Review of unusual patient care experiences is a cornerstone of medical education. Each month, the AQI-AIRS Steering Committee abstracts a patient history submitted to the Anesthesia Incident Reporting System (AIRS) and authors a discussion of the safety and human factors challenges involved. Real-life case histories often include multiple clinical decisions, only some of which can be discussed in the space available. Absence of commentary should not be construed as agreement with the clinical decisions described. Feedback regarding this article can be sent by email to Heather Sherman: **airs@asahq.org**. Report incidents or download the AIRS mobile app at **www.aqiairs.org**.

Case:

A 34-year-old female, 66 inches, 67 kg, underwent general anesthesia for laparoscopic cholecystectomy. Thirty minutes after the end of surgery, the patient showed no signs of moving. A nerve stimulator showed no response to train-of-four and a weak response to tetanic stimulation. Examination of the anesthesia work area and recent actions suggested that just minutes prior to end of surgery, an I.V. might have been mistakenly flushed with 10 mg of vecuronium, believed to be a saline flush. The patient was managed accordingly and did well.

Later, the anesthesia team, an attending and a CA-1, were told that the circulator had "written them up" on the hospital incident reporting form, "accusing" them of using smartphones and surfing the Internet during the case.

Discussion:

Incident reporting systems are powerful tools,[1] and as such can be powerfully misused.[2] In this case history, reporting took an accusatory tone. The resulting damage to workplace relationships, and the recrudescence of old-view, blame-based attitudes toward safety, may be hard to repair. The hostile feelings and defensive postures that are provoked overshadow a very legitimate safety issue.

The use of Internet-based resources, smartphone apps and texting during patient care, whether by smartphone or computer (henceforth all referred to as "technology"), raises questions of ethics, communication, human factors, trust, professionalism, perception, physics, infection control, unintended consequences and other safety issues.

Technology can be an O.R. distraction, a topic we introduced last month.[3] In that piece, the ASA "Statement on Distractions" was cited,[4] and while the impact of music was emphasized, a number of subtopics were discussed, including noise, the sterile cockpit and the impact of technology.

Last month we implied that the first responsibility of O.R. anesthesia is the second-to-second condition of the patient, the vigilance we committed to in ASA Standard I.[5] By this definition, necessary tasks such as adjusting bed position and inserting an extra I.V. or an arterial line technically are distractions, but appropriate and unavoidable. Distraction, defined non-judgmentally, is anything that prevents us from giving full attention to something else. Distraction can be defined more judgmentally as something that takes your attention away from what you are supposed to be doing,[6] implying they are avoidable (bad, unforgivable).

Distractions live on a polarized continuum. At one end are those necessary for patient care. At the other end are completely avoidable activities that contribute nothing to treatment. In between is a lot of gray. The two types of distraction are bound to be confused. Gray areas make this more likely. Looking up how to treat your patient's acute condition is clearly acceptable. Checking stocks is not. But what about looking up the next patient? It has to be done, but must it be now?

The opportunity for avoidable distraction is not new. It has long been possible to run an entire retail business on a landline during surgery. So, why discuss technology? Isn't it just another distraction, like reading, which also features acceptable, borderline and avoidable types? And isn't reading, as the cognitive load, the final common pathway even for technology? We will argue that current technologies pose new, specific distracting risks that should be considered and managed differently from other sources.

Technology is ubiquitous. We almost all have smartphones, and most O.R.s have networked computers. Unlike printed material, we do not have to bring technology to the O.R. It is waiting there for us. The size and variety of the temptation is massive: endless games, texting, news, general studying and social media[7]: "The temptation to engage in personal business, while not unique to the technology, is perhaps greater given the power and sophistication that mobile devices offer." Using technology for appropriate, patient-centered purposes may appear to others exactly like playing Angry Birds. This can lead to confusion by our nursing and surgical colleagues, as might have happened in this case.

Processes once done manually, such as measuring arterial pressures and charting, are now automated. Idle time may cause

"boredom, inattention and sleepiness."[8,9] It is suggested that reading and technology "might represent an intentional strategy to alleviate boredom and stay alert."[8] While this is possible, it is also a slippery slope. Slagle et al. mentioned boredom mitigation as a hypothesis. Did they mean to put forth an excuse for catching up on Facebook or reviewing dog videos in the O.R.? Probably not. Perhaps better strategies for boredom mitigation include the implementation of a structured environmental "sweep" in which all data sources are systematically evaluated (although their data may flow automatically to the clinical record) and the mental exercise of rehearsing "what if?" exercises to consider alternate diagnoses and emergency management, even in the absence of concerning findings. More science needs to be done before any intentional distraction can be recommended.

Print media are what they are, but technology is a moving target. Soon our main monitor screen may be a wireless handheld tablet with wireless patient connections.[10,11] With a tablet in hand all the time, distinctions between types of distractions will blur further. Medical apps might fall into the acceptable type of distraction, but they are not necessarily peer-reviewed or otherwise error-checked.[a] Thus, even "patient-centered" technology may not actually be helpful. Even "good" technology may hurt our practice by introducing data entry and autocomplete errors, allowing HIPPA violations,[12] or creating over-dependence.[13] Finally, technology can actively work to distract us in ways that other types of distractions cannot. A newspaper will not solicit your attention by vibrating and chirping at odd times, whereas smartphones obviously do. A book can be put down and ignored, but the smartphone chirp from a new text or Facebook post is distracting in itself and encourages the additional distraction associated with looking at and responding to the text/post/tweet/etc.

