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SCDPIM Système canadien de déclaration et de prévention des incidents médicamenteux

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Understanding Human Over-reliance on Technology

- *When providing training for automated systems, review the limitations of such systems with trainees. Allow trainees to experience and understand automation failures during training.*
- *Conduct proactive risk assessments and/or staged implementation for new technologies to identify unanticipated vulnerabilities.*

Through the analysis of an incident received from the National System for Incident Reporting (NSIR),* this ISMP Canada safety bulletin highlights human over-reliance on technology by introducing two related human cognitive limitations: automation bias and automation complacency.

Incident Description

An older adult was admitted to hospital with a diagnosis of new-onset seizures. Admission orders included initiation of the anticonvulsant phenytoin (handwritten using the brand name Dilantin), 300 mg orally every evening. Before the pharmacy closed, a pharmacy staff member who was new to the clinical area entered the Dilantin order into the pharmacy computer system, so that the medication could be obtained from an automated dispensing cabinet (ADC) in the patient care unit overnight. In the pharmacy's computer system, medication selection for order entry was performed by typing the first 3 letters of the medication name ("dil" in this case) and then choosing the desired medication name from a drop-down list. The computer list contained both generic and brand names. The staff member was interrupted while performing the order entry. When this task was resumed, diltiazem 300 mg was selected instead of Dilantin 300 mg.

On the patient care unit, the order for Dilantin was correctly transcribed by hand onto the medication administration record (MAR). The MAR entry was verified against the prescriber's order sheet and was cosigned by a nurse. The nurse who obtained the evening medications from the unit's ADC noticed the discrepancy between the MAR and the ADC display, but accepted the information displayed in the ADC as correct. The patient received one dose of long-acting diltiazem 300 mg orally instead of the Dilantin 300 mg ordered. The next morning, the patient exhibited significant hypotension and bradycardia, which was attributed to the administration of the unordered diltiazem.

Background

The implementation of clinical information technology in medication-use systems is widely accepted as a means of reducing the incidence of adverse drug events by decreasing the potential for human error.[1] Examples of such technologies include computerized order entry systems (e.g., for pharmacy and prescriber order entry), clinical decision support

* The NSIR (provided by the Canadian Institute for Health Information) is a component of the Canadian Medication Incident Reporting and Prevention System (CMIRPS) Program. More information about the NSIR is available from: http://www.cmirps-scdpim.ca/?p=12

systems, robotic dispensing, ADCs, and bar coding (e.g., for use during medication dispensing and administration).

Designing safe systems and making subsequent improvements involves the integration of multiple interventions, including high-, medium-, and low-leverage strategies.[2] Because automation and computerization are considered high-leverage, they are expected to be more effective than lower-leverage strategies in combatting the shortcomings of existing manual medication systems.

Discussion

Automation Bias and Automation Complacency

Although consensus has not been reached for definitions of these two concepts, the tendency to favour or give greater credence to information derived from an automated decision-making system (e.g., an ADC display) and to ignore a manual (non-automated) source of information that provides contradictory information (e.g., a handwritten MAR) illustrates the human cognitive phenomenon of *automation bias*.[3]

Automation complacency is a related, overlapping term that refers to the monitoring of an automated process less frequently or with less vigilance than optimal because of a low degree of suspicion of error and a strong belief in the accuracy of the technology.[4] End-users of an automated technology (e.g., the ADC display listing medications to be administered) tend to forget or ignore that information output from the device may depend on data entry by a human being. In other words, processes that may appear to be wholly automated are often dependent upon human input at critical points and thus require the same degree of monitoring and attention as manual processes.

Automation bias and automation complacency are thought to result from 3 factors:[4]

- In human decision-making, people have a tendency to select the pathway requiring the least cognitive effort, which often results in letting technology dictate the path. This factor is likely to play a greater role as humans are placed under heavier workloads or face increasing time pressures—common phenomena in healthcare where resource constraints are in place.
- People often perceive that the analytic capability of automated aids is superior to that of humans, which may lead them to overestimate the performance of these technologies.
- People may reduce their effort or shed responsibility in carrying out a task when an automated system is also performing the same function. It has been suggested that the use of technology convinces the human mind to hand over tasks and associated responsibilities to the automated system.[5] This mental handover can reduce the vigilance that the person would demonstrate if carrying out the particular task independently.

