



Medication Errors: When Pharmacy Is Closed

Michael J. Gaunt, PharmD
Senior Patient Safety Analyst
Pennsylvania Patient Safety Authority

ABSTRACT

When pharmaceutical services are not available, the medication-use process can be more vulnerable to errors. Between June 2004 and September 2010, Pennsylvania hospitals submitted to the Pennsylvania Patient Safety Authority 519 medication error reports that implied an event occurred while the pharmacy department was closed. The most common types of medication errors reported included wrong-drug events, drug omissions, and prescription or refill delays. The predominant medications associated with these reports were warfarin sodium, hydration solutions, insulin, guaifENesin, and vancomycin. The incorrect drug was retrieved from an automated dispensing cabinet or night cabinet in 82.3% (n = 130) of wrong-drug events. In 28.7% (n = 43) of drug omission events, the medication was not available to the nurse to administer, leading to an omission. Strategies to prevent errors when the pharmacy is closed include providing access to a limited supply of medications to be used for urgent medication orders, standardizing processes for accessing medications when the pharmacy is closed to reduce variability and opportunity for error, and establishing a forcing function error reduction strategy to make the allergy "reaction" selection a mandatory entry in the organization's order entry systems for prescribers and pharmacists. (Pa Patient Saf Advis 2012 Mar;9[1]:11-7.)

INTRODUCTION

Pharmacists play a vital role in ensuring safe and effective medication use by reviewing medication orders before patients receive the prescribed therapy. However, because of the limited hours of pharmaceutical services in some hospitals, not all medication orders are prospectively reviewed by a pharmacist. For all U.S. hospitals, inpatient pharmaceutical services are provided an average of 112 hours per week (Monday through Sunday), or 16 hours per day, with smaller hospitals and health systems having fewer service hours per week than larger hospitals.¹ An estimated 41.2% of hospitals provide 24-hour inpatient pharmaceutical services. This also varies significantly by staffed-bed size, with larger hospitals more likely to provide 24-hour inpatient pharmaceutical services. For example, only 8.8% of hospitals with fewer than 50 staffed beds provide 24-hour inpatient pharmaceutical services, whereas 98.4% of hospitals with 600 or more staffed beds provide 24-hour inpatient pharmaceutical services.

The use of remote order entry and review technology that provides pharmacists with real-time access to a patient's medication profile, medical history, and other key patient information can provide hospitals with access to a pharmacist 24 hours a day. A 2008 survey of U.S. hospitals found that 20.7% of the hospital pharmacies that were not open 24 hours a day used an off-site pharmacist when the pharmacy was closed.² The most frequent providers of remote order entry were affiliated hospitals (46.5%) or a regional or national company (36.8%). The other hospitals (16.7%) using off-site pharmacist review of orders had on-call pharmacists for this activity.

Provision of on-site 24-hour pharmaceutical services contributes to a more secure drug storage and distribution system. It also reduces the need for night cabinets, non-pharmacist access to the pharmacy, and access to medications stored in automated dispensing cabinets (ADCs) without prior order review by a pharmacist. When the pharmacy is closed, a well-organized drug storage system can safeguard access to medications and thereby reduce the risk of medication errors or minimize adverse outcomes should an error occur.^{3,4} Without safeguards in place, medication errors can occur, some with tragic outcomes,⁵ especially if non-pharmacists have complete access to the pharmacy after hours.

During case-by-case analysis of events reported by Pennsylvania healthcare facilities to the Pennsylvania Patient Safety Authority, analysts found a number of medication errors that were occurring when the pharmacy department was closed. Some of these events, such as patients receiving a medication to which they have a documented allergy, are typically intercepted when the pharmacy department is open. This article includes examination of medication errors reported to the Authority that occurred after the pharmacy department was closed. Factors that contributed to the events are delineated where possible. Strategies to reduce the risk of error are discussed.

