Preventing medication incidents

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Pharmacists strive to provide the best patient care, while recognizing the values and needs of our patients. Despite our great efforts, medication errors and other adverse events do occur and sometimes cause serious harm to patients.[1] As a result, special attention is necessary for continuous quality improvement and enhancement in medication safety. This article illustrates the importance of medication safety and continuous quality improvement in pharmacy practice. It also outlines error prevention principles and discusses a systematic approach for pharmacists to establish a safer medication-use system. By understanding the contributing factors and recognizing the potential flaws in the medication-use system, community pharmacists can implement system-based safeguards and ultimately prevent medication incidents from happening in the future.

Significance of medication errors

In 2000, the Institute of Medicine reported that as many as 98,000 people in the United States were harmed by medical errors each year, and 7,000 of these people might have lost their lives due to medication errors alone.[2] According to the Canadian adverse events study in 2004, an estimated 7.5% of hospitalized patients in Canada had experienced at least one adverse event within a year, and 36.9% of these patients were determined to have highly preventable adverse events.[3] The increasing number of pharmaceutical products and technologies, and the growing population of older adults with chronic and acute conditions requiring complex therapeutic regimens, further complicates medication use. As a result, medication safety is now recognized as a key issue in the Canadian healthcare system.

Why do errors happen?

In a community pharmacy, medication errors can occur at any point in the medication-use system, such as prescribing, order entry, dispensing, administration and/or monitoring. When medication errors occur, it is often due to multiple factors rather than a single event in the delivery of patient care.[2] Factors contributing to medication incidents can be categorized into two areas: *human factors* and *environmental factors* (Table 1).[4-6] An understanding of both types of factors will help us recognize and mitigate potential risk factors, and thus optimize patient safety.

Human factors

Owing to the fact that individual or human performance is greatly influenced by knowledge, skills, experience and personality attributes, human factors (e.g., abilities, characteristics, limitations) must be considered when designing the workflow or setting up a work environment in which healthcare practitioners will perform their duties.[7] In other words, if we want to improve the efficiency, reliability and safety of the medication-use system, we must first understand human factors or human limitations, so that we can identify potential human errors and the corresponding flaws in the workflow or processes.[8] The ultimate goal is to design processes or workflow that take into account human limitations, support people in areas with potential challenges, and optimize human performance. In the case of a community pharmacy, if the physical layout and workflow are properly designed or structured by taking individual or human circumstances into consideration, then the medication-use system within the pharmacy will more likely have a positive impact on patient safety.

Environmental factors

We can choose how we practise in a particular community pharmacy setting, within the realm of the standards of practice of our provincial regulatory bodies; however, we often have less control over the environment itself. The practice environment can be highly distracting due to factors such as unpredictable workload, frequent phone calls and front-store customer interruptions. The ongoing interactions between pharmacists and patients, together with technological components of the healthcare environment (e.g., the dispensing system, third-party billing, the clinical decision support system on drug-drug interactions), can significantly influence the individual decision-making process and directly

affect patient safety.[9] Therefore, system-based considerations within the stages of the medication-use process (i.e., prescribing, order entry, dispensing, administration and/or monitoring) can help us understand the relationship and intricacies among various elements of the complex work environment.[9]

Reactions to medication errors: person vs. system approach

As healthcare professionals, we are expected to maintain professional competence to ensure patient safety. Traditionally, when things go wrong, we tend to blame the person who is believed to have caused the problem. This "person approach" focuses on the errors of individuals by blaming them for their forgetfulness or carelessness.[10] However, even the most experienced and dedicated professionals can be involved in preventable adverse events.[9] With a person-approach culture, healthcare workers tend to develop a fear of making mistakes and have low morale. Researchers have identified that the person approach or "blame and shame" culture has significant implications for subsequent safety interventions.[10] Within this culture, interventions to improve patient safety will likely only focus on the people who were blamed.[10] This could cause serious delay in the development of a culture of safety in the organization or work environment.

