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Distracted doctoring: The role of personal electronic devices in the operating room

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ABSTRACT

Background: The purpose of this paper is to identify personal electronic device (PED) use by cardiac team members during a series of cardiovascular surgeries. Authors make the case that these devices contribute to the cognitive disconnect between practitioners and their primary task of taking care of the surgical patient.
Methods: This prospective observational study took place over four months of data collection. Twenty-five cardiovascular procedures (totaling 139.06 h) were observed for workflow disruptions and those related to the use of PEDs were further analyzed for frequency of occurrence and time spent attending to the PED.
Results: Data collection yielded 545 events for analysis; each requiring an average of 86.51 s of attention. Most PED use events took place during bypass (n = 233) followed by pre-bypass (n = 197) and post-bypass (n = 115).
Conclusion: The results presented here indicate that mobile devices have infiltrated not just social interactions, but those situations that by their nature demand often times undivided attention to ensure safety and protection of others.

1. Introduction

Most would agree that technology has made our lives easier, more manageable and more efficient. Indeed, personal electronic devices (PEDs) afford us the opportunity to communicate more effectively and solve problems more efficiently. Indeed, the proliferation of PEDs, and the ever-increasing levels of technology associated with them have provided consumers with a platform for what is often a welcome distraction during down times or repetitive/ monotonous tasks. Perhaps none are more apparent than the increase in automobile accidents that result from texting and driving[1].

While the dangers of texting and driving are well established, the impact of PEDs on other complex operations, like healthcare, is much less clear. This is clearly illustrated in the case of a 61-year-old female cardiac surgery patient who checked into the hospital for an operation to correct an irregular heartbeat. The procedure to correct this issue, an AV node ablation, is considered routine. Despite this, ten hours after her surgery began, she was pronounced dead. The ensuing investigation revealed that the anesthesiologist was distracted by his PED and failed to recognize that her oxygen levels had dropped. In fact, he was so engaged with his PED that it was not until the patient had been blue for 15–20 min that he realized something was wrong.[2]

Adverse outcomes like the previous example seem to beg the question, 'is there ever an appropriate use of a PED during surgery?' This question is currently being addressed by several perioperative professional associations who have started to develop their own personal mobile device use policies. For example, in 2014 the Association for peri-Operative Registered Nurses (AORN) released a statement maintaining: "During critical phases of the surgical procedure, surgical team members should create a no-interruption zone where nonessential conversation and activities are prohibited". [3] Similarly, the American College of Surgeons released a set of guidelines for using smartphones in the operating room including: "whenever possible, members of the OR team, including the operating surgeon, should only engage in urgent or emergent outside communication during an operation. Personal and routine calls should be minimized. All phone calls should be kept as brief as possible". [4]

Despite the aforementioned guidelines and statements, PEDs are continually used in the operating room. Some studies suggest that PEDs improve healthcare delivery and patient safety. For instance, a review of the impact technology on physicians' work practices and patient care found that PEDs positively impacted rapid response, error prevention,

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and data management/accessibility.[5] Likewise, Attri et al. (2016) demonstrated that the use of a “smart phone” or “smart” device in the operating room facilitated immediate access to patient information, peer communication, various diagnostic applications, and several drug reference applications.[6]

However, sometimes improvements come with unintended consequences. Take for example, the routine task of monitoring a patient’s vital signs on during surgery. Because critical moments are rare, it is not uncommon for healthcare providers to take a moment to send/read a quick text message, check their email, or even log onto Facebook, all of which are readily available on modern smart devices. In 2013, ECRI Instutite identified distractions from smartphones and other mobile devices as one of the top ten health technology hazards.[7]

Boquet et al. (2017) make the case that these distractions serve to disengage the healthcare professional from the task at hand, creating an “error space” within which the likelihood of an error increases.[8] These disruptions create multiple interfaces, which must occur over the course of the procedure as the medical professional reestablishes a cognitive connection with the patient.

It should be noted that the longer a team member is disengaged from the procedure, the more difficult it will be to “catch up” or reengage. According to the AAA Foundation for Traffic Safety, distracting events include what researchers refer to as “latency”. Engaging with a PED, even if only for a few seconds can negatively affect full focus for an average of 27 s after the engagement is over.[9] Thus, an error space exists during the time anyone is engaged with their PED, and during reengagement with the procedure. While interruptions to workflow often seem trivial, the case has been made that disruptions of this nature are associated with increases in procedural failures and clinical errors.[10]

This paper represents an effort to identify PED usage by cardiac team members during a series of cardiovascular operating room (CVOR) surgeries and makes the case that these devices contribute to the cognitive disconnect between practitioners and their primary task of taking care of the surgical patient.