METHODOLOGY

In order to categorize and retrieve reports in which reporters implied that an event occurred while the pharmacy department was closed, Authority analysts created the standardized monitor code "24h" that can be entered into the program database during case-by-case analysis. This monitor code and the phrases "pharmacy closed," "night closet," and "after pharmacy hours" were used to query the data to identify reports, trends, contributing factors, and risk reduction strategies.



AGGREGATE ANALYSIS

From events reported from June 2004 through September 2010, analysts identified 519 medication error events that occurred when the pharmacy was closed. A breakdown of these events by harm score, which is adapted from the National Coordinating Council for Medication Error Reporting and Prevention's harm index,⁶ shows that nearly 87% (n = 450) of the events reached the patient (harm index = C to I). Only two (0.4%) of the events resulted in harm significant enough to require additional treatment.

The two most common medication error types identified through event analysis, specifically from the event description, represented 308 (59.3%) of the 519 reports, with the most commonly represented event type being wrong-drug events (30.4%, n = 158) (see Table 1). Drug omission reports represented the second-largest category of event types (28.9%, n = 150).

Table 2 lists the top 10 medications involved in events that occurred after the pharmacy was closed. Four high-alert medications, drugs that bear a heightened risk of causing significant patient harm when used in error,^{7,8} appear in the top 10. The anticoagulant warfarin sodium, a high-alert medication, was the most frequently reported medication (4.4%, n = 23). Even though only one anti-infective agent, vancomycin, appears in the first five of the listed medications, anti-infective agents as a class were most frequently involved in events (23.3%, n = 121). Other classes of medications cited in reports include cardiovascular (8.1%, n = 42), analgesic (7.1%, n = 37), anticoagulant (5.2%, n = 27), and electrolytes (5.2%, n = 27).

When analyzing the reports, analysts questioned whether or not it was necessary for the medications involved in the events to be ordered and administered when the pharmacy was closed (i.e., were they critical medications that required immediate administration?). The lack of clinical and patient details in the reports prevents

definitive determination for each and every medication. However, based upon the type of medications involved (e.g., antileptic agents, vaccines, bisphosphonates), it is unlikely they were all critical.

Analysis of the event descriptions revealed that 60.3% (n = 313) of events originated in the administration phase, or node, of the medication-use process (see Table 3). Nearly 12% (n = 62) of reports did not include sufficient information in the event description to determine in which node the event originated.

FOCUSED EVENT ANALYSIS

Wrong-Drug Events

Analysts identified wrong-drug events as the most frequently reported (30.4%, n = 158) medication error occurring after the pharmacy had closed. The top five medications involved in wrong-drug events included products containing guaiFENesin (10.1%, n = 16), hydration solutions (8.9%, n = 14), insulin (7%, n = 11), carbidopa/levodopa (3.8%, n = 6), and ampicillin sodium/sulbactam sodium (3.2%, n = 5).

Table 1. Top Five Medication Error Event Types (430 of 519) from June 2004 through September 2010

EVENT TYPE	NUMBER	% OF TOTAL EVENTS (N = 519)
Wrong drug	158	30.4%
Drug omission	150	28.9
Prescription/refill delay	57	11.0
Wrong dose/underdosage	35	6.7
Extra dose	30	5.8

Table 2. Top 10 Medications Involved in Events That Occurred After the Pharmacy Was Closed (166 of 519) from June 2004 through September 2010

RANK	MEDICATION NAME	NUMBER	% OF TOTAL EVENTS (N = 519)
1	Warfarin sodium*	23	4.4%
2	Hydration solution	20	3.9
3	Insulin*	19	3.7
4	GuaiFENesin	18	3.5
	Vancomycin hydrochloride	18	3.5
6	Potassium chloride*	14	2.7
7	CefTRIAXone sodium	9	1.7
	MethylPREDNISolone	9	1.7
9	CeFAZolin sodium	8	1.5
10	Carbidopa/levodopa	7	1.4
	Levofloxacin	7	1.4
	Metoprolol	7	1.4
	Morphine sulfate*	7	1.4

