Medication Safety in the Operating Room: Teaming Up to Improve Patient Safety

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Abstract

A medication safety project for operating rooms (ORs) was initiated under the leadership of the Departments of Anesthesia and Nursing with a representative from the Canadian Anesthesiologists' Society and the Institute for Safe Medication Practices Canada. The aims of the collaborative project were twofold: (1) to identify areas of exposure to risk and make recommendations to enhance medication safety within the hospital and (2) to inform the development of a medication safety checklist specific to the OR setting. The strategies developed and implemented during this project were aimed at reducing the risk of injury induced by medications. Attempts were made to use feasible best practices and managerial support systems for defined areas – in this case, medication-use systems for the ORs and associated patient care areas. The learning from this project will also inform the development of a medication safety checklist for use by other hospitals and OR settings.

Several studies have suggested that medication error is a leading cause of adverse events during anesthesia. For example, in an analysis of critical events during anesthesia, Cooper et al. (1984) demonstrated that the total number of medication-related events (including syringe swaps, drug ampoule swaps, overdoses and incorrect drug choices) far exceeded the next most frequent problem, disconnection of the breathing circuit. In a large Australian survey, Webster et al. (2001) estimated the incidence of drug administration errors in anesthesia on the basis of a large, prospective set of data. Overall, one drug administration error was reported for every 133 anesthetics administered. A survey of 687 anesthesiologists (representing a 30% response rate) (Orser et al. 2001) revealed that 85% of the respondents had experienced at least one drug error or near miss. A variety of factors contribute to increases in the risk of medication error in patients undergoing anesthesia, including the use of potent drugs that carry a risk of serious injury or death when administered in excessive doses or without adequate patient support; the dynamic, complex environment of the operating suite; and the fact that one person is responsible for prescribing, dispensing and administering the anesthetic and

monitoring the patient. Safeguards that are present in hospital nursing units (e.g., review of medication orders by nurses or pharmacists) are lacking. In addition, the administration of several high-risk drugs over a short period of time likely increases the likelihood of errors (Orser 2000).

The Project

In January 2005, patient safety was adopted as a priority for a large teaching hospital in Ontario. The hospital's board of trustees approved an Accountability for Patient Safety Policy, which created a framework for all staff, volunteers and physicians, emphasizing shared responsibility to ensure that systems of care were as safe as possible.

A medication safety project for operating rooms (ORs) was initiated under the leadership of the Departments of Anesthesia and Nursing. The Institute for Safe Medication Practices Canada (ISMP Canada) was invited to be a team member. The aims of the collaborative project were twofold: (1) to identify areas of exposure to risk and make recommendations to enhance medication safety within the hospital and (2) to inform the development of a medication safety self-assessment specific to the OR setting and related patient care areas, as part of a collaborative project with the Canadian Anesthesiologists' Society. The project was funded through the Ontario Ministry of Health and Long-Term Care.

On March 15 and 16, 2005, an interdisciplinary team of consultants from ISMP Canada, along with a representative from the US-based ISMP, performed a targeted system review of medication use in the OR and related patient care areas at the hospital. The review team observed the environments in which medications were prescribed, stored, transcribed, prepared, dispensed and administered. Areas of direct observations included the same-day surgical ward, individual ORs and the post-anesthesia care unit. Physicians (surgeons and anesthesiologists), nurses, respiratory therapists, perfusionists, pharmacy technicians, educators and representatives from

Table 1. Examples of findings and recommendations of the review team

Finding	Recommendation	Status of Change
Patient Information		
Incomplete and inconsistent medication history in patient charts Lack of sufficient prompts to ensure routine assessment of allergy information	Consistently document and complete preoperative medication history for all patients Add prompts to pre-admission records	New forms to prompt for medication and allergy history have been instituted. Medication reconciliation initiative has been started in associated patient care areas.
Drug Information		
Pharmaceutical care not provided routinely in OR, PACU and SDS areas	Provide enhanced pharmacist support	Approval has been granted for one permanent full-time equivalent pharmacist for the OR, PACU and SDS areas.
Communication of Drug Orders and Information		
Large number of abbreviations used on preprinted forms and in medication communications (verbal and written)	Eliminate use of dangerous abbreviations and dose expressions	Revisions have been made to preprinted forms.
Dose, frequency and route information inconsistently written on handwritten and preprinted orders	Incorporate computerized physician order entry into strategic planning	Computerized physician order entry, integrated with clinical decision support, is planned.
Drug Labelling, Packaging and Nomenclature		
Medication brands change without the knowledge of surgical teams or technicians	Enhance communication mechanisms	This is currently in progress.
Anesthetic cart trays not standardized; quantities not based on usage patterns	Standardize anesthetic cart trays and consider usage patterns	This has been completed.
Practitioner-prepared solutions, basins and syringes are inconsistently labelled, both on and off the sterile field	Require labelling of all medications and solutions up to the point of use Standardize labelling procedures	Policy, checklists and standardization of labelling are in development.

