



Institute for Healthcare Improvement's
5 Million Lives Campaign

Best-practice protocols:

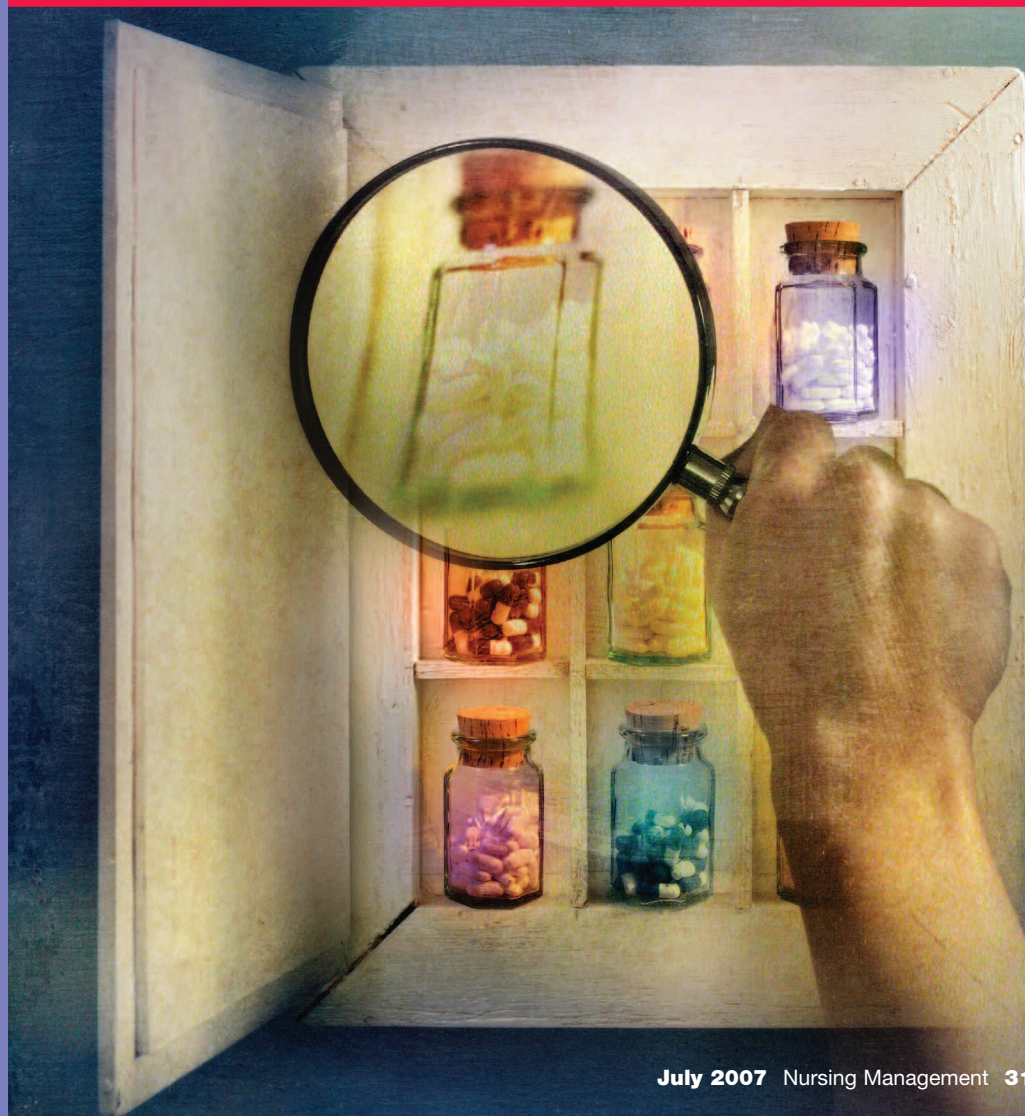
Reducing harm from high-alert medications

The Institute for Healthcare Improvement challenges clinicians and administrators to raise care quality through its 5 Million Lives Campaign, a sequel to the 100,000 Lives Campaign. Here, review a case study on the importance of postoperative monitoring of opioid-naive patients who are receiving narcotics.

By **Mary Meisel**, RN, APRN,BC, MS, and **Steven Meisel**, PharmD

In December 1999, a 19-year-old woman entered the hospital for a routine same-day surgery. The woman's postoperative pain was difficult to manage, so the surgeon admitted her. The assigned surgical RN was surprised to read a medication order for "I.V. push morphine 4 to 8 mg q 15 minutes – 2 hours PRN." The dose seemed too high, so the RN decided she wouldn't give more than 4 to 6 mg at a time.

