

Determining the most efficient controlled substance inventory practice that minimizes discrepancies and maximizes security

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Summary

Increased patient acuity and decreased staffing and reimbursement are driving hospital administrators to seek systems that save time while still safeguarding against medication errors and diversion by their employees. The latest advances in automated dispensing cabinet (ADC) technology provide facilities with tools that minimize time spent documenting and inventorying controlled substances, but still maximize safety. This study investigated the efficiency and safety advantages of storing only those controlled substances frequently used, using optimal drawer configurations, only inventorying controlled substances recently accessed, counting weekly and using the blind count method.

Challenges

Diversion potential: While monitoring the proper use of all medications is important, monitoring controlled substances is one of the highest priorities. Statistics have shown an increased awareness and prevalence of controlled substance diversion. Data from the National Drug Intelligence Center shows that the estimated number of diverted controlled pharmaceutical drugs analyzed by state and local laboratories nationwide increased for most of the commonly diverted and abused prescription opioid pain relievers and benzodiazepines from 2003 through 2007. The highest percentage increases were for the prescription opioid pain relievers hydrocodone (118%), morphine (111%) and methadone (109%).¹ Results from the 2008 National Survey on



Drug Use and Health, conducted by the Substance Abuse and Mental Health Services Administration, estimated that 8% of the population aged 12 years old or older used an illicit drug during the month prior to the survey interview.²

Hospitals can be a source of these drugs. Detection of individuals diverting controlled substances in hospitals was reported as 1.12 diverters per 100 beds per year in a study by Crowson and Monk-Tutor.³ The storage and handling of controlled substances is closely regulated by many different agencies and governing bodies such as the DEA, the Joint Commission and state boards of Pharmacy and Nursing. Failure to abide by the regulations set forth by these entities can lead to fines, loss of accreditation and/or loss of license.

Nursing time: Counting controlled substances stored in ADCs is a time-consuming process depending on the number of medications stored in the cabinets, the type of drawers the medications are stored in, the frequency of counting the medications and the number of discrepancies. Counting controlled substances in ADCs typically requires two individuals to ensure accountability.

Adequate secure storage: The increasing number of controlled substances on the market, the packaging sizes and the need for refrigeration of some controlled substances present challenges for secure storage in ADCs. Adequate space and appropriate security is needed. A 355-bed hospital reviewed for this study stocked 32 line items of controlled substances in their med/surg unit in June 2004. The same unit stocked 56 controlled substances (a 75% increase) five years later.

A brief history of automating controlled substance management

Prior to the use of ADCs, controlled substances were stored in locked cabinets or carts on the patient-care units. All controlled substances were available to anyone with the key to the cabinet or cart. Typically, controlled substances had to be manually counted whenever they were removed and also at the change of shift.

Accountability was maintained through the use of single-sheet disposition forms or a hard copy of the perpetual inventory of the controlled substances. Patient billing was also a manual process that required an individual to review the single sheet or hard copy perpetual inventory and enter the charges into the hospital billing system. Monitoring for diversion or trending of usage was difficult at best.

With the introduction of ADCs in the late 1980s the manual process of controlled substance storage and accountability was replaced with automated processes. By 2008, 83% of facilities were using ADCs.⁴ While a manual count was still necessary, all transactions were electronically recorded. This allowed for automatic patient billing. It also resulted in better tracking of controlled substances and therefore better diversion monitoring and trending. Automated dispensing cabinets have evolved to allow for a number of drawer options for single drug access and different methods for counting the controlled substances (e.g., *blind count*, *prompted count*). And now, only users with approved privileges have access to the controlled substances.

Methods

Data was collected from 75 hospitals that dispensed controlled substances via the system, ranging from less than 25-bed critical access hospitals to hospitals with greater than 1000 beds located mostly in the Southeastern U.S. Data was collected from January 2009 to July 2009. In each facility, one general medical surgical (*med/surg*) patient-care area was included in the data collection. To ensure consistency, a standard data collection tool with directions was utilized. Data was collected from the ADC reports and console settings. The Hospital Wide Medication Summary report was used to determine the number of controlled substance line items and the number and type pockets used. The number of controlled substances inventoried was obtained from the Inventory report. This report was also used to calculate the time it took to inventory by using the time the first and last item was inventoried.

