Benefits of Automation in Medication Delivery: A Community Hospital's Experience

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Personal Introduction and Statement of the Issue

My name is Neil Reed, and it is my pleasure and privilege to testify before you today about the potential of new pharmacy technologies to make patients even safer with regard to their medications.

I hold both a bachelor's of science and a master's degree in my profession, and have worked as a pharmacist since 1983, not only in my current position as director of pharmacy at Eastern Idaho Regional Medical Center in Idaho Falls, but also as a staff hospital pharmacist. I have therefore seen the hospital medication delivery process inside and out, from a variety of different vantage points.

The hospital where I work, Eastern Idaho Regional Medical Center, is a 350 bed community, tertiary hospital and is part of Healthcare Corporation of America (HCA) based in Nashville, Tennessee. We provide primary, trauma, acute and long term care for the residents of Eastern Idaho, Wyoming and Yellowstone National Park.

Our pharmacy department handles between 80,000 and 90,000 drug items each month. That translates to an average of 14 to 16 drug items per patient per day.[1] Those sound like very large numbers - and they are. But that volume isn't unique to our facility. A staggeringly large number of drug items are handled each and every day in hospital pharmacies throughout the United States. - with many steps, people and handoffs along the way before the meds finally reach the patients.

I was asked to speak to you today about the benefits our hospital has seen as a result of automating the way we give medicine to our patients – and we believe those benefits are considerable. But before I do, there's a point which is crucial to your understanding of the issue, and one that I fear may become lost in the recent rhetoric about patient medication errors.

That point is: hospital pharmacies, even those without robots, are already impressively accurate. National statistics show that over 99.9% of all medication ordered by doctors for patients gets there, gets there on time, gets there in the right amount, and gets there to the right patients.

Having said that, it is equally true that hospitals exist for the sake of patients. With the health, safety and well-being of patients at stake, we as hospital professionals view even one medication mistake as an unacceptable number. The crux of the issue is therefore not to "fix a broken system," but to create conditions within an existing system of high standards and an excellent track record for even higher levels of patient care.

The inescapable truth is that administering medicine in American hospitals is an endeavor of human beings. And because it is, there is potential for error. Our goal is to reduce that potential.

To pursue the goal, in early 1999, my hospital embarked on a comprehensive exploration of the benefits of automating our medication processes. For more than a year, we analyzed costs, benefits and other impacts of automating.

What would it mean for our patients? For our pharmacy department? For our nursing units? For our physicians? For our facility as a whole? The answers to all of those questions were very encouraging.

Why We Took the Plunge and Automated

We learned that we **could** tap technology to aid us in doing an even better job for our patients. And we learned that the best way to make the biggest impact on errors was to eliminate redundant processes in which human beings could incorrectly select, dispense and administer drug items. The "cart fill" process – the manual daily routine of getting scheduled medication to the patient – was quickly identified as the "step" in the chain where automation could make the biggest difference, so that is where we focused our early implementation efforts.

It also must be said that another reason we were able to make the technology leap toward automation is that we enjoy the support of our corporate parent, HCA. As part of its extensive program to improve medication best practices throughout all affiliate hospitals and facilities, HCA agreed to adopt the new approach at several hospitals with an eye toward improving medication safety. Not all facilities are similarly blessed, but I'm proud to be part of an organization with such foresight and initiative. Other corporate initiatives by HCA at each of its member facilities include: adoption of plans for medication safety; establishing a Medication Safety Team; developing a list of "high risk" medications for dispensing and/or administration; and education for staff and physicians to heighten awareness of cause and prevention of medication errors. These medication safety initiatives, combined with automation at our facility, improve the assessment, delivery, storage and administration of medication at all levels.

Common features in automated medication systems include:

- bar-code technology;
- robotics; and
- point-of-care drug administration

The automated systems chosen by our hospital have two main components: a robot located in our pharmacy (Robot-Rx[R]) and computerized cabinets located in each nursing unit which store and dispense drugs based on the patient's electronic medication profile from the pharmacy information system (Acudose-Rx[R]).[2] Both systems are manufactured and distributed by McKesson Automated Healthcare. These two separate and integrated products form the backbone for our automated system at EIRMC.

Automated technologies improve the medication delivery process in the following ways:

- they reduce medication errors
- they reduce missed doses
- they create significant cost savings
- they free pharmacists for more direct involvement with patients and doctors (instead of pill-counting and sorting, pharmacists can spend more time sharing their expertise with patients and doctors)
- they reduce billing errors related to medication

The Results: Benefits of Automation at Eastern Idaho Regional Medical Center

For those of you who are interested, I have included in your packets a simple depiction of how the robot and carts work and the steps involved in the process. You'll find that in your materials as Appendix 1.

Of more importance to you than "how it works," however, is, "Does it work?" And with six months experience behind us, I can tell you that it does.

For both patients and healthcare providers, the benefits of automation have been real, measurable and significant.

