

Bar-Code Scanning Can Fix 'Black Hole' of OR Drug Safety

Error rates slashed; anesthesiologists embrace technology

NEW ORLEANS—When an anesthesiologist calls the operating room (OR) a “black hole of medication safety,” hospitals might want to pay attention. The description came from Ludwik Fedorko, MD, PhD, FRCPC, staff anesthesiologist at the University Health Network's (UHN) Toronto General Hospital in Canada, during a session on OR drug safety at the 2011 American Society of Health-System Pharmacists Midyear Clinical Meeting.

Dr. Fedorko noted that anesthesiologists are the only health care professionals in the hospital setting who dispense, premix, repackage, relabel and administer medications without independent verification. Given that most drugs administered perioperatively are high risk, the potential threat to patients is obvious. If that's not enough to make hospital administrators uneasy, other figures presented by Dr. Fedorko are equally disconcerting: The OR and the postanesthesia care unit disproportionately accounted for 81% of all medication error reports, which exceeds by fivefold the error rates reported in the rest of the hospital (*MEDMARX Data Report: A Chart-*

book of 1998-2004 Findings from the Perioperative Setting; 2006). Additionally, more than 60% of medication errors committed by anesthesiologists are related to the removal of incorrect ampoules or vials from anesthesia drug trays, incorrect labeling of syringes after admixing and syringe swaps during surgery (*Can J Anaesth* 2001;48:139-146).

On average, anesthesiologists administer 10,000 drug doses a year, with estimated error rates ranging from 0.1% to 0.85%, Dr. Fedorko noted. At best then, one error is committed for every 1,000 drug-dose administrations, or 10 errors annually. But even that calculus may underestimate the true extent of the trouble because a vast majority of the errors—many of which pose a significant risk for harm—are reversible. “We can almost always dig ourselves out of a hole,” Dr. Fedorko said. “The event is charted, but it doesn't always show up as an error.”

Errors are often system-driven, Dr. Fedorko continued—a result of the fast pace of the OR workflow combined with a lack of redundant checks and balances. One possible solution, a satellite pharmacy for the OR, is exceedingly expensive and still would not address emergency doses. “We're very good clinicians, but we're not machines,” he said. “Throughout the hospital, there are safety steps in place to prevent medication errors, but not in the OR.”

The Power of Collaboration

That is until now. Under the leadership of Esther Fung, RPh, BScPhm, MScPhm, director of pharmacy operations at UHN, a pharmacy-anesthesia collaboration was established to explore the potential of a point-of-care, computer-aided syringe

labeling, bar-coding and verification process. The system was designed and developed at the UHN, with funding from the Canadian Patient Safety Institute and drug-industry sponsors.

In January 2010, the system was implemented in all 20 ORs at Toronto General, a 762-bed tertiary academic health system. Use by anesthesiologists was completely voluntary. The process requires the anesthesiologist to scan every drug ampoule and syringe label for accuracy verification throughout drug dispensing, premixing, administration and documentation. Dr. Fedorko explained that it enables real-time documentation of medication, fluids, infusions, and urine and blood loss through an interface similar to a touch-pad screen. Electronic anesthesia data capture produces a complete intraoperative record that funnels directly to the UHN electronic medical record, which means that anesthesiologists do not have to document their actions after the procedure, as they had to do previously.

Within two weeks of implementation, all staff anesthesiologists had adopted the new process. Five months out, the bar-coding system had been used for more than 60,000 doses in more than 4,000 surgeries. All anesthesiologists who had used the system were surveyed about medication errors that were intercepted by bar-code scanning and to grade their satisfaction level with the system within that five-month window. The survey also asked if the anesthesiologists preferred the new system over the traditional one. Surveys were submitted anonymously. Twenty-one of the 41 survey respondents (52%) reported 29 medication errors, all of which were intercepted by bar-code scanning. Opinions about the system were overwhelmingly positive: More than 97% of the responding anesthesiologists favored it.



