Case Study

Understanding Medication Errors: Discussion of a Case Involving a Urinary Catheter Implicated in a Wrong Route Error

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In 1999, the first Institute of Medicine (IOM) report on the quality of U.S. healthcare, *To Err is Human: Building a Safer Health System*, catapulted patient safety to national attention. The IOM asserted that the system, in its present form, could annually expect as many as 98,000 individuals to become the fatal victims of medical errors, a number that exceeds the combined total deaths from motor vehicle accidents, HIV/AIDS, and breast cancer (Kohn, Corrigan, & Donaldson, 2000). Iatrogenic injuries became the 8th leading cause of death in America, and as many as 7,000 of deaths were from medication errors (Kohn et al., 2000). The 1999 IOM report highlighted that “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 safer” (p. 49). Because of the report, health care providers, payers, and policy makers became aware of this issue, the role of human error, and systems-related weaknesses within the world’s most expensive health care system.

Nurses involved in urologic care must have a basic understanding of how to analyze and report medication errors. This requires a brief overview of the use of error taxonomy. Understanding components of this taxonomy will help nurses by providing a standard means to identify, record, interpret, track, and understand such events. The case study presented in this article is based on an actual error from a national medication error reporting program. Additionally, findings from a recent national medication error report will further advance knowledge about the breadth of this important topic.

Medication errors represent a failure in the medication use process leading to an increase in morbidity and mortality. In an effort to standardize reporting, evaluating, and trending of medication errors, the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) developed and maintains a medication error taxonomy. A case study involving a medication intended for administration via rectal tube and inadvertently given through a Foley catheter is discussed using the NCC MERP medication error taxonomy and critiqued using recent national findings. Awareness of national trends for patient safety, including emerging changes leading to best practices, updates to National Patient Safety Goals, and changes in national policy, can reduce the risk of error involvement.

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Medication Error Taxonomy

A standard approach exists for understanding why and how medication errors occur. The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) (1998-2001) provides standard language that promotes safe medication use, and the NCC MERP Taxonomy of Medication Errors remains one of the most comprehensive tools for evaluating medication errors. It encompasses all disciplines involved in safe medication use and covers all domains, such as type and cause of errors, which could be involved in the error. The NCC MERP encourages all institutions, researchers, and software developers to use this standardized taxonomy when reporting medication errors internally and/or externally to a national database.

The United States Pharmacopeia (USP), a not-for-profit standards-setting organization and the secretariat for the work of the NCC MERP, operates two nationally recognized medication error reporting programs (see Figure 1). In cooperation with the Institute for Safe Medication Practices (ISMP), the USP-ISMP Medication Errors Reporting (MER) Program is a free service for any clinician to report medication errors. USP shares findings from this program with the Food and Drug Administration (FDA), the product manufacturer, ISMP, and its own safe medication use expert committee. USP’s MEDMARX® program is an Internet-accessible, voluntary, anonymous medication error reporting program for use by hospitals and related health systems that subscribe as part of ongoing quality improvement efforts related to safe medication use. Together, USP and NCC MERP contribute to better understanding, reporting, and prevention of medication errors.

Table 1 lists some major elements of a medication error taxonomy based on the work of NCC MERP and USP.

**Definition of Medication Error**

Not only did the NCC MERP produce the nation’s first comprehensive taxonomy for studying medication errors, it also established the following definition of a medication error: A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems (including prescribing; order communication; product labeling, packaging, and nomenclature; dispensing; distribution; administration; compounding; and use) (NCC MERP, 1998-2001).

**Medication Error Severity**

One of the most important steps in analyzing medication error data is understanding its severity. NCC MERP developed an *Index for Categorizing Medication Errors* for determining the outcome or effect of the medication error on the patient. The Index contains four major sub-scales; these include potential for error (Category A), actual error that did not reach the patient (Category B), actual error that reached the patient but did not result in harm (Categories C or D), and actual error that reached the patient and resulted in harm (Categories E, F, G, H, and I) (see Figure 2). The *Index* has a reliability of $K = 0.60$, determined by a study from researchers at Ohio State University (Forrey, Pedersen, & Schneider, 2007). Kappa ($K$) is a measure of interrater agreement. A value above 0.60 suggests moderate agreement. NCC MERP provides standardized tools and definitions to assist in proper coding of medication errors (NCC MERP, 1998-2001). Based upon accurate classifications, institutions that collect and analyze error data are able to trend patterns of non-harmful and harmful events.
Figure 2. Error Categories Associated with the Index for Categorizing Medication Errors

<table>
<thead>
<tr>
<th>Error Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Circumstances or events that have the capacity to cause error.</td>
</tr>
<tr>
<td>B</td>
<td>An error occurred, but the error did not reach the patient.</td>
</tr>
<tr>
<td>C</td>
<td>An error occurred that reached the patient but did not cause patient harm.</td>
</tr>
<tr>
<td>D</td>
<td>An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm.</td>
</tr>
<tr>
<td>E</td>
<td>An error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention.</td>
</tr>
<tr>
<td>F</td>
<td>An error occurred that may have contributed to or resulted in temporary harm to the patient and required initial or prolonged hospitalization.</td>
</tr>
<tr>
<td>G</td>
<td>An error occurred that may have contributed to or resulted in the patient’s death.</td>
</tr>
<tr>
<td>H</td>
<td>An error occurred that required intervention necessary to sustain life.</td>
</tr>
<tr>
<td>I</td>
<td>An error occurred that may have contributed to or resulted in the patient’s death.</td>
</tr>
</tbody>
</table>


Node of the Medication Use Process

The medication use process describes the systematic progression of ordering/prescribing a medication. NCC MERP and USP define each step in the medication use process as a “Node” (Hicks, Becker, & Cousins, 2008). Within each node are professional responsibilities that serve as checks and balances for safe care.