Accuracy: Housewide, our accuracy has improved since the inception of Robot-Rx[R] and Acudose-Rx[R]. Errors overall[3] have fallen from 0.021% to 0.0193% (comparing first of 2000 and 2001, respectively). And **all** medication picked by Robot-Rx [R] has been 100% accurate. In other words, with medications picked by the robot, we have not had a single mistake since we installed the system.

Efficiency: Before Robot-Rx[R] and Acudose-Rx[R], we spent up to 8 hours in our hospital pharmacy performing tasks that now take us just 1½ hours. What do we do with the time we're saving? We spend it with patients and with doctors. Pharmacists are the professionals on the cutting edge of what's new and what's promising for patients, pharmaceutically speaking. For patients to reap the benefits of new medicines, their doctors have to know the new medicines exist. We now have more time to teach them. We're also spending more time at the bedside, talking to patients about side effects they may experience, and helping coordinate their care. In short, we're doing more clinical pharmacy and less pill-counting, and clinical pharmacy leads to better patient care.

Savings: Having pharmacists available to use the meds the right way has also facilitated cost-capture. Harder to measure but undeniably significant economic benefits also include the reduced liabilities which results from greater accuracy.

We are so pleased with automation at EIRMC that we plan to take additional steps to fully optimize our system by adding "nurse-servers" and "point of care" drug administration tools at the bedside.[4] Essentially this means nurses will be able to quickly and directly confirm the accuracy of the medication and the "match" with the patient at the bedside, thereby decreasing the potential for mistakes. We also continue to add more Acudose-Rx[R] cabinets throughout the facility to provide added security, improved access and documentation of narcotic and PRN (as needed) medication items.

Automation, Bar-Code Technology, and the Aging.

How does our experience at EIRMC apply to the aging, the group with which your subcommittee is concerned? Patients in long-term care facilities would benefit greatly from automation and bar-code technology[5] - in the same ways and for the same reasons as patients in our hospital have benefited.

The medication profile of elderly patients typically remains constant throughout their length of treatment, affording an efficient application of automation. Removing the human component of drug dispensing via bar-code technology followed by verification at patient bedside will greatly decrease medication errors.

What Lies Ahead

Automation in the hospital and long term care industry has advanced considerably over the past fifteen years. Even with all our progress, challenges remain.

Only 4.5% of all hospitals[6] and systems can be designated as fully automated. Lack of automation also factors into the large percentage of time (73%) that centralized pharmacists spent on monotonous, manual, repetitive, distributive functions, all of which decrease the time available for clinical services.

Hospitals and health systems need to capitalize on the advances of automation. Doing so will enable pharmacy and nursing to provide clinical care that improves both the medication safety, patient outcomes and the overall patient experience. However, the initial expense of automating creates barriers for many, even those who see and appreciate the technology's potential. In general, larger hospitals and health systems are much more likely to use new technology than smaller institutions[5] because they are better equipped to capitalize the upfront costs of providing an automated infrastructure.

Recommendations

As a pharmacy healthcare professional, I would like recommend four things to improve medication delivery and administration:

1. *Standardization of bar-code technology to the packaging medications:* Currently there is no standard or requirement for drug manufactures to place bar-coding on unit dosed packaged medications. Leaders in pharmacy and drug manufacture must agree on standardization which includes the national drug code (NDC) and product expiration. With standardization in place, even smaller players could reap the benefits of the technology "safety net" at the bedside, with the patient "match" technology - even if they lack a robot.
2. *Computerized physician order entry:* Physicians should be required to place patient medication orders electronically to assure clarity and accuracy of medication orders and avoid mistakes from illegible handwriting. This is a critical step in "closing the loop" to prevent errors.
3. *Financial incentives for institutions demonstrating improved medication safety:* Premium credit should be extended to those institutions demonstrating improved medication safety through installation of automation, bar-coding, point of care drug administration and institution of physician order entry of medication orders.
4. *Increase the number of allied health professionals:* Currently there is an extensive shortage of all healthcare professionals. All disciplines are affected by the shortage, from nursing to pharmacy to laboratory and beyond. The promise of automation will not be fully realized without trained, qualified personnel to provide clinical decision-making and ultimately deliver the product.

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[1] Eastern Idaho Regional Medical Center average patient census 190 per day, and 30 day month.

[2] Jacque MB, Rascati KL & Rascati B, Effect of an automated, nursing unit-based drug dispensing device on medication errors, *Am J Hosp Pharm*, 1995; 52;1875-79.

[3] Medication error rate = Number of errors observed divided by the number of opportunity for errors x 100.

[4] Fitzpatrick K, Robotic automation of medication-use management. *Physician Assistant*, November 1993.

[5] Barker KN, Ensuring safety in the use of automated medication dispensing systems. *Am J Health-Syst Pharm*. 1995; 52:2445-47.