The Meds Without Removal reports for one day and seven days were used to calculate time saved by nurses in the event only accessed (*any transaction other than inventory*) controlled substances are inventoried. The Meds Without Removal report for 90 days was used to calculate time saved by nurses if unused controlled substances were to be removed from the ADC.

The Discrepancy report was run for the last 30 days for closed controlled substance discrepancies to determine the number of discrepancies and true discrepancies. A true discrepancy was defined as a discrepancy where the controlled substance was actually under or over the expected amount. A discrepancy due to an inaccurate count by the prior user that was corrected by the discovering user was not counted as a true discrepancy (e.g., *if an expected count of seven found five, and the next transaction found seven but expected five, this is not a true discrepancy*). Frequency of inventorying controlled substances was gathered through interviews with the automation system managers.

Results

The typical med/surg ADC stored 58 different controlled substances in 66 pockets. There were minimal differences in this average among small, medium and large hospitals (Table 1). The average time to inventory a controlled substance was 13.2 seconds when blind count was used and 10.2 seconds when verify count was used. Blind count was used by 86% ($n = 65$) of the hospitals to count controlled substances. Only 14% ($n = 10$) used verify count. The study revealed that an average of 10.9 controlled substances not used in the past 90 days were stored in the ADC. An average of 34.3 controlled substances were not accessed in the past seven days and 47.1 in one day.

Table 1

Number of line items of controlled substances				
Number of beds	Number of hospitals	Average number of controlled substances	Minimum number of controlled substances	Maximum number of controlled substances
1–100	15	57	36	100
101–300	31	57	34	79
300+	29	60	38	89

Policies for the frequency of inventorying controlled substance varied by hospital. In a review of the 75 hospitals, 6.7% required an inventory by shift, 8% daily, 8% two times a week and 66.7% required a weekly inventory. A few hospitals, 9.3% did not require any inventories. The frequency of inventorying controlled substances varied slightly by hospital size (Table 2).

When facilities were asked why they were counting daily or every shift, they responded that there had been a diversion event and that this was the resulting change in policy.

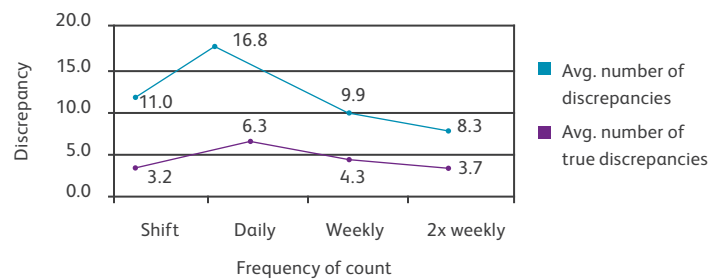
Table 2

Frequency of inventory													
Number of beds	Number of hospitals	Shift		Daily		Twice weekly		Weekly		Monthly		Never	
		n	%	n	%	n	%	n	%	n	%	n	%
1–100	15	0	0%	0	0%	1	7%	10	66%	1	7%	3	20%
101–300	31	1	3%	3	10%	2	6%	22	71%	0	0%	3	10%
300+	29	4	14%	3	10%	3	10%	18	62%	0	0%	1	3%

When comparing the number of total and true discrepancies, again it was found that there was not a difference based on hospital size (Table 3). One factor did influence the number of discrepancies—the frequency of inventory. Hospitals that inventoried daily had a greater number of total discrepancies than hospitals that inventoried weekly. However, the number of true discrepancies stayed similar regardless of the frequency of counting.

The percentage of total minus true discrepancies was higher the more frequently the medications were counted: shift 71%, daily 62.5%, twice weekly 56.6% and weekly 55.5%.