The "system approach" considers the person as part of the medication-use process or practice environment. It facilitates healthcare professionals to understand the interaction between different elements within the work environment and identifies opportunities for system-based interventions.[10] As indicated by the Institute of Medicine, "People working in health care are among the most educated and dedicated workforce in any industry. The problem is not bad people; the problem is that the system needs to be made safer."[2] In addition, according to James Reason, a British clinical psychologist, "we cannot change the human condition, but we can change the conditions under which humans work."[10] Humans are not capable of performing perfectly all the time. In fact, incidents are usually caused by flaws in the work environment or system, and human errors should be expected as part of any working environment. Since the healthcare system is complex, involving different people and technologies, it is important to consider all elements of the system and not simply the individuals delivering patient care. System-based thinking enables us to view health care as a system with complexity and interdependence. It removes the focus from the individual and helps us move away from the traditional "blame and shame" culture towards the system approach.[10]

Defences, barriers and safeguards all play important roles in the system approach. Theoretically, all of these will function effectively to ensure patient safety. In pharmacy practice, each step in the medication-use process has the potential for failure or errors.[10] Medication incidents usually occur due to a combination of multiple risk factors that may exist in prescribing, order entry, dispensing, administration and monitoring. Therefore, a multifactorial approach is essential to overcome the threats to patient safety and achieve the delivery of safe medication use. Ultimately, the system approach facilitates the development of a safety culture within community pharmacy practice, which will have a substantial impact on continuous quality improvement and overall patient safety.

The medication incident case scenario in Box 1 illustrates the importance of identifying potential contributing factors, including both human and environmental factors, when developing system-based safeguards in the pharmacy for advancing safe medication use and continuous quality improvement. Table 2 illustrates the possible causes of the Box 1 medication incident.

With respect to the various stages of the medication-use process, the bisoprolol–bisacodyl incident occurred at the order-entry stage and the threats to patient safety included both human factors and environmental factors (Table 2). Fortunately, the incident was caught by the pharmacist at the prescription dispensing and checking stage. How can we prevent a similar incident from happening? How can we address the vulnerabilities in the complicated medication-use process and ensure the delivery of quality patient care? To address these questions, we need to examine error prevention principles in a system-based approach.

Error prevention principles – hierarchy of effectiveness

A system-based perspective should be applied when seeking solutions or changes to our work environment or workflow for safer medication use. Due to the multifactorial nature of the causes of medication incidents, there is no one-size-fits-all solution. Instead, we should consider error prevention principles and the hierarchy of effectiveness for safety solution development (Figure 1); this well-recognized model can be used to explore various ways to make medication use safer.[12] Keep in mind that solutions of the highest effectiveness may not be applicable or logistically feasible in your pharmacy setting, but it is important to aim for these high standards when brainstorming ideas with your pharmacy team members.

Forcing functions and constraints essentially eliminate the possibility of an incident from happening in the future. In the bisoprolol–bisacodyl

BOX 1

MEDICATION INCIDENT CASE SCENARIO[11]

Consider the following example that could occur in a community pharmacy:
67-year-old Mr. Smith dropped off a prescription for bisoprolol 5 mg (Directions: 1 tablet once daily x 30 days).

- Order entry is supposed to be Apo-Bisoprolol 5 mg tablets (DIN 02256134).
- Prescription was entered as Apo-Bisacodyl 5 mg (Directions: 1 tablet once daily x 30 days).
- Order entry ended up being Apo-Bisacodyl 5 mg tablets (DIN 00545023).
- Prescription was then filled with 30 Apo-Bisacodyl 5 mg tablets.
- Pharmacist caught the error when checking the prescription.

case scenario (Box 1), it would imply eliminating one of two drugs from the pharmacy if they are commonly confused for one another during order entry or dispensing. In other words, if either bisoprolol or bisacodyl is removed from the pharmacy, then it will never be mixed up with the other in the future. Yet, it is obvious that this solution is not realistically possible or practically feasible.

Automation and computerization integrate the use of technology to enhance workflow and promote safe medication practice. An example is having automatic detection/alert software embedded in the dispensary system to signal or remind the user of look-alike/sound-alike drug names during order entry or incorporating bar-coding/scanning technology to facilitate product selection/identification in dispensing.

Simplification and standardization attempt to change the physical or work environment to streamline workflow and reduce the opportunity for incidents to recur. An example would be re-organizing the drug inventory storage so that look-alike/sound-alike medications, such as bisoprolol and bisacodyl, are not stored in close proximity.