There is conflicting evidence as to the effect of training and experience on automation bias and automation complacency. One study indicated that these types of errors may occur more frequently with inexperienced staff and that as experience and confidence in one's own knowledge increases, there may be reduced reliance on technology.[3] Conversely, it has also been shown that increased familiarity with a technology can lead to desensitization and habituation effects, which may cause clinicians to contradict their own instincts by accepting inaccurate technology-derived information.[3] In the incident described above, there were two occurrences of automation bias/complacency: first, when the pharmacy staff member accepted diltiazem as the correct drug in the computerized pharmacy order entry system, and second when the nurse identified the discrepancy between the ADC display and the MAR but trusted the information on the ADC display over that on the handwritten MAR.

As trust in automation increases, people tend to use it "as a heuristic replacement of vigilant information seeking and processing".[3,6] In other words, when automation is perceived as reliable, people are less likely to question the accuracy of its outputs and are therefore particularly prone to missing failures of automation.[7] Automation bias can be considered a rational strategy to optimizing decision making—but only if the users' trust in the automation closely matches the reliability of the automation itself. Therefore, strategies to address errors related to

automation bias should focus on:

- improving the reliability of the automation itself; and
- supporting clinicians to more accurately assess the reliability of the automation, so that appropriate monitoring and verification strategies can be employed.

Clinical Context

Automation and computerized order entry systems should be considered additional tools in the safe delivery of care. Although their use can make many aspects of the medication-use system safer, healthcare professionals must continue to rely on and apply their clinical knowledge and critical thinking to provide optimal patient care. Thoughtful consideration of the nature of the therapy in the context of the patient's clinical presentation can play a significant role in preventing errors.

An opportunity exists to modify and improve order entry systems so that they compare and match a patient's diagnoses and conditions with the medications being prescribed.[8] However, the introduction of such technologies needs to be studied thoroughly to identify the benefits and risks with such an approach.

Recommendations

Healthcare Organizations

- Provide training about the automated components of the medication-use system to all involved staff, both at orientation and on an on-going basis.
  - Include information about the limitations of such technology, as well as previously identified gaps and opportunities for error.
  - Allow trainees to experience automation failures during training. Understanding the technology and the human–technology interfaces within the system can help to reduce automation bias[3] and encourage critical thinking in using automated systems.
- Conduct a proactive risk analysis (e.g., failure mode effects analysis [FMEA]) and/or staged implementation for new technologies to identify unanticipated vulnerabilities. Address any system shortcomings that are identified before undertaking facility-wide implementation. In particular, seek feedback directly from end-users to identify limitations and encourage reporting of technology-associated risks, issues, and errors.
- Allow automated systems to communicate seamlessly, thereby limiting human-computer interfaces. Consider an integrated system comprised of physician order entry, pharmacy, ADC and pharmacy-generated MAR components that allow for independent double checks throughout the process.
- Incorporate recommendations for pharmacy and nursing (see below) into organizational medication administration policies.

Pharmacy and Nursing

- Ensure those involved in the double check process can do so uninterrupted and are not simultaneously responsible for other tasks. Automation failures are less likely to be identified if the human monitoring the automated outputs is required to multi-task.[4]
- Establish a standardized process to address identified medication discrepancies, including verification of the original prescriber's order *before* medication administration. This manual verification counteracts automation complacency that can occur with technological outputs from the medication use process. Part of the verification process should include assessing the appropriateness of the medication based on the patient's medical history and treatment plan.
- When selecting a medication from the ADC, compare the ADC display with the MAR to confirm the accuracy of order entry and transcription. Locating ADCs in areas where nurses have easy access to patients' MARs will support this process.

Conclusion

Over-reliance on automated processes, as well as the inevitable increase in human–technology interfaces, can result in unanticipated errors. Automation and its associated technologies play an important role in the design and improvement of medication systems; the technology must be viewed, however, as supplementary to clinical judgement.