* A high-alert medication

Night cabinets and ADCs provide nurses with access to essential medications during off-hours in hospitals where 24-hour pharmaceutical services are not available. This access helps reduce the risk of drug omissions and delays but provides more opportunity for errors. The incorrect drug was retrieved from an ADC or night cabinet in 82.3% (n = 130) of wrong-drug events. Insufficient information was provided to determine if storage or how the drug names were listed on ADC screens contributed to the mix-ups. However, it has been noted previously in the *Pennsylvania Patient Safety Advisory* that the accessibility and variety of medications available, as well as a potential lack of an independent double check of the original order to the obtained medication, contribute to medication errors.³

In an event published by the Institute for Safe Medication Practices, a physician ordered ampicillin 200 mg and gentamicin 5 mg intravenous (IV) push for a premature baby girl.⁹ The nurse misheard the second antibiotic order as gentamicin 500 mg. Because the pharmacy had closed for the night, a nursing supervisor obtained seven vials of an adult concentration of gentamicin (80 mg/2 mL vials) from a night cabinet. The pediatric concentration (20 mg/2 mL vials) also was available in the same night cabinet, but the nursing supervisor did not notice it. She brought the gentamicin to the patient care unit where one nurse drew up 12.5 mL of medication from the seven vials, and another nurse gave the medication IV

push to the infant. The infant's gentamicin level rose to 590 mcg/mL but declined steadily over the next several days. Her renal function continued to be normal and the child survived.

An unsafe practice with the use of ADCs is the use of overrides, which bypass safety features, including pharmacy verification, in favor of gaining access to the medication.¹⁰ Slightly more than 8% (n = 13) of wrong-drug event reports indicated the nurse retrieved a medication from an ADC using the override function.

Forty-three wrong-drug events (27.2%) involved drug products available in different combination products or modified-release formulations that carry the same name with different modifiers or suffixes. Forty-one of these 43 events reached the patient. Products containing the expectorant guaiFENesin (25.6%, n = 11) were the most frequently involved agents in errors involving drug products available in different combination products or modified-release formulations. GuaiFENesin is available as a single-ingredient product and in various combination products. Practitioners often refer to these products using actual and contrived names such as guaiFENesin, guaiFENesin DM (guaiFENesin and dextromethorphan), guaiFENesin AC (guaiFENesin with codeine), and guaiFENesin DAC (guaiFENesin, pseudoephedrine, and codeine), relying on the different suffixes to differentiate the products. However, this type of nomenclature is often confusing

and contributes to medication errors.¹¹ For example, see the following:

A patient was ordered Robitussin® after the pharmacy was closed. The registered nurse supervisor removed Robitussin AC from the Pyxis. The patient received Robitussin AC. The error was not caught until more than 24 hours later. The patient suffered no adverse effects . . .

The wrong insulin product was retrieved in 7% (n = 11) of wrong-drug events. Roughly 90% (n = 10) of wrong-insulin events involved products with suffixes as part of the drug name (e.g., HumaLOG® Mix 75/25™, NovoLIN® R, NovoLIN 70/30, NovoLOG® Mix 70/30). Other medications with names that have suffixes were also cited in medication error reports. Examples of these include the following:

- Depakote® and Depakote ER
- Effexor® and Effexor XR®
- Sinemet® and Sinemet CR
- Vicodin® and Vicodin ES®

Similarly, look-alike names contributed to wrong-drug events in roughly 5% (n = 8) of reports. These events involved name pairs with look-alike names such as quinIDine and quinINE; Solu-Cortef® and Solu-Medrol®; and cefuroxime and cefTRI-AXone. All of these events reached the patient. For example, see the following:

A patient was ordered quinine sulfate and needed the dose after the pharmacy had closed. The nursing supervisor retrieved quinidine sulfate from the night stock for the patient, and the patient's nurse then administered the wrong medication.