[6] Percentage of Hospitals and Systems with Centralized Inpatient Pharmacy Distribution Systems and Degree of Automation

	Centralized Inpatient Pharmacy Distribution System			Automation		
Characteristic	n	%	n	% Not Automated	% Partially Automated	% Full Automated
Occupied beds						
All hospitals	535	74.8	530	77.4	18.1	4.5
<50	189	91.0	190	90.0	10.0	...
50-99	115	82.6	115	80.9	19.1	...
100-199	122	68.0	119	74.8	18.5	6.7
200-299	50	50.0	49	61.2	32.7	6.1
300-399	26	46.2	25	52.0	24.0	24.0
≥ 400	33	39.4	32	43.8	34.4	21.9
Metropolitan. Statistical Area (MSA)						
All hospitals	536	74.8	531	77.2	18.3	4.5
Within an MSA	334	66.8	330	69.4	23.6	7.0
Outside an MSA	202	88.1	201	90.0	9.5	0.5
Medical School Affiliation						
All hospitals	535	74.8	531	77.2	18.3	4.5
Yes	158	59.5	155	60.6	29.0	10.3
No	377	81.2	375	84.3	13.6	2.1

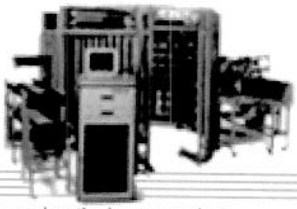
Ringold DJ, Santell JP, Scheider PJ ASHP national survey of pharmacy practice in acute care settings: Dispensing and administration—1999. Am J Health-Syst Pharm. 2000; 75:1759-75

The Rx for even better patient care at your hospital? EIRMC's new pharmacy robot!

New-fangled technology means more old-fashioned patient care. Instead of counting pills, EIRMC's new Robot-Rx frees our pharmacy experts to do what they do best: **help patients.** The robot gives pharmacists more one-on-one, face-to-face time to spend with patients and physicians. This lets them share their knowledge about the newest, most promising medicines and answer questions abut drug interactions and side effects.

Dispensing medicine just got faster and more accurate. Where your care is concerned, we're leaving no room for error. The manufacturer of Robot-Rx says the system is completely accurate. The robot is fast, too; it can process more than 10,000 unit doses per day!

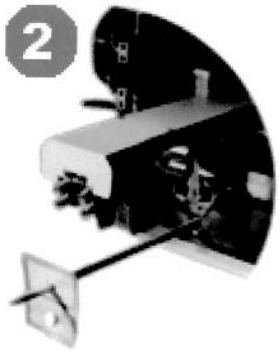
When we see a way to take even better care of you, count on EIRMC to lead the way. EIRMC's state-of-the-art pharmacy robot is the first of its kind in Idaho, and one of just 200 used in hospitals nationwide.

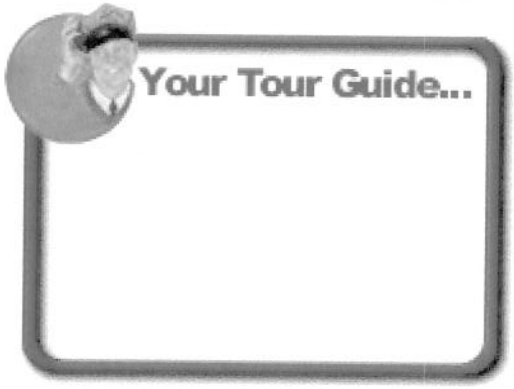


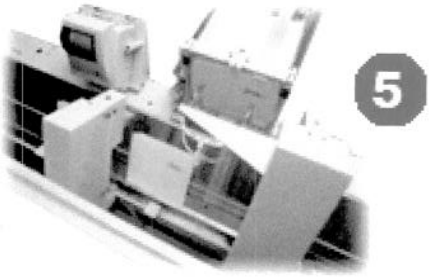
So, how does it work? Take a look!

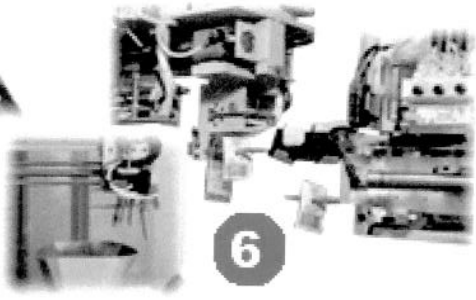
Pharmacy Robot Tour

Move your mouse over each step and the "tour guide" will tell you what's happening.









Tour Guide points:

1. Medications are packaged, bar coded, and checked for accuracy
2. Robot sorts prepared medications and stores them inside its octagonal cell
3. Physician examines patient and writes prescription
4. Pharmacist enters prescription into computer
5. Robot's envelope system labels patient's medication envelope and waits for robot to fill prescription
6. Robot's arm picks up prescribed medication and drops it through chute into envelope
7. Pharmacy staff pick up patient prescriptions and deliver to various floors in hospital
8. Nurse gives medication to patient