Reminders and checklists are guiding tools we can use when dealing with complex processes that involve a significant amount of human-oriented or manual tasks. In this case, a reminder memo or email can be provided to staff members on a regular basis with respect to common look-alike/sound-alike drug names. For example, the *Institute for Safe Medication Practices (ISMP's) List of Confused Drug Names* is available at https://www.ismp.org/tools/confuseddrugnames.pdf. In addition, independent double checks should be performed, if possible, at each stage of the medication-use process in the pharmacy. During order entry, it is ideal for a second pharmacy staff member to perform verification before proceeding to the next stage of dispensing. It is important that the order-entry staff member does not communicate to the second staff member what he/she expects to see, as this would introduce confirmation bias and violate the independent double-check verification process.[13]

Creating new rules and policies or providing education and information to pharmacy staff is not as effective as the strategies mentioned above, because they very much rely on human factors, interventions or memory instead of the system or physical environment. For example, in the bisoprolol–bisacodyl case scenario, the pharmacy manager could hold a staff meeting and share details of the incident with the team and discuss potential contributing factors. During the meeting, team members could be provided with education or information pertaining to look-alike/sound-alike drug names, or a new policy could be implemented (e.g., look-alike/sound-alike medications will now be ordered from different generic manufacturers and stored separately on the shelves).

Solution development–Effectiveness vs. feasibility

The effectiveness of the solutions that are eventually chosen for your pharmacy to prevent similar incidents from occurring can be determined by the degree of effectiveness as described previously. However, another factor to consider is the feasibility of the solutions; this is directly related to the logistics and resources in your pharmacy practice setting. Very often, the high-leverage strategies are the most costly and time-consuming to implement, while the low-leverage solutions are straightforward and can be immediately executed in the pharmacy (Figure 1).[14] In other words: the least feasible options imply that they are only feasible if other resources (e.g., financial and human resources) and support are available.

Moderately feasible options can usually be accomplished in six to 12 months with support from financial and human resources.

The most feasible options are typically strategies that you can implement immediately in your pharmacy.

Executing an action plan

After considering the effectiveness and feasibility of the solutions as proposed by your pharmacy team members, the execution of your action plan [14] needs to be SMART—Specific, Measurable, Attainable, Relevant and Time-based, to allow monitoring of the progress of quality improvement strategies in your pharmacy. One way to accomplish this is to assign tasks to specific team members with expected timelines, while also taking into consideration possible barriers that you or your pharmacy staff members may encounter during implementation of the action plan. The bottom line is to stay away from big bold actions, but try to execute small steps or even one step at a time, so that you can monitor, review and evaluate before moving on to the next change or action plan.[15]

Conclusion

The vulnerabilities in the medication-use process and the complexity of human and environmental factors in pharmacy practice are inevitable. Yet, these are often the potential contributing factors leading to near misses and medication incidents. In order to learn from previous mistakes, we need to stay away from the traditional "blame and shame" culture and move towards the system approach, where we openly share and discuss our errors, look for possible causes of the incidents, and develop effective and feasible solutions using a team-based approach. Finally, in order to successfully carry out an action plan, we need to be SMART and engage in continuous quality improvement for the delivery of quality patient care in our everyday practice.

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TO SEE **TABLES 1, 2, FIGURE 1** AND **REFERENCES**, GO ONLINE OR VIEW OUR TABLET EDITION