Now, after 23 months and more than 300,000 doses administered in more than 20,000 surgical cases, no medication error incidents related to mistaken drug identity have been reported when bar-code scanning was used. A single critical drug error did occur when an anesthesiologist bypassed the bar-code scanning process. The results were so compelling that the system has become the standard of care at Toronto General and will soon extend throughout the UHN system to Princess Margaret Hospital and Toronto Western Hospital, both in Toronto.

Embracing Change

At first, Dr. Fedorko feared that his colleagues would resist the change, in part because they would need to scan every ampoule pulled from the dispensing cabinet. So he was surprised at how quickly and enthusiastically the staff anesthesiologists embraced the process. "In fact, there was unanimous acceptance and they were very keen to use it," he said. "They understood that it would not only prevent them from making drug errors, but also that it improved and automated workflow in terms of easier charting and documentation because they would no longer have to do it manually."

Another key that led to systemwide adoption is the relatively low implementation and operational costs. "The process is orders-of-magnitude cheaper than alternatives, such as a satellite pharmacy, and it also puts us fully in compliance with the Joint Commission for injectable medication labeling in the OR," Dr. Fedorko said.

He emphasized that the real driver of the project was the pharmacy, which took

the lead in the system's development and rollout. "I'd advise others who want to introduce this technology to coordinate closely with leadership in the pharmacy and anesthesia departments right from the start, and to make sure that the end users—the anesthesiologists—are involved in the development process," he said. "Anesthesia on its own had no knowledge of, or appetite for, implementing a medication safety system. It was only the continuous education and support from pharmacy leaders that made it happen."

"This a fascinating study, especially coming from a practicing anesthesiologist who sees these problems every day and did something to address them," said Roy Guharoy, PharmD, FASHP, chief pharmacy officer and professor of medicine with the University of Massachusetts Memorial Health Care in Worcester. "What they did was unique, because they didn't mandate use of the system. But once it could be shown that it helped anesthesiologists save time, the anesthesiologists were won over, and now they have 100% compliance."

Dr. Guharoy concurs with Dr. Fedorko's characterization of the OR as a "black hole" of drug safety. "They're often in a rush; they get these drugs very fast and it's easy to mix up the wrong dose. It happens. All around the country there are major initiatives, and a lot of federal money, to implement electronic medical records. But the OR is one area that has not been adequately addressed in terms of safety, and there's lots of room for improvement."

In fact, shortly after hearing Dr. Fedorko's presentation, Dr. Guharoy said he spoke to his facility's medica-

tion safety pharmacist, and his hospital has begun looking into implementing a similar system. "This is an area we really need to address. Not nearly enough has been done."

Does Initiative Go Far Enough?

In 1999, the American Society of Health-System Pharmacists issued *Guidelines on Surgery and Anesthesiology Pharmaceutical Services*, which called for ongoing and direct pharmacy involvement in numerous aspects of surgical care. Matt Grissinger, BS, RPh, director of error reporting programs at the Institute for Safe Medication Practices, said the bar-coding initiative at Toronto General Hospital is an important first step in meeting that goal. But more work remains. He noted, for example, that the hospital is not yet using the pharmacy to manage the formulary and evaluate the actual use of drugs in the OR. Still, he said he was impressed that the project was led by the pharmacy, that project leaders involved the anesthesiologists in the development process, and that they solicited end-user opinions after the system had been up and running for a while. "They made sure it was going to be used correctly and what feelings the anesthesiologists had about it," he said. "That's not a small task. A lot of people implement technology but don't prepare for it, but this group did."

—Steve Frandzel

Dr. Fedorko disclosed that he is a consultant and stockholder with Thornhill Research Inc., a spin-off of the University Health Network, which developed the technology described in the article.

Dr. Guharoy and Ms. Fung disclosed no relevant conflicts of interest.