Finding	Recommendation	Status of Change
Drug Standardization, Storage and Distribution		
Hazardous chemicals found in close proximity to products designated for patient use	Evaluate need for, and then clearly identify and segregate, hazardous products	This has been completed.
Selected medications prepared in the unit with limited checking and sterility safeguards	Increase provision of premixed solutions	Opioids for epidural administration are now prepared by pharmacy; additional medications are under consideration for premixing.
Neuromuscular blocking agents not adequately segregated in storage areas	Segregate and label storage areas for neuromuscular blockers	This has been completed.
Use of bulk bottles for medication supplies, poor design of medication supply area, incomplete documentation	Budget for increased use of unit-dose products; consider acquisition of profiled automated dispensing cabinets for OR, PACU and SDS; incorporate bar-coding into strategic planning	One automated dispensing cabinet has been installed, and its evaluation is in progress.
Environment and Workflow		
Top of anesthesia carts cluttered	Minimize advance preparation of syringes for later administration and segregate them from the immediate workspace Return or remove unused medications from the work cart	Ongoing monitoring of the environment has been implemented.
Staff Competency and Education		
Medication "stashes" found in selected areas; other "workarounds" identified	Investigate, evaluate and educate staff about the dangers associated with workaround practices	Systems for review of practices are being explored.
Patient Education		
Inconsistent preoperative teaching of patients	Provide enhanced education materials for preoperative patients Consider pharmacy involvement in same-day assessment	These enhancements are in progress.
Quality Processes and Risk Management		
Limited voluntary reporting, a "siloed" error-analysis process and limited feedback	Encourage reporting (including near misses) by all practitioners Consider monitoring use of trigger drugs (e.g., naloxone and other reversal agents)	Hospital-wide electronic incident reporting program is being implemented. Patient safety rounds are held regularly.
Inconsistent system of double-checks	Consistently employ independent double-checks for hospital-selected "high-alert" drugs	Checklist development for high-risk procedures and disease management is currently under review by several departments.

PACU = post-anesthesia care unit; SDS = same-day surgery.

surgical management were interviewed. The team also toured the pharmacy. Various supporting documents (e.g., protocols, policies, procedures, order sets, drug guidelines, error reports and educational materials) were reviewed during the assessment process. System weaknesses were identified, and 75 specific recommendations were made to enhance medication safety.

Hospital managers reviewed and endorsed the recommendations (examples of which are listed in Table 1), and the Pharmacy Department received funding to hire an OR pharmacist to lead the implementation of the recommendations. Deliverables for this pharmacist included developing an implementation team, leading the implementation of selected recommendations over the short term and helping to develop plans for the implementation of selected long-term recommendations. Many of the changes that have already been made or are currently in progress are being considered for hospital-wide implementation.

Discussion

Published analyses of the underlying causes of medication errors suggest that many of these errors stem from basic ergonomic flaws in medication systems and the hospital environment (Leape et al. 1991; Silver and Antonow 2000). Systems approaches to deal with these ergonomic flaws and to thus reduce or intercept medication errors encompass standardization, simplification, the institution of double-check systems, restriction of access, the reduction of the reliance on memory and the creation of redundancies for critical functions. Incorporation of these principles into the design of work processes reduces the likelihood of error and increases the chances that any errors that do occur will be intercepted before patient harm occurs (Massachusetts Hospital Association 1999).

The teaching hospital that undertook this project recognized a need to address safety issues and to expand the knowledge base on medication safety. Although the efficacy of the recommendations in Table 1 has not yet been proven by formal research, it has been argued that many medication safety practices involve common sense and are well supported by human-factors literature in other industries (Leape et al. 2002). As such, the medication safety team feels that their implementation is reasonable. The carefully constructed implementation plan and agenda, the provision of education sessions and the creation of ongoing opportunities for input from different professional groups helped move the initiative forward and ensured that this collaborative project would provide knowledge translation for hospital staff. Nonetheless, achieving continued steady improvement will depend on adequate resources being sustained over an extended period.

Conclusions

Enhancing working relationships among anesthesiologists, pharmacists and nurses is pivotal for safe medication practices in the OR setting. The strategies developed and implemented during this project were aimed at reducing the risk of injury induced by medication errors. Attempts were made to use feasible best practices and managerial support systems for enhanced medication-use systems in the ORs and associated patient care areas. The learning from this project will also inform the development of a medication safety checklist for use by other hospitals. HQ

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Acknowledgements

We gratefully acknowledge members of the interdisciplinary team of consultants who provided the targeted system review: Susan Paparella, RN, MSN, director of consulting services (and currently vice-president at ISMP [US]); and Alex Ho, MD, FRCPC, who is with the Department of Anesthesia, St. Michael's Hospital in Toronto, and is an ISMP Canada fellow (2004–2005).

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