Discrepancies by count frequency (avg. per hospital)



A combined total of 64 controlled substances were stored in nonsecure drawers with other medications in 25 of the hospitals. This did not include refrigerated control substances. Only eight controlled substances among all 75 facilities were stored in a refrigerator. The predominant drawer types for controlled substance storage were CUBIE™ pockets at 55.6%, followed by 27.5% in carousel drawers and 15.5% in MiniDrawers. The majority of hospitals, 76%, inventoried controlled substance by class with 21% inventorying by drawer and 3% by all controlled substances.

Table 3

Number of discrepancies					
Number of beds	Number of hospitals	Average number of controlled substances		Minimum number of controlled substances	
		Total	Avg	Total	Avg
1–100	15	149	9.9	81	5.4
101–300	31	306	10.2	124	4.13
300+	29	282	9.7	116	4.0

Discussion

This study showed that the average combined time for two nurses using blind count to inventory controlled substances on a med/surg unit was 29 minutes. Two factors can decrease the amount of time spent inventorying controlled substances and give nurses more time for direct patient care. The first is for pharmacy to unload controlled substances that have not been used in the last 90 days. This accounted for a small combined average time savings for two nurses of 4.8 minutes; however, eleven hospitals had 20 or more controlled substances that had not been used in 90 days. If pharmacies are not open 24 hours per day, then it is most efficient to unload the infrequently used controlled substances from all but one of the ADMs. This will allow nursing to access the medication when pharmacy is closed, but not to inventory the medication in each patient care area. The second factor is to just inventory controlled substances that have been accessed since the last inventory. Hospitals that require a daily inventory can decrease the time it takes two nurses to complete this inventory by an average of 20.7 minutes when the nurses only count the controlled substances that were accessed since the previous day's inventory. The average nursing time saved in hospitals with a weekly inventory is 15.1 minutes when only controlled substances accessed since the last inventory are counted. Since one of the nurses doing inventory is usually on the off-going shift, the use of access inventory may also potentially decrease overtime.

The intent of the controlled substance inventory is to check for discrepancies; however, the study showed that when an inventory of controlled substances was required too frequently, it could actually create false discrepancies. This may be explained by nurses taking less care to inventory when they have to do it once or twice daily. If verify count is used instead of blind count, users may accept the count on the screen rather than actually counting the medications. This theory was supported by the data that shows facilities took 20% less time

to count when using verify rather than blind count. This is more time than can be explained by typing rather than accepting the quantity.

Two-thirds of the hospitals inventoried controlled substances weekly. They had slightly less true discrepancies than hospitals that inventoried daily. This data suggests that weekly inventories using blind count improve accountability.

A surprising finding was that 64 controlled substances were stored in nonsecured drawers in 33% of the hospitals. Some facilities may not have installed enough secured drawers to accommodate the increasing number of controlled substances introduced to the market or this may be due to inadequate technician education on which medications must be loaded in secure pockets. Some state laws, such as Florida's, specifically state that controlled substances cannot be stored in matrix drawers: 64B16-28.605 (9) Security: A decentralized automated medication system that contains controlled substances shall prohibit simultaneous access to multiple drug entities, drug strengths or dosage forms of controlled substances, unless otherwise contained in labeled patient- specific form.

In addition to legal concerns, improper storage of controlled substances can increase the potential for diversion and medication errors. The relatively few refrigerated controlled substances support the trend to store items such as lorazepam in the ADC at room temperature. A limitation of this study was that data was evaluated only from hospitals using the Pyxis MedStation™ system.

Conclusion

Removing medications that are not frequently used from the ADC will open up valuable space and also make the controlled substance inventory a more efficient process for nursing. Additional time can be saved when nurses only count controlled substances that were accessed since the last inventory. It is recommended that the accessed inventory feature be used three weeks out of every month and that a full inventory of controlled substances be performed once a month. This will ensure that all controlled substances are accounted for on a monthly basis.

Security is increased when blind count is used. Its use assures that controlled substances are actually counted. The number of true discrepancies appears to be similar whether inventory is done weekly or daily. A weekly inventory using blind count saves time, improves accountability and minimizes discrepancies.