Richard Tuschman



High-alert medications

The RN recorded the patient's blood pressure, pulse, and respirations as prescribed by hospital policy. The documentation sheet included areas for vital signs, but not for a pain or sedation score. Pain and sedation scores were required documentation for patients on patient-controlled analgesia therapy or continuous narcotic infusions, but not I.V. push narcotics. The facility's med-surg units had just started administering I.V. push narcotics; previously, only critical care areas had administered these "high-alert" drugs.

The patient was crying, restless, and frequently requesting pain medication. After 6 hours, the RN had given the patient a total of 32 mg of I.V. morphine. The nurse checked on her patient after the final dose and found her sleeping soundly, snoring lightly, and positioned on her abdomen. Although it was unusual to find a postoperative patient lying on his or her stomach, the patient's mother reported it as her daughter's preferred sleeping position.

Forty-five minutes later, the nursing assistant found the patient unresponsive with cyanotic lips, still lying

Table 1: Naloxone harm rating classification

Criteria for naloxone use

Class	Description
0	No adverse event. Naloxone was used but didn't result in an improvement of the patient's clinical condition.
1	Intentional overdose.
2	Adverse drug event; naloxone use resulted in a measurable improvement in the patient's clinical condition. However, an uneventful recovery without sequelae would likely have occurred without the use of naloxone. 2a – Improvement was incomplete. Adverse event was complicated by an underlying medical condition or other medication. 2b – Improvement was dramatic. Adverse event was clearly related to opioids.
3	Adverse drug event and a near miss; naloxone use resulted in a measurable improvement of the patient's clinical condition. An uneventful recovery without sequelae wouldn't have likely occurred without the use of naloxone.
4	Adverse drug event and sentinel event; naloxone use resulted in a measurable improvement of the patient's clinical condition or would likely have if given earlier in the course of the adverse event or in a more aggressive fashion. Patient suffered significant harm, required transfer to a higher level of care, suffered a respiratory or cardiac arrest, or died.

on her stomach. While her parents watched in horror, a code-blue team arrived to resuscitate her, but its efforts were unsuccessful. The patient died from an apparent narcotic-associated respiratory depression.

The nurse was devastated. She repeatedly reviewed her nursing care in her mind, trying to uncover what she missed. She had followed the current policy for recording postoperative vital signs, checked on the patient more frequently than

Figure 1: Serious narcotic oversedation at Fairview Southdale Hospital through April 2001

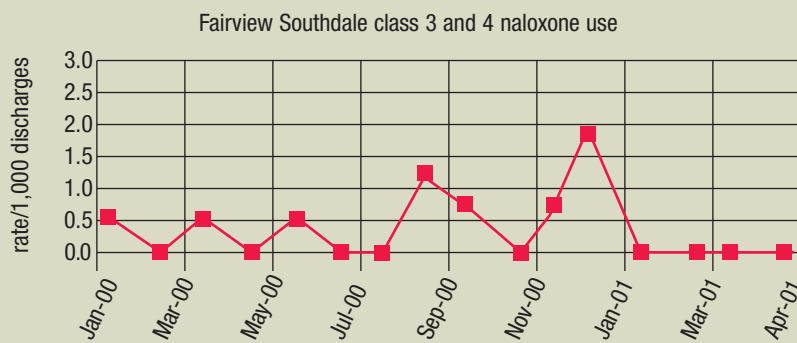
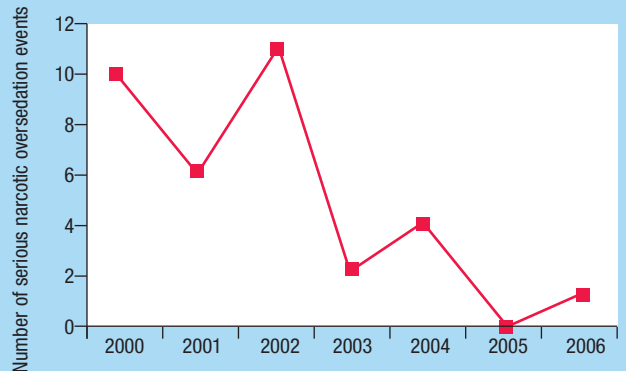


