
• Set an example—vigilance and focused attention on patient care is paramount
• Speak up—verbalize to others when their PED use is distracting

Figure. Risk Management Strategies to Reduce Operating Room Distractions
Abbreviation: PED, personal electronic device.
(Adapted with permission from Thomas.12)

the ways people conduct their personal and professional lives. This article described the positive attributes that PEDs currently serve to CRNAs19,20 but also cautioned about ethical and legal implications21 of inappropriate use. Emphasizing the gravity of PEDs’ distractive influence, this article exposed significant, correlated evidence outside of anesthesia22,23 that led to subsequent development and enforcement of motor vehicle policies pertaining to PEDs.24 With patient safety at the forefront of anesthesia care, adaptation of PED use is still evolving regarding appropriate application by the anesthetist.

A concentrated history and review of literature has been presented to portray the ethically blurred boundaries of PED use in healthcare and to demonstrate a thorough assessment of the problem. Limited data exist concerning patient safety repercussions when anesthesiologists engage in inappropriate PED use while caring for patients. The purpose of this article was to illustrate the need for further investigatory efforts by the anesthesia community to ensure the preservation of patient safety. Based on future research results, the development, education, and enforcement of PED media policies within healthcare organizations could be standardized and optimized. Until then, anesthesia providers must remain conscientious of the potential risks PEDs may pose to patient safety; encourage the adoption, examination, and revision of their current organizational PED policies; and continue to align their anesthesia practice with standards of excellence set forth by this esteemed profession.

REFERENCES

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