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REFERENCES

1. Phipps DL, Noyce PR, Parker D, et al. Medication safety in community pharmacy: a qualitative study of the sociotechnical context. BMC Health Serv Res 2009;9:158.
2. Institute of Medicine. To err is human: building a safer health system. Washington, DC: National Academies Press; 2000.
3. Baker GR, Norton, PG, Flintoft V, et al. The Canadian Adverse Events Study: the incidence of adverse events among hospital patients in Canada. CMAJ 2004;170:1678-86.
4. Kawano A, Li Q, Ho C. Preventable medication errors – look-alike/sound-alike drug names. Pharmacy Connection 2014;21(2):28-33.
5. ISMP Canada. Labelling and packaging: an aggregate analysis of medication incident reports. ISMP Canada 2013;Sep. http://www.ismp-canada.org/download/Labelling-Packaging/ISMPC2013_LabellingPackaging_FullReport.pdf (accessed July 30, 2015).
6. ISMP Canada. Do not use: dangerous abbreviations, symbols and dose designations. ISMP Canada 2006;July. http://www.ismp-canada.org/download/ISMPCanadaListOf-DangerousAbbreviations.pdf (accessed July 30, 2015).
7. Human Factors and Ergonomics Society. Definitions of human factors and ergonomics. http://www.hfes.org/Web/EducationalResources/HFEdefinitionsmain.html (accessed July 30, 2015).
8. World Health Organization. Human factors in patient safety: review of topics and tools. Report for methods and measures working group of WHO patient safety. WHO 2009;April. http://www.who.int/patientsafety/research/methods_measures/human_factors/human_factors_review.pdf (accessed July 30, 2015).
9. Frank JR, Brien S (eds); The Safety Competencies Steering Committee. The safety competencies: enhancing patient safety across the health professions. Ottawa, ON: Canadian Patient Safety Institute; 2008.
10. Reason J. Human error: models and management. BMJ 2000;320:768-70.
11. ISMP Canada. Concerned reporting: mix-ups between bisoprolol and bisacodyl. ISMP Canada 2012;12(9):1-6. http://www.ismp-canada.org/download/safetyBulletins/2012/ISMPCSB2012-09-ConcernedReporting-BisoprololandBisacodylMixups.pdf (accessed April 18, 2016).
12. Grissinger M. Medication error-prevention "toolbox." P&T 2003;28(5):298.
13. ISMP Canada. Lowering the risk of medication errors: independent double checks. ISMP Canada Safety Bulletin 2005;5(1):1-2.
14. ISMP Canada. Community Pharmacy Incident Reporting (CPhIR) Program. http://www.cphir.ca (accessed July 30, 2015).
15.Ontario College of Pharmacists. CQI benefits patients in community pharmacies. Pharmacy Connection 2015;22(1):12-5.

TABLE 1

CONTRIBUTING FACTORS TO MEDICATION INCIDENTS IN COMMUNITY PHARMACIES[4-6]

Factors Possibly Contributing to Medication Incidents		Incident Example*
Human factors	**Confirmation bias**	A patient went to an outpatient clinic on the weekend for treatment of shoulder pain and was prescribed Diclofenac. It was interpreted as Diflucan by the pharmacy staff member who did the order entry. (The pharmacy staff member thought Diclofenac and Diflucan were the same.)
	Illegible handwriting	A prescription was written for mebendazole 100 mg, 2 doses given 2 weeks apart. The pharmacist interpreted the prescription as metronidazole 1000 mg, 2 doses given 2 weeks apart. The prescriber's handwriting was hard to read, and metronidazole was commonly prescribed by this physician.
Environmental factors	**Look-alike/sound-alike drug names**	A pregnant patient was prescribed Diclectin, but Dicetel was filled.
	Look-alike labelling or packaging	A patient was prescribed Novolin ge 30/70 Penfill; however, NovoRapid Penfill was dispensed. The labelling and packaging of these two products are very similar.
	Dangerous abbreviations	*QD (every day) and QOD (every other day) can be mistaken for each other.* (NOTE: both QD and QOD are dangerous abbreviations that should not be *used when communicating medication information. A list of "**Do Not Use" Dangerous Abbreviations, Symbols, and Dose Designation** is* available at https://www.ismp-canada.org/download/ISMPCanadaListOfDangerousAbbreviations.pdf.) [6]

*These incidents were anonymously reported by community pharmacy practitioners to the ISMP Canada Community Pharmacy Incident Reporting (CPhIR) Program (http://www.cphir.ca).