In order to allow for controlled substance expansion over the life of the ADCs, extra single-access secured pockets are needed to accommodate newly released controlled substances. Storing controlled substances in secured pockets decreases the potential for diversion.

Appendix

Controlled substance management study data

Study elements	Product/count/frequency	n	%	Data
Number of facilities (<i>range</i>)		75		
Average number of stations (<i>3–116</i>)		33.4		Report
Average number of controlled substance line items per station (<i>34–100</i>)		57.8		Inventory report
Average number of controlled substance pockets per station (<i>36–239</i>)		66		Inventory report
Average number of medications in more than one pocket		8.2	14%	Inventory report
Average pocket mix for controlled substances	Carousel	1311	27.5%	
	MiniDrawers	738	15.5%	
	CUBIE pockets	2651	55.6%	
	Matrix	64	1.3%	
	Refrigerator	8	0.2%	
Count option for controlled substances	Blind count	65	86%	Device/formulary settings
	Prompted count	10	14%	
Frequency of inventorying controlled substances	Shift	5	7%	DOP/Pyxis™ system manager
	Daily	6	8%	
	Twice weekly	6	8%	
	Weekly	50	67%	
	Never	7	9%	
	Monthly	1	1%	
How controlled substances are inventoried	All	2	3%	
	By class	51	76%	
	By drawer	14	21%	
	Last accessed*	0		
Percent of facilities who inventoried medications			90.7%	Inventory transaction report

Study elements	Product/count/frequency	n	%	Data
Average time (<i>minutes</i>) taken to inventory medications	Blind count (<i>2–26 minutes</i>)	13.3		60.6 medications; inventory report end time minus start time
	Prompted count (<i>5–15 minutes</i>)	10.6		62.6 meds
Average time (<i>minutes</i>) to inventory one pocket	Blind count	0.22		
	Prompted count	0.17		
Average number of discrepancies	Blind count (<i>1–36</i>)	11.0		Discrepancy report
	Prompted count (<i>0–5</i>)	2.2		
Average number of true discrepancies	Blind count (<i>0–15</i>)	4.7		Discrepancy report and manually eliminate consecutive transactions that cancel each other out
	Prompted count (<i>0–3</i>)	1.6		
Average number of controlled substances not used in 90 days (<i>0–77</i>) Note: Facility with 77 pockets was single-dose dispensing.		10.9	16.5%	83.3% pockets accessed in 90 days
Average number of controlled substances not used in seven days (<i>15–74</i>)		34.3	52%	48% pockets accessed per week
Average number of controlled substances not used in one day (<i>25–92</i>)		47.1	71.4%	28.6% pockets accessed in 24 hours
Average minutes per station per controlled substances inventory saved inventorying if medications not used in 90 days removed	Blind count	2.40		
	Prompted count	1.85		
Average minutes per station saved per day if using accessed inventory (<i>daily count</i>)	Blind count	10.4		
	Prompted count	8.01		
Average minutes per station saved per week if using accessed (<i>weekly count</i>)	Blind count	7.55		
	Prompted count	5.83		

* Data collected prior to general release of this feature

References

1 National Drug Intelligence Center. National Pharmaceutical Drug Threat Assessment 2009. <http://www.usdoj.gov/ndic/pubs33/33775/33775p.pdf>. Accessed November 30, 2016. 2 Substance Abuse and Mental Health Services Administration. Results from the 2008 National Survey on Drug Use and Health: National Findings. <http://www.oas.samhsa.gov/12k8/12k8nsduh/12k8Results.pdf>. Accessed November 30, 2016. 3 Crowson K, Monk-Tutor M. Use of automated controlled substance cabinets for detection of diversion in U.S. hospitals: a national study. *Hosp Pharm*. 2005;40:977–983. 4 Pederson, CA, Schneider, PJ, Scheckelhoff, DJ. ASHP national survey of pharmacy practice in hospital settings: Dispensing and administration-2008. *Am J Health Syst Pharm*. 2009;66(10):926–946.

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