Technology in Anesthesiology: Opportunities for Innovation

Barcoded Medications in the OR: Is It Time?

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In late 2012, an outbreak of fungal meningitis linked to contaminated epidural steroids led to 753 infections and 64 deaths (asamonitor.pub/3ez66BW). Congressional inquiries identified a slow FDA response and limited congressional intervention due to political and jurisdictional issues. Congress passed the Drug Quality and Security Act (asamonitor.pub/3gW3sYo) in November 2013 to prevent future actions against pharmaceutical and compounding facility events from getting caught in similar red tape and delaying prevention of patient harm. The act includes sections that address loopholes in compounding regulations and drug supply chain monitoring. Drug supply chain monitoring requires "unit level traceability" by 2023, which means tracking individual vials and packages through the supply chain as they are packaged and repackaged and ultimately distributed to individual pharmacies. While the FDA has clarified that dispensing related to filling prescriptions and point-of-care delivered doses are exempted at this time (asamonitor.pub/38Ty0Y1), the legislation reflects the regulation and oversight trend to require barcode medication administration workflows throughout health care.

Barcode medication administration typically involves linking barcodes of both the patient identifier and the National Drug Code that is required to be present by law on all drug packaging. After a drug is dispensed, the patient and pharmaceutical are both electronically identified by barcode prior to administration, which allows the electronic health record (EHR) system to cross check existing orders against the drug and dose in hand. This workflow also facilitates documentation accuracy and administration timing, both of which reduce downstream medication administration errors.

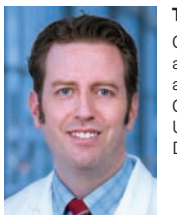
Many facilities already use EHR technology with mandatory barcode medication administration in their inpatient care areas, but meaningful barcode medication administration doesn't exist in most anesthetizing locations across the country despite high rates of drug delivery during operations. Drug administrations are commonly recorded on handwritten paper records or stylized EHR modules designed to mimic paper charting. Both methods favor the addition of drugs to the record only after administration. Even when intraoperative barcode medication administration is available, adoption rates are extremely low due to clinician resistance and the significantly different administration workflow necessary in high-criticality areas.

Perhaps the most important workflow difference in the OR compared to other health care areas is that original pharmaceutical packaging is usually no longer available at administration. Drug preparation patterns in the OR include single patient multi-dosing and syringe preparation by clinicians before patient arrival. Vials are commonly discarded or separately stored from the syringes that now hold their contents. Syringe label printers are more common in ORs to improve labeling compliance and are a potential solution for OR barcode medication administration. Even when workflow obstacles are overcome, however, clinician resistance remains. A recent study demonstrated that label printer use in the OR improved barcode medication administration compliance, but not until anesthesia clinicians were incentivized with coffee (*Anesth Analg* 2015;121:410-21).

Anesthesiology has a storied history of leadership in revolutionizing health care safety. Through the 1970s and 1980s, standardization of monitoring, equipment interfaces, and machine checkout protocols had exponential effects on reducing mortality and complication rates. Creation of the Anesthesia Patient Safety Foundation (APSF), the Closed Claims Database Project, the Anesthesia Quality Institute (AQI), and the National Anesthesia Clinical Outcomes Registry (NACOR®) have all contributed to our continued success as a specialty in pushing the envelope to keep the OR as safe as possible. The NACOR database has been particularly useful in tracking complication rates over the past decade, with reported medication errors appearing in approximately one out of every 300 cases (*Anesthesiology* 2015;123:1312-21). Inpatient studies demonstrate that barcode medication administration can reduce the relative risk of medication errors (*J Hosp Pharm* 2016; 69:394-402). This evidence and more led to an APSF expert consensus conference on medication safety in 2018 that suggested the need for barcode medication administration in the O.R. and made specific recommendations (asamonitor.pub/2Ok8P7w):

- Encourage and support the development of technologies that can identify drugs and directly link these to documentation in electronic medical records.
- Develop collaborative efforts with electronic medical record corporations that support drug identification, documentation Oxford, and patient safety.
- Encourage the perioperative practice of identifying and documenting drugs before administering them.

Ideally, EHRs are built by vendors to meet regulations and consumer demand. The rudimentary functions of barcode medication administration do exist for anesthesia modules in major EHR systems. To meet our specialty's needs in the future, development surrounding barcode medication administration workflows and technology will likely require active lobbying by EHR users and regulatory pressure. Government and payer incentive programs, administrative body oversight, and society recommendations and guidelines have led to many of the quality and patient safety EHR features we enjoy today.



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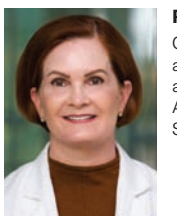

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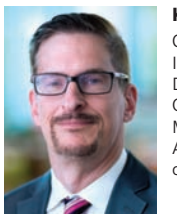

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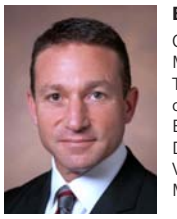

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As individual clinicians, and as a specialty, we must return to our rich history to build a better system and not rest on our laurels, believing "only other people make those mistakes" with medications. Medication errors persist as a common root cause of patient harm in the OR, most being preventable. OR technology and EHR systems have evolved and could allow barcode medication administration workflows to become commonplace and reduce these preventable errors. Before legislation and regulation forces us to use systems not designed specifically for the OR, we need to lead innovation efforts and adopt effective solutions for the OR.

ASA could make formal recommendations regarding routine barcode medication administration use, as ASA did with pulse oximetry, which would lead EHR systems to be incentivized by guidelines and specialty demand to develop the technology for an optimized intraoperative barcode medication administration workflow. In addition, we could expect continuous improvement and innovation that would reduce barriers to both implementation and adoption. ■