Table 2: Changes tested and implemented in 2000 and 2001

Location	Patient assessment and monitoring	Individualization of therapy	Communication
Operating Room	<ul style="list-style-type: none"> ◆ Highlight history of snoring and sleep apnea as part of history 	<ul style="list-style-type: none"> ◆ Eliminate or reduce morphine dose at end of case ◆ Reduce intraoperative doses of fentanyl ◆ Increase use of regional anesthesia ◆ Increase use of ketorolac 	<ul style="list-style-type: none"> ◆ Communicate with PACU staff any sleep apnea history ◆ Communicate with PACU staff any intraoperative use of naloxone ◆ Reorganized structure of anesthesia department ◆ Clarify accountabilities between nurse anesthetists and anesthesiologists ◆ Standardize anesthesia practice
Recovery Room	<ul style="list-style-type: none"> ◆ Change discharge guidelines to ensure patient is stable upon transfer ◆ Eliminate use of oxygen for comfort care ◆ Hold patients for at least 30 minutes following narcotic dose ◆ Hold patients for at least 30 additional minutes if naloxone administered in OR or PACU 	<ul style="list-style-type: none"> ◆ Lower doses of morphine used ◆ Remove morphine syringes of > 4 mg from floor stock ◆ Wait to start PCA until patient is on the floor for patients who aren't alert enough to safely self-manage 	<ul style="list-style-type: none"> ◆ Revise communication upon transfer to postoperative floor ◆ Adopt a single set of PACU pain orders ◆ Revise epidural analgesic orders ◆ Standardize volume of epidural analgesic bags dispensed by the pharmacy
Postoperative Floor	<ul style="list-style-type: none"> ◆ Vital signs monitoring schedule modified ◆ Test continuous pulse oximetry ◆ Establish new vital signs flow sheet ◆ Educate nurses against using narcotics to treat anxiety 	<ul style="list-style-type: none"> ◆ Modify pain orders to reduce maximum dose of morphine ◆ Modify PCA orders to discourage basal rate ◆ Modify PCA orders to include a 1-hour limit ◆ Modify pain orders to treat respirations ≤ 8 from < 8 ◆ Remove morphine syringes of > 2 mg from floor stock 	<ul style="list-style-type: none"> ◆ Report all naloxone usage to house physician ◆ Reemphasize that oxygen is to be administered only upon a physician's order ◆ Improve preoperative education to manage patient's expectations ◆ Have nurses carry phones to enable 1:1 report from PACU staff

Figure 2: Serious narcotic oversedation at Fairview Southdale Hospital through December 2006



hospital policy required, and administered no more than 4 to 6 mg of I.V. morphine at a time, actually less than what was ordered. The autopsy found nothing that would have contributed to the patient's death.

Organizational response

This tragic case triggered a chart review of all patients who had received naloxone over a 2-month period. The review identified 11 patients who had experienced severe respiratory depression that required naloxone to reverse the oversedation. A multidisciplinary group was chartered in April 2000 to investigate the reasons for respiratory oversedation, create an action plan to correct any contributing factors, and ultimately decrease the incidence of severe narcotic oversedation by 75%. The group consisted of nurses from the surgical unit and postanesthesia care unit (PACU), pharmacists, a house physician, anesthesiologists, respiratory therapists, and a member of the clinical quality department, who served as the group's facilitator. The group was led by a clinical nurse specialist and sponsored by the vice president for medical affairs.

The group's first task was to explore possible root causes of oversedation. Members completed a flow-chart of the surgical process, starting with patient arrival to the operating room and ending with patient discharge. Several members felt there was only one primary cause of oversedation—and it occurred after the patient arrived on the surgical unit. Some members were concerned with only their department's actions and missed seeing the whole picture of the patient's surgical experience.

The flowchart helped change their parochial thinking by highlighting times during the surgical process when the processes weren't clear and errors could occur. The flowchart also demonstrated the interdependence between the OR, PACU, and surgical unit, and how an action upstream in the surgical process could impact patient outcomes later in the process.

The group measured progress by reviewing all instances when a patient required naloxone to reverse respiratory sedation, and classified the severity of oversedation. No severity scale was found during a literature review, so the group developed one (Table 1). The measure of progress was the rate of class 3 and 4 events tracked monthly. Later, these rates were annualized and reframed as the number of discharges for every severe episode of oversedation.

Over the next 12 months the group tested and implemented 34 changes (Table 2). By April 2001 the group concluded that it had achieved its goal, so it disbanded (Figure 1). However, later in 2001 the rate of severe

The flowchart demonstrated how an action upstream in the surgical process could impact patient outcomes later in the process.

narcotic-induced oversedation increased, returning to the same rate as before interventions. The group was reconvened with a goal of once again reducing severe oversedation by 75%. A pain management team, consisting of a 0.8 full-time equivalent (FTE) clinical nurse specialist and a 0.5 FTE clinical pharmacist specialist, was also piloted at this time. This team reviewed the care of all postoperative patients, offered consultation to nurses and physicians, performed extensive staff education, reviewed every case when a patient

received naloxone, and implemented 23 additional changes (Table 3).

Results since late 2002 have been dramatic. From 2000 through 2002, Fairview Southdale Hospital, a 350-bed community hospital in Minneapolis, Minn., averaged nine class 3 and 4 events per year. This decreased to 1.7 events per year from

Since 2004, the annual number of serious narcotic oversedation cases at Fairview has fallen from 25 to 10, a 60% reduction.

2003 through 2006: a reduction of 81.1% (Figure 2).