2. Method

2.1. Data collection

Over four months, 25 procedures involving cardiopulmonary bypass were observed (totaling 139.06 h) at a hospital in Florida. Four observers each with a M.S. in Human Factors, were involved with the data collection over the observation period. Observers rotated shifts so that two individuals would observe a procedure at a time to be as discrete as possible within the operating room. Each of the two observers collected workflow disruptions impacting *two* of the *four* observed cardiac team areas (anesthesiology, circulating nurses, perfusionists, and surgeons) per surgery. For example observer one documented workflow disruptions impacting anesthesiology and perfusion and observer two documented workflow disruptions impacting the surgeon and circulating nurse. Observations were made from the time the patient entered the room until the procedure was complete and the patient was transported out of the operating room.

Throughout the procedure, three distinct phases of surgery were documented: pre-bypass, bypass, and post-bypass. The pre-bypass phase involved prepping the patient for surgery including intubation (performed by the anesthesia team) skin prep, and draping the patient (performed by the nursing team), skin incision (performed by the surgeon), maintenance of anesthesia (performed by the anesthesia team), set up of the heart-lung bypass machine (performed by the perfusionists) and charting/documentation and equipment retrieval (performed by the circulating nurses). The bypass phase involves placing the patient on cardiopulmonary bypass using a heart-lung machine that is operated by the perfusionists. This phase consists of initiating and terminating bypass (performed by the surgeon and perfusionists), cross -clamping on/off of the aorta (performed by the surgeon), bypass maintenance (performed by the perfusionists), anesthesia maintenance and vent updates (performed by the anesthesia team) and charting/documentation and equipment retrieval (performed by the circulating nurses). Finally following bypass, responsibilities include closing the incision (performed by the surgeon), maintaining anesthesia (performed by the anesthesia team), charting/documentation and equipment retrieval (performed by the circulating nurses).Surgical team members were aware that researchers were observing and documenting disruptions to individual’s tasks. Disruptions were defined as any event that resulted in a disturbance to the natural progression of a team member’s task. The events and the associated time spent attending to these events were recorded using a customized platform called the Observation Precision Tool to Improve Communication and Safety (OPTICS), designed using Microsoft Access.

This project received exempt status from the hospital’s IRB as only observational behavior was being documented.

2.2. Data classification

Observations were later classified into the Realizing Improved Patient Care through Human-centered Operating Room Design for Threat Window Analysis (RIPCHORD-TWA) framework. RIPCHORD-TWA is a taxonomy used to classify human factors related disruptions into six major categories: communication, coordination, equipment issues, interruptions, layout, and usability, each with fine-grained minor categories for further analysis.[11] After formal training from the original developers of RIPCHORD-TWA, three human factors analysts consensus coded each observation into the framework.

2.3. Analysis

After classification, all PED usage events that impacted any of the four cardiac team members listed above were included for analysis. Descriptive statistics were used to calculate the frequency and time required to attend to PED-related events observed.

3. Results

Overall, a total of 558 PED-related events were observed during the 25 cases. While most individuals spent less than a few minutes attending to their PEDs, a handful of these disruptions lasted an abnormally long time. To better represent the data, any event in which the provider spent longer than three standard deviations (9 min, 46 s) of the average time (1 min, 45 s) to attend to their PEDs were removed. This eliminated thirteen data points (see Table 1), resulting in a total of 545 events to be included for analysis (for an example of the types of events that occurred, refer to Table 2) (see Fig. 1).

In an effort to respect the privacy of the team-members being observed, researchers were unable to see the content of many of the PED-use events as a means to gauge if the event was hospital-related or not. Additionally, due to the positioning of observers, there were several instances ($n = 124$) where it was documented that an individual was using a PED however, the reason for use (e.g., emailing, texting, taking photos, etc.) was unclear. Texting made up the largest proportion of these events ($n = 330$) followed by phone calls ($n = 53$), non-hospital related events such as engaging with social media, visiting YouTube or browsing the internet ($n = 27$), emailing ($n = 9$) and charging the device ($n = 2$).

On average, each of the 545 included events took 1 min, 26 s (SD = 1 min, 40 s) of attention. The investigation was further broken down by the phase of surgery (i.e., pre-bypass, bypass, and post-bypass) and discipline (i.e., anesthesiologist, circulating nurse, perfusionist, and surgeon) (see Tables 3 and 4).

With respect to phase of surgery, pre-bypass was generally the longest phase of surgery, lasting on average 2 h, 27 min (SD = 34 min,

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