Table 3. Node in Which the Event Originated (457 of 519) from June 2004 through September 2010

EVENT TYPE	NUMBER	% OF TOTAL EVENTS (N = 519)
Administration	313	60.3%
Dispensing	63	12.1
Transcription	50	9.6
Prescribing	31	6.0

Drug Omission Events

Analysts identified drug omission events as the second-most frequently reported (28.9%, n = 150) medication error occurring after the pharmacy had closed. The drug classes most frequently mentioned in drug omission reports included anti-infectives (26%, n = 39), anticoagulants (8.7%,



n = 13), gastrointestinal agents (7.3%, n = 11), and electrolytes (6%, n = 9). High-alert medications⁷ represented 21.3% (n = 32) of all reported drug omissions; warfarin (7.3%, n = 11), HYDROMorphone (2%, n = 3), and insulin (2%, n = 3) were 3 of the top 10 individual drugs involved in drug omissions.

Overall, little detail was reported in the event descriptions as to what factor(s) contributed to the drug omission. In 28.7% (n = 43) of the reports, the medication was not available to the nurse to administer. Some reports simply noted “not available” for the reason why the medications were not available, and other responses included reasons such as the nurse being unable to locate the medication and the pharmacy not delivering the medication before it closed.

A breakdown in the transcription process was noted in 16.7% (n = 25) of the drug omission reports. In 19 of these reports, transcription did not take place after the original order was written or when copying from an old medication administration record (MAR) to a new MAR. Analysts were unable to determine why these breakdowns occurred.

Analysis of reported event descriptions revealed that some staff failed to follow after-hours procedures in 14.7% (n = 22) of the reports. For example, in 6% (n = 9) of the reports, nursing staff did not call or attempt to call the on-call pharmacist for assistance. This prevented the pharmacist from assisting in locating the appropriate drug or traveling on-site to prepare the necessary medications (e.g., morphine syringe for patient-controlled analgesia [PCA] pump). Even on-site resources were not accessed by nursing staff; in 4.7% (n = 7) of reports, the staff nurse did not contact the nurse supervisor to obtain the medication from a night cabinet or contact the on-call pharmacist. Some examples of failure to follow after-hours procedures reported to the Authority include the following:

Vancomycin protocol was ordered after pharmacy hours. Protocol states

that the pharmacist is to be called for initiation of protocol. The nurse did not follow procedure.

A patient was ordered morphine PCA after the pharmacy closed. The nurse should have notified the supervisor to call the on-call pharmacist to compound the drug.

Prescription or Refill Delay Events

Analysts identified prescription or refill delays as the third-most frequently reported (11%, n = 57) type of medication event occurring after the pharmacy had closed. Similar to drug omissions, anti-infective agents (21%, n = 12) were more often involved in these events as any other class of drug. The high-alert medications insulin (5.3%, n = 3), fentaNYL (3.5%, n = 2), and warfarin (3.5%, n = 2) were among the top individual medications involved in delays.

The primary contributing factor to these events, like that for drug omissions, was the unavailability of the prescribed medication (17.5%, n = 10). For example, see the following report:

Nursing needed Demerol® PCA during 11 p.m. to 7 a.m. shift when pharmacy is closed. The night cabinet was not properly stocked, so the pharmacist had to be called in.

Prescribing Events

One key service that the pharmacy provides is prospective medication order review. One aspect of order review is checking the patient’s medication and laboratory profile for wrong doses, documented allergies, and potentially serious interactions. When pharmaceutical services are not available, either on-site or by means of remote pharmaceutical services, vulnerability is introduced into the medication-use system that can allow prescribing errors to reach patients more easily.

Analysts examined events for those that originated in the prescribing node.

Thirty-two events were identified. More than 62% (n = 20) involved a patient that was prescribed a medication to which he or she had a documented allergy. Only one documented allergy was caught before reaching the patient; 95% (n = 19) of events reached the patient, with one requiring additional treatment. Examples reported to the Authority include the following:

Order [was placed] for cefepime 1 gram. First dose was not checked by pharmacist due to pharmacy [being] closed on nights. [Staff] used another patient’s dose. . . . The patient developed a rash because he is also allergic to Rocephin®, which is also a cephalosporin.