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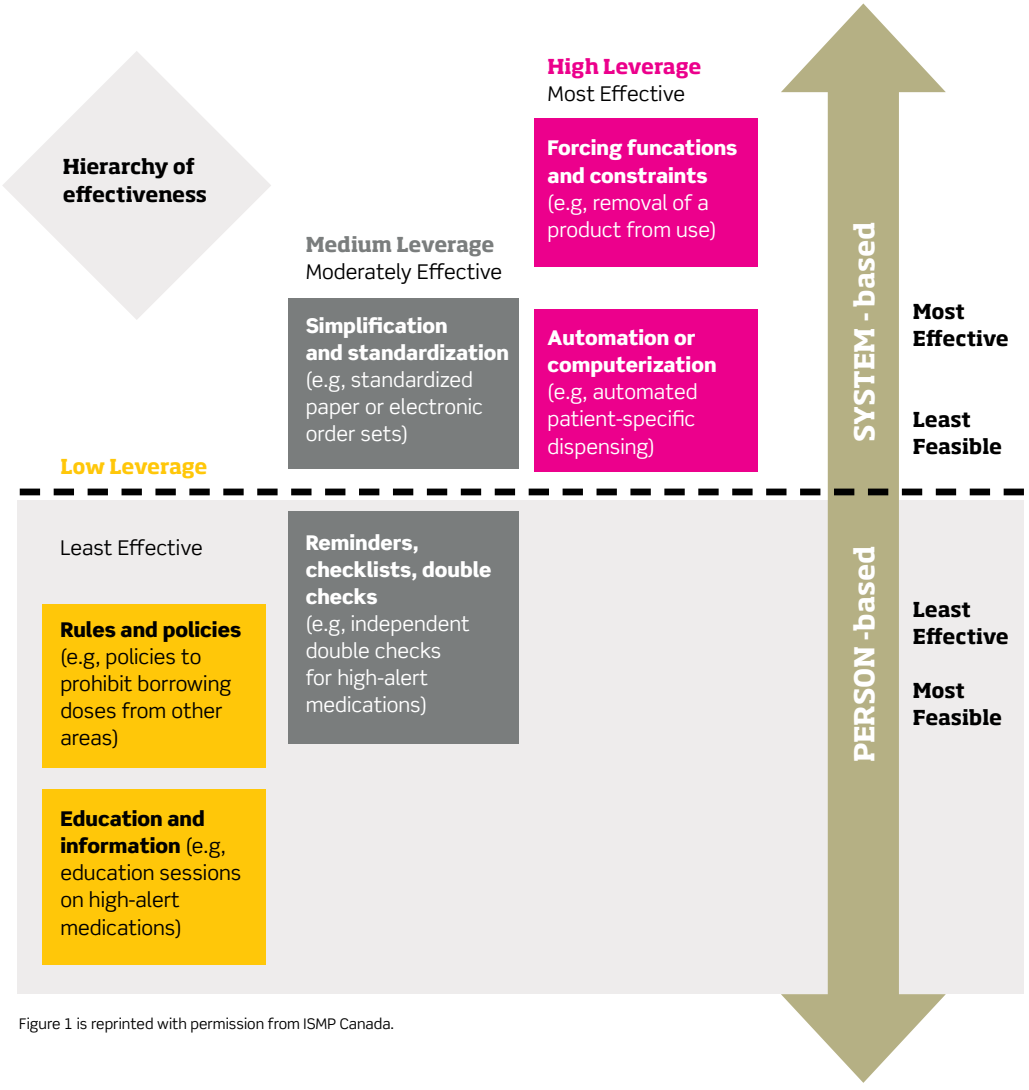
TABLE 2

POSSIBLE CONTRIBUTING FACTORS TO BISOPROLOL-BISACODYL MEDICATION INCIDENT[4-6]

Possible Contributing Factors to the Incident		Commentary
Human factors	**Confirmation bias**	During order entry, the pharmacy staff member misinterpreted bisoprolol as bisacodyl.
	Illegible handwriting	The prescriber's handwriting was hard to read, and bisoprolol was misinterpreted by the order-entry staff member as bisacodyl.
Environmental factors	**Look-alike/sound-alike drug names**	Bisoprolol and bisacodyl both start with "b" and they are both available in 5 mg tablets.
	Look-alike labelling or packaging	The labelling and packaging of these two generic products—Apo-Bisoprolol 5 mg tablets and Apo-Bisacodyl 5 mg tablets—are very similar.

FIGURE 1

HIERARCHY OF EFFECTIVENESS FOR SAFETY SOLUTION DEVELOPMENT[12]



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