These results convinced Fairview Health Services to set a goal for its seven-hospital system to reduce its rate of serious narcotic oversedation by 75%. The corporate director of clinical pharmacy services was assigned to lead this spread effort. In 2004 a system-wide Pain Committee was established as a subcommittee of the Fairview Formulary and Drug Use Committee. Chaired by a clinical pharmacy pain specialist, this committee is responsible for refinement of tools, the spread of best practices, development of relevant computer deci-

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Table 3: Changes tested and implemented in 2001 and 2002

Focus area changes	Changes
Staff knowledge and critical thinking skills	Skills day programs One-on-one staff education on postoperative units Mandatory I-pump education, epidural Mandatory competency package Pharmacy pain management training Posters and wallet cards Modify post-op pain and epidural orders
Physician knowledge	Grand rounds Pain education at specific clinics Revised post-op pain orders Letters sent to all physicians Posters and wallet cards Pain management team available for consults Education at specified medical department meetings
Documentation, sedation assessment, and pain assessment	New policies for pain assessment New frequent vital sign form One-on-one staff education Nurse competency for pain management implemented
Miscommunication	Pain team assesses all patients on postoperative units Surgical nurse has direct phone access for PACU staff PACU and unit staff meet to discuss communication processes Modify post-op pain orders and epidural orders Prepackage hydromorphone syringes

sion support, and other aspects of safe narcotic use. (See Table 4 for a list of actions taken at a system level.)

Campaign participation

Since 2004, the annual number of serious narcotic oversedation cases at Fairview has fallen from 25 to 10, a 60% reduction. By continuing to focus on reducing narcotic oversedation, Fairview is actively contributing to the 5 Million Lives Campaign, created by the Institute for Healthcare Improvement (IHI). According to the IHI, 58% of medication injuries are due to high-alert medications. The four high-alert medications most responsible for injuries are anticoagulants, sedatives,

narcotics, and insulin. The general principles for reducing harm from high-alert medications are prevention, identification, and mitigation.¹

The majority of Fairview's actions in reducing severe oversedation follow the above principles. Interventions range from using standard order sets for certain pain medications to taking practical precautions to prevent potential errors in dispensing and administration. For

Pharmacists repackage hydromorphone from 2-mL syringes into 0.2 mg.

example, the facility's pharmacists repackage hydromorphone, I.V. pain medication, from 2-mL syringes into 0.2 mg, the usual dosage.²

From tragedy to teaching

Fairview Southdale Hospital supported the surgical RN who provided care to the deceased patient. The nurse wasn't fired and didn't lose her license. She took an active role in redesigning the policies for the care of postoperative patients. The postoperative documentation now includes areas to chart a patient's pain and sedation level, and respiratory rate, depth, and quality—regardless of the route of the narcotic. Postoperative pain orders list recommended dose ranges for I.V. narcotics, and physicians are contacted when narcotics

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Table 4: System-wide actions since 2004

- ◆ Range order policy
- ◆ Standardized PCA orders
- ◆ Renal dosing and drug selection
- ◆ Override restrictions
- ◆ Standardized system-wide measurement plan
- ◆ Standardized documentation on e-MAR and flow sheets
- ◆ Standardized pain assessment scales
- ◆ Extensive education
- ◆ Switch meperidine to hydromorphone
- ◆ Guidelines for procedural sedation
- ◆ Simplify selections of epidural infusions

are ordered in unusually high doses.

Nurses at the facility receive this case study as a learning tool. The nurse involved often retells this patient's story, urging her peers to question high narcotic doses and thoroughly document patients' responses. She shares her experience in the pursuit of safe patient care and reduction of harm from high-alert medications. **NM**

REFERENCES

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2. Institute for Healthcare Improvement. High-alert medications require heightened vigilance. Available at: <http://www.ihl.org/IHI/Topics/PatientSafety/MedicationSystems/ImprovementStories/FSHighAlertMedsHeightenedVigilance.htm>. Accessed May 18, 2007.

ABOUT THE AUTHORS

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ABOUT THE IHI

Founded in 1991 and based in Cambridge, Mass., the Institute for Healthcare Improvement (IHI) is a not-for-profit organization leading the improvement of healthcare throughout the world. The IHI is a catalyst for change, cultivating innovative concepts for improving patient care and implementing programs for putting these ideas into action. The 5 Million Lives Campaign is a nationwide initiative of the IHI to radically reduce incidents of medical harm in U.S. hospitals. The 5 Million Lives Campaign asks hospitals to improve more rapidly than before the care they provide to protect patients from 5 million incidents of medical harm over a 24-month period, ending December 9, 2008. To learn more about this effort, visit the IHI at <http://www.ihl.org>.

ABOUT THIS SERIES

This series examines the IHI's suggested 5 Million Lives Campaign interventions from a managerial perspective. The series continues next month with a discussion of lowering patient risk from MRSA. The journal will explore the remaining interventions in subsequent months.