This patient is allergic to Cipro®. This patient was ordered Levaquin®, which is contraindicated in patients allergic to Cipro. The medication was removed from the night room by the nursing supervisor while the pharmacy was closed.

Anti-infective agents, including levofloxacin, cephalexin, and azithromycin, were involved in over half (n = 11) of the documented allergy events. Celecoxib, ketorolac, and other analgesics accounted for another 20% (n = 5) of these events.

RISK REDUCTION STRATEGIES

Healthcare facilities can strive to identify systems-based causes of the medication errors that take place when on-site pharmacy services are not available and implement effective risk reduction strategies to prevent harm to patients. Although many of the reports submitted to the Authority did not explicitly reveal all of the causes and contributing factors, healthcare facilities may consider the strategies described below, which are based on a review of events reported to the Authority, observations from the Institute for Safe Medication Practices, and recommendations in the literature.

Pharmaceutical Services

- Explore the possibility of establishing on-site 24-hour pharmaceutical services. Health-system pharmacies have an obligation to review medication orders for appropriateness and safety. Accrediting organizations, such as the Joint Commission, recognize this responsibility and require prospective review of medication orders except in certain situations.¹²
- If establishment of on-site 24-hour pharmaceutical services is not possible, investigate the concept of remote, or off-site, pharmacy order entry services.^{13,14,15} These types of services allows for pharmacist review of medication orders when the pharmacy may be closed at night or on the weekends. The after-hours coverage is often provided by an affiliated hospital, another hospital, or a regional or national company.²
- Each morning, pharmacy staff should reconcile all medications removed from ADCs and night cabinets while pharmacy was closed by comparing what was removed against the prescribers' orders.¹⁶

Medication Access and Storage

- Provide access to a *limited* supply (e.g., types of medications, quantities, dosage forms, container sizes) of medications to be used for urgent medication orders.¹⁷ Carefully select the drugs stocked according to staff expertise and the typical patient population in each patient care area.¹⁸
- Ensure that drugs stocked in patient care areas and night cabinets are in ready-to-administer, unit-of-use forms (i.e., not stored in bulk containers).^{3,18}
- Determine those medications for which administration after pharmacy hours is not critical. Create a protocol to guide practitioners to identify non-critical medications so that they limit unnecessary distractions and better focus on those medications

that require retrieval and administration while pharmacy is closed.

- Separate and segregate products using bins and dividers to improve safe drug storage.³ For ADCs, convert matrix drawers to drawers with locking lids. For look-alike products, consider purchasing one product of an identified look-alike pair from a different vendor or clearly differentiating the products.¹⁹
- Store essential neonatal or pediatric medications away from adult medications, including in night cabinets, when 24-hour pharmacy service is not available.⁹
- Standardize processes for accessing medications when the pharmacy is closed to reduce variability and opportunity for error.
- Develop protocols or checklists to guide the practitioner as to when a supervisor or pharmacist should be contacted to assist in medication retrieval and preparation. Regularly review the after-hours procedures with staff.
- Limit overrides to urgent situations when a delay in therapy would harm the patient.^{10,18,20}
- Incorporate an independent double check by another practitioner at vulnerable points of the after-hours medication-use system.¹⁶ This would include when retrieving a medication from a night cabinet or via an override, as well as transcribing medication orders after pharmacy hours.
- Develop a check system to help ensure accurate cabinet stocking.¹⁰ Another staff member from the pharmacy or a nurse on the unit can verify accurate stocking by having the pharmacy provide a daily list of items added to the cabinet. Employing barcode technology during the stocking process can also help ensure accuracy.
- Require periodic review by a pharmacist or pharmacy technician of storage areas throughout the organization.³

- Regularly analyze ADC override reports, requests for missing or unavailable medications, and other sources of data (e.g., voluntary error reports, administration of rescue drugs) to identify problems.^{18,20} Discuss findings with pharmacy and nursing staff to identify potential risk reduction strategies.
- Use auxiliary labels to differentiate products with look-alike names or drug name suffixes in medication storage areas.
- Standardize the manner in which drug names and descriptions are displayed to nurses, including in computer systems, ADCs, and typed lists.