Despite the potential concerns cited above, the actual impact of distraction from technology on clinician vigilance or patient safety is not well understood. We hope and expect it to be measurable, but it has not proven to be, nor do existing studies support a clear safety problem. In reading any of these studies we must remember that vigilance has both an informal definition that we associate with our organization's motto and a scientific laboratory definition,[b] closer to what was measured by Slagle and Weinger. They found that reading in the O.R. was performed at times of low work load and that vigilance as measured by a specific probe was not affected.[8] Above, we indicated that reading may not be the same as surfing or texting, but their methodology would be applicable to technology. Similar work should be done assessing technology and vigilance in the O.R. The compulsion to use technology may be stronger, and with technology the interruptions are not all self-initiated, and thus the impact on vigilance may be more pronounced. Campbell et al. studied distractions, but they looked at non-technology interruptions.[14] They suggested that dealing with interruptions is a learned skill. Technologic distraction may be different, since we initiate the distraction. Wax et al. did study technology in the O.R. and[15] found that vital sign instability was not worse when the anesthesia staff was on a computer. This is an encouraging result but, like the Slagle study, should not be seen as a license to surf the Internet. Their negative result may just mean that the variable was insensitive under the particular conditions of their study, as is suggested in the accompanying editorial.[16]

Finally, it is clear that technology in the O.R. is here to stay and that its net impact is positive. It helps us record vitals automatically and legibly, giving the clinician time to attend to critical patient care duties. It gives us access to the whole world of medical knowledge to facilitate management of unusual events. It facilitates communication between colleagues. It might even eventually be used to improve vigilance. If a smartphone can chirp because a friend has posted a new picture, it can also warn you that you have not done much on the chart in a while or that you inactivated an alarm or that an infusion syringe has become empty, or even that the phenylephrine is still running but the blood pressure is too high. Vigilance devices have been required on rail transportation for decades. Apps can be developed that similarly redirect our attention.[17] Yes, if we were truly vigilant, we should not need an app. In the post-"Institute of Medicine Report" world we inhabit,[18] human imperfection is a fact of life, something we assume and create system improvements to circumvent. Structures to support vigilance are not in any way inappropriate.

Public sentiment can easily turn; laxity in other domains was unpopular, and legislation about texting while driving or operating public transportation is now ubiquitous.[19-21] Although the topic is still novel in health care, popular search engines, when challenged with "distracted anesthesiologist," all yielded pages of relevant communications.[22,23] Most do not give us the benefit of the doubt. One that does, and that provides a thoughtful analysis along the lines of this piece, comes from industry, not a medical insider.[24c] Technology in the O.R. may be controlled by law or policy,[d] and fine distinctions regarding useful/unavoidable or just-in-time learning may be lost. As an editor of this publication pointed out, the action of reading in the O.R. has almost a res ipsa loquetur[13] quality, and misuse of technology will not be different. The oversight might "just" regulate behavior. It may, on the other hand, become more draconian and allow access only to medical libraries or other sites, but block everything else, perhaps banning our own devices and having us use the O.R. computer or institution-issued tablets. Several simple, common-sense steps can help to ensure appropriate use of technology in the O.R.

(a) The ACGME-sponsored Meded Portal, **https://www.mededportal.org**, provides one way to address some of this.

(b) A state of readiness to detect and respond to small changes occurring at random intervals in the environment.

(c) The author, CEO of an anesthesia billing company, frames the problem somewhat like we do.

(d) Per the google search referenced previously, this is already happening at the local level.

1. Model restraint and good judgment in our own behavior.
2. Extend "speak up for safety" initiatives and training to permission to challenge us gently and respectfully, perhaps with an advocacy-inquiry statement.[25]
3. Limit literature surfing to peer-reviewed publications when possible to avoid inaccuracies, or use other sources with extreme care.
4. Encourage the developers of apps, such as those that calculate clinical equations, to partner with a physician (if developer is not) and submit the app for peer review on Mededportal or similar.
5. Avoid hiding screens of our devices from other team members in the O.R.; it looks suspicious and compromises team integrity.
6. Never enter HIPAA-protected information on personal devices, and delete any email that includes such information.
7. Establish explicit expectations; these can provide for flexibility and trust. They should support professionalism and steer clear of blanket prohibitions. They must not tie our hands from appropriate use of technology.
8. It has been suggested that we should imagine that the patient's family is watching us on closed circuit T.V. during patient care. Any technology use that we would be proud to perform with this kind of scrutiny is probably warranted.

It is not clear that the syringe swap in this case resulted from the use of technology. In all likelihood this was an honest mistake rather than improper or unprofessional behavior. We do not endorse the use of incident reporting to perpetuate blame or to substitute for face-to-face engagement. However, the perception that technology negatively impacted the patient care was present and this should give us cause to reflect.

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