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Improved Labelling and Packaging Will Make It Easier for Canadians to Use Health Products Safely

New guidance released by Health Canada will help improve the safe use of health products by making labels easier to read and understand for consumers and health professionals.

Two new "Good Label and Package Practices" guides, one for prescription drugs, and the other for non-prescription (i.e., over-the-counter) drugs and natural health products, provide manufacturers with direction for designing clear and effective health product labels and packages. This includes a new standardized Facts Table that will be phased into the Canadian marketplace starting June 2017. The Facts Table will make it easier to find important product safety information like ingredients, directions and warnings, and is modelled after the Canadian Nutrition Facts Table for foods and a similar table used for non-prescription drugs in the United States.

The "Good Label and Package Practices" guides were developed collaboratively by Health Canada and ISMP Canada, in consultation with stakeholders and an expert panel of Canadian healthcare and patient safety representatives. These guides are an important milestone in Health Canada's Plain Language Labelling Initiative.

The guides are available on Health Canada's website: www.hc-sc.gc.ca
- Good Label and Package Practices Guide for Prescription Drugs
- Good Label and Package Practices Guide for Non-Prescription Drugs and Natural Health Products

For more information, contact info@ismp-canada.org

This segment of the bulletin describes a recent SafeMedicationUse.ca publication from ISMP Canada's Consumer Program.

July 2016 - Newsletter:

Beat the Heat: How to Prevent, Recognize, and Manage Heat-Related Illnesses

Some medications can increase the risk for developing a heat-related illness. Consumers taking medications to treat allergies, high blood pressure, Parkinson's disease, and some mental illnesses might have this increased risk. These individuals should continue taking medications for these health conditions, but prepare themselves to prevent heat-related illnesses.

Extreme age (i.e., young children and elderly), certain disease states (e.g., pulmonary, cardiovascular and renal conditions) and outdoor exposure for work or training, can also contribute to developing a heat-related illness.

Tips for Practitioners:

- Identify individuals in your practice who may be at risk of heat-related illnesses. Inform them of their risk, and share the information in the newsletter with them.

Tips to Share with Consumers:

- Be aware of heat wave warnings in the area. Check the weather regularly on local television stations, or consult a weather service like Environment Canada.
- If at risk of a heat-related illness, ask a neighbour, friend, or family member to check in during a heat wave.
- Avoid outdoor activity when the sun is hottest, between 10:00 am and 3:00 pm. If active outdoors, take lots of breaks and drink plenty of fluids.
- Know the warning signs of heat-related illnesses, and know what action to take if the warning signs occur.

To find out more about how to help your patients prevent, recognize and manage heat-related illnesses, read the full newsletter at www.safemedicationuse.ca/newsletter/newsletter_Heat.html

CMIRPS SCDPIM

Canadian Medication Incident Reporting and Prevention System

Système canadien de déclaration et de prévention des incidents médicamenteux

The Canadian Medication Incident Reporting and Prevention System (CMIRPS) is a collaborative pan-Canadian program of Health Canada, the Canadian Institute for Health Information (CIHI), the Institute for Safe Medication Practices Canada (ISMP Canada) and the Canadian Patient Safety Institute (CPSI). The goal of CMIRPS is to reduce and prevent harmful medication incidents in Canada.

HIROC

The Healthcare Insurance Reciprocal of Canada (HIROC) provides support for the bulletin and is a member owned expert provider of professional and general liability coverage and risk management support.

ISMP CANADA

The Institute for Safe Medication Practices Canada (ISMP Canada) is an independent national not-for-profit organization committed to the advancement of medication safety in all healthcare settings. ISMP Canada's mandate includes analyzing medication incidents, making recommendations for the prevention of harmful medication incidents, and facilitating quality improvement initiatives.

Report Medication Incidents

(Including near misses)

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ISMP Canada strives to ensure confidentiality and security of information received, and respects the wishes of the reporter as to the level of detail to be included in publications. Medication Safety bulletins contribute to Global Patient Safety Alerts.

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