Allergy Information

- Establish a forcing function error reduction strategy, a technique that eliminates or reduces the possibility of a medication error by guiding the practitioner to take the correct action while making it impossible to do the wrong thing.^{21,22} Make the allergy “reaction” selection a mandatory entry in the organization’s order entry systems for prescribers and pharmacists.²³
- Test computer systems to ensure complete allergy information crosses interfaces among systems and truncation of information is avoided.
- Standardize locations (e.g., front of medical record, on top of order forms, computer screens, assessment forms) in which practitioners document and retrieve complete allergy information, including descriptions of any reaction.²³ Alert staff to always refer to these areas for reliable information.
- Provide prescribers, nurses, and pharmacists with education and tools on medication allergies.²⁴ Focus education on screening patients for the potential of a reaction, recognition of an allergic reaction, treatment of serious allergic reactions, and



where to access important drug information such as common allergies, cross allergies, and combination drug products that may have implications with common drug allergies.

CONCLUSION

In Pennsylvania, 519 medication errors have been reported to the Authority

NOTES

that imply an event occurred while the pharmacy department was closed. The predominant types of medication errors identified through analysis of the event descriptions are wrong-drug errors, drug omissions, and prescription or refill delay events. Prescribing errors primarily involved the ordering of medications to which the patient was allergic. The primary long-term goal to prevent errors

when the pharmacy is closed is to explore the possibility of establishing on-site 24-hour pharmaceutical services or remote, or off-site, pharmacy order entry services. Regular monitoring of medication retrieval when pharmacy services are unavailable could unveil potential errors. Employment of strategies to safeguard the storage and access of drugs can help prevent errors and harm to patients.

1. Pedersen CA, Schneider PJ, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: monitoring and patient education-2009. *Am J Health Syst Pharm* 2010 Apr 1;67(7):542-58.
2. Pedersen CA, Schneider PJ, Scheckelhoff DJ. ASHP national survey of pharmacy practice in hospital settings: dispensing and administration-2008. *Am J Health Syst Pharm* 2009 May 15;66(10):926-46.
3. Safeguarding the storage of drug products. Pa Patient Saf Advis [online] 2010 Jun [cited 2011 Oct 3]. Available from Internet: [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2010/Jun7\(2\)/Pages/46.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2010/Jun7(2)/Pages/46.aspx).
4. The Joint Commission. Standard MM.05.01.13. In: *Comprehensive accreditation manual for hospitals: the official handbook (CAMH)*. Update 2. Oakbrook Terrace (IL): Joint Commission Resources; 2011 Sep.
5. Institute for Safe Medication Practices. Potassium may no longer be stocked on patient care units, but serious threats still exist! *ISMP Med Saf Alert* 2007 Oct 4;12(20):1-2.
6. National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP). NCC MERP index for categorizing medication errors [online]. 2001 [cited 2009 Sep 15]. Available from Internet: <http://www.nccmerp.org/medErrorCatIndex.html>.
7. Institute for Safe Medication Practices. ISMP 2007 survey on high-alert medications: differences between nursing and pharmacy perspectives still prevalent. *ISMP Med Saf Alert* 2007 May 17;12(10):1-3.
8. Institute for Safe Medication Practices. ISMP's list of high-alert medications [online]. 2011 [cited 2011 Sep 15]. Available from Internet: <http://www.ismp.org/Tools/highAlertMedications.asp>.
9. Institute for Safe Medication Practices. Verbal order spells near disaster. *ISMP Med Saf Alert* 2002 Sep 4;7(18):2.
10. Problems associated with automated dispensing cabinets. PA PSRS Patient Saf Advis [online] 2005 Sep [cited 2011 Oct 3]. Available from Internet: [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2005/sep2\(3\)/Pages/21.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2005/sep2(3)/Pages/21.aspx).
11. Drug name suffix confusion is a common source of errors. PA PSRS Patient Saf Advis [online] 2004 Dec [cited 2011 Oct 3]. Available from Internet: [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2004/dec1\(4\)/Pages/17.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2004/dec1(4)/Pages/17.aspx).
12. The Joint Commission. Standard MM.05.01.01. In: *Comprehensive accreditation manual for hospitals: the official handbook (CAMH)*. Update 2. Oakbrook Terrace (IL): Joint Commission Resources; 2011 Sep.
13. Thompson B, Conrad G, Gum MO, et al. ASHP guidelines on remote medication order processing. *Am J Health Syst Pharm* 2010 Apr 15;67(8):672-7.
14. Levine S. Fourfold increase reported: after-hours nurse overrides boost medication error rates. *Pharm Pract News* 2005 Dec;32:12.
15. Mango MD, Mabe DM. Remote order entry services: providing 24-hour pharmaceutical care for small to medium sized hospitals. *Hosp Pharm* 2011 Sep;46(9):677-79.
16. Grissinger M. Dose confusion with phosphorus-containing products. *P T* 2003 Jul;28(7):432.
17. American Society of Hospital Pharmacists. ASHP guidelines on preventing medication errors in hospitals. *Am J Hosp Pharm*. 1993 Feb;50(2):305-14.
18. Institute for Safe Medication Practices. 2011 ISMP medication safety self assessment for hospitals. [online] 2011 [cited 2011 Oct 10]. Available from Internet: <http://www.ismp.org/selfassessments/Hospital/2011/pdfs.asp>.
19. Drug labeling and packaging—looking beyond what meets the eye. PA PSRS Patient Saf Advis [online] 2007 Sep [cited 2012 Feb 6]. Available from Internet: [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2007/sep4\(3\)/Pages/69b.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2007/sep4(3)/Pages/69b.aspx).
20. Institute for Safe Medication Practices. Guidance on the interdisciplinary safe use of automated dispensing cabinets [online]. 2008 [cited 2011 Oct 10]. Available from Internet: http://www.ismp.org/Tools/guidelines/ADC_Guidelines_Final.pdf.
21. Cohen MR, Smetzer JL, Tuohy NR, et al. High-alert medications: safeguarding against errors. In: Cohen MR, ed. *Medication Errors*, 2nd ed. Washington (DC): American Pharmacists Association; 2007.
22. Kohn LT, Corrigan JM, Donaldson MS. *To err is human: building a safer health system*. Washington (DC): National Academy Press; 2000.
23. Medication errors associated with documented allergies. Pa Patient Saf Advis [online] 2008 Sep [cited 2011 Oct 10]. Available from Internet: [http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2008/Sep5\(3\)/Pages/75.aspx](http://www.patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2008/Sep5(3)/Pages/75.aspx).
24. Institute for Safe Medication Practices. Topical medications and allergic reactions. *ISMP Med Saf Alert* 1996 Jun 5; 1(11):2.

LEARNING OBJECTIVES

- Recognize the most frequently reported medication error types involving medication therapy delivered when the pharmacy is closed.
- Recall contributing factors associated with wrong-drug events that occur after the pharmacy is closed.
- Recognize the most frequently reported high-alert medications involved in errors when the pharmacy is closed.
- Distinguish between effective and ineffective strategies to reduce the risk of medication errors when the pharmacy is closed.

SELF-ASSESSMENT QUESTIONS

The following questions about this article may be useful for internal education and assessment. You may use the following examples or come up with your own questions.

1. Which of the following is the most frequently reported type of medication error involving medication therapy delivered when the pharmacy is closed?
 - a. Drug omission
 - b. Extra dose
 - c. Wrong dose/underdosage
 - d. Wrong drug
 - e. Wrong dose/overdosage
2. *The incorrect drug was retrieved from an automated dispensing cabinet (ADC) or night cabinet in 82.3% of reported wrong-drug events.*

Select the factor *least* likely to contribute to wrong-drug selection from ADCs or night cabinets when the pharmacy is closed.

 - a. Combination drug products that carry the same name with different modifiers
 - b. Lack of a review of the patient's documented allergies
 - c. The volume and variety of medications available
 - d. Use of overrides to gain access to the medication
 - e. Drug names that look alike
3. The predominant high-alert medications involved in medication errors when the pharmacy is closed included all of the following EXCEPT:
 - a. Warfarin sodium
 - b. Morphine sulfate
 - c. Meperidine hydrochloride
 - d. Insulin
 - e. Potassium chloride
4. All but one of the following are effective strategies to reduce the risk of medication errors when the pharmacy is closed. Select the *ineffective* strategy.
 - a. Create a protocol to guide practitioners to identify noncritical medications so that they limit unnecessary distractions and better focus on those medications that require retrieval and administration while the pharmacy is closed.
 - b. Standardize locations in which practitioners document and retrieve complete allergy information, including descriptions of any reaction.
 - c. Develop a check system to help ensure accurate ADC stocking.
 - d. Standardize processes for accessing medications when the pharmacy is closed to reduce variability and opportunity for error.
 - e. If using ADCs, organize stock using matrix drawers.
5. *The patient was ordered quiNINE and needed a dose after the pharmacy department had closed for the day. The patient's nurse asked the nurse supervisor to retrieve the medication from the hospital's night stock. However, the nurse supervisor retrieved quiNIDine. The patient's nurse then administered the incorrect medication to the patient.*

Select the appropriate strategy to help prevent this event from reoccurring.

 - a. Use auxiliary labels to differentiate products with look-alike names or drug name suffixes in medication storage areas.
 - b. Store essential neonatal or pediatric medications away from adult medications, including in night cabinets, when 24-hour pharmacy service is not available.
 - c. Ensure that drugs stocked in patient care areas and night cabinets are in ready-to-administer, unit-of-use forms.
 - d. Develop protocols or checklists to guide the practitioner as to when a supervisor or pharmacist should be contacted to assist in medication retrieval and preparation.
 - e. Limit overrides to urgent situations when a delay in therapy would harm the patient.

PENNSYLVANIA PATIENT SAFETY ADVISORY

This article is reprinted from the Pennsylvania Patient Safety Advisory, Vol. 9, No. 1—March 2012. The Advisory is a publication of the Pennsylvania Patient Safety Authority, produced by ECRI Institute and ISMP under contract to the Authority. Copyright 2012 by the Pennsylvania Patient Safety Authority. This publication may be reprinted and distributed without restriction, provided it is printed or distributed in its entirety and without alteration. Individual articles may be reprinted in their entirety and without alteration provided the source is clearly attributed.

This publication is disseminated via e-mail. To subscribe, go to <http://visitor.constantcontact.com/d.jsp?m=1103390819542&p=oi>.

To see other articles or issues of the Advisory, visit our website at <http://www.patientsafetyauthority.org>. Click on “Patient Safety Advisories” in the left-hand menu bar.

THE PENNSYLVANIA PATIENT SAFETY AUTHORITY AND ITS CONTRACTORS



The Pennsylvania Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error (“Mcare”) Act. Consistent with Act 13, ECRI Institute, as contractor for the Authority, is issuing this publication to advise medical facilities of immediate changes that can be instituted to reduce Serious Events and Incidents. For more information about the Pennsylvania Patient Safety Authority, see the Authority’s website at <http://www.patientsafetyauthority.org>.



ECRI Institute, a nonprofit organization, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for more than 40 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research. More than 5,000 healthcare organizations worldwide rely on ECRI Institute’s expertise in patient safety improvement, risk and quality management, and healthcare processes, devices, procedures and drug technology.



The Institute for Safe Medication Practices (ISMP) is an independent, nonprofit organization dedicated solely to medication error prevention and safe medication use. ISMP provides recommendations for the safe use of medications to the healthcare community including healthcare professionals, government agencies, accrediting organizations, and consumers. ISMP’s efforts are built on a nonpunitive approach and systems-based solutions.



Scan this code with your mobile device’s QR reader to subscribe to receive the Advisory for free.