The medication use process begins with procurement, which describes the acquisition and storage processes used by institutions. The second step is prescribing, which is the point that involves a licensed prescriber issuing a prescription or medication order. The next step is transcribing/documenting, a point that involves the act of transcribing an order or documenting procedures or anything pertinent to the patient in the notes or on the patient chart. The next step is dispensing, which involves the pharmacist’s assessment of the prescription or order and the release of the product for use by the health care provider or the patient. Administering encompasses the act of preparing and providing the medication to the patient using the five rights of which nurses are aware and is a guiding principle intended to avert errors. The final step, monitoring, is an inter-disciplinary approach in evaluating, scrutinizing, and recording the patient’s response/reaction to the medication administered.

Type of Error

Defining the type of error is a manifestation of what occurred, regardless of the cause (Hicks et al., 2008). Based on the NCC MERP taxonomy and USP’s MEDMARX, there are 14 different types of errors (see Table 2). It is important to recognize that some medication errors can involve more than one type. For example, when the wrong patient receives a drug, it results in both a wrong patient error and wrong drug error. Furthermore, depending on the circumstances, the patient for whom the drug was intended could be involved through an omission error or a wrong time error.

Cause of Error

NCC MERP, the USP-ISMP MER Program, and USP’s MEDMARX program all use the cause of error variable to gather information that directly or indirectly led to the error (Hicks et al., 2008). NCC MERP groups the selections according to communication, name confusion, labeling, human factors, and packaging/design (NCC MERP, 1998-2001). Within the MEDMARX program are more than 70 selections for the cause of error variable, including communication, calculation errors, performance deficit, and procedure/protocol not followed.

Contributing Factors

According to MEDMARX, contributing factors are situational, environmental, and/or organizational conditions (or lack of a condition) that influence the opportunity for an error to occur (Hicks, Becker, & Cousins, 2006). Contributing factors alone do not directly lead to an error but may be so common within health care that practitioners fail to recognize or distinguish them from normal duties (Cook, Render, & Woods, 2000). As a variable in medication error reporting, there are more than 15 possible responses.

Product Involvement in Medication Errors

The variable product is recorded using generic names. Additional information about the product, such as its brand name, strength, container size, and manufacturer, can supplement data about the error. In some circumstances, more than one product may be involved in the error.

Staff Members and Medication Errors

NCC MERP identifies three staff variables for association with the error, using only professional titles. First, the staff variable represents the individual staff member responsible for the error. The second staff variable represents all other individuals perpetuating the error. Finally, a third staff variable represents...
Table 2. MEDMARX® Types of Errors

<table>
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<tr>
<th>Error Type</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Detreriorated product</td>
<td>A product in which the physical or chemical integrity may have been compromised by improper storage, light, exposure, temperature, or container type.</td>
</tr>
<tr>
<td>Expired product</td>
<td>A product with an expiration date beyond the date by which policies and procedures direct the removal of the product from stock.</td>
</tr>
<tr>
<td>Extra dose</td>
<td>A duplicate dose administered at a different time.</td>
</tr>
<tr>
<td>Improper dose/quantity</td>
<td>Any dose or strength that differs from the prescribed dose or strength, including incorrect quantity (for example, tablets, vials) dispensed.</td>
</tr>
<tr>
<td>Mislabeleding</td>
<td>The drug product was labeled incorrectly.</td>
</tr>
<tr>
<td>Omission error</td>
<td>A failure to administer an ordered dose excludes patient’s refusal and clinical decision (contraindication) or other reason (patient sent for test) not to administer.</td>
</tr>
<tr>
<td>Prescribing error</td>
<td>An incorrectly prescribed or authorized order (written or verbal).</td>
</tr>
<tr>
<td>Unauthorized/wrong drug</td>
<td>A medication that was not authorized by a legitimate prescriber was dispensed and/or administered.</td>
</tr>
<tr>
<td>Wrong administration technique</td>
<td>An inappropriate/improper technique used in the administration of a drug, including incorrectly activating a drug administration system and inappropriately crushing tablets.</td>
</tr>
<tr>
<td>Wrong dosage form</td>
<td>A dosage form dispensed/administered other than that ordered by the prescriber.</td>
</tr>
<tr>
<td>Wrong drug preparation</td>
<td>An incorrect preparation/formulation of a drug product (for example, incorrectly reconstituted or diluted).</td>
</tr>
<tr>
<td>Wrong patient</td>
<td>A product ordered for, dispensed for, or administered to the wrong patient.</td>
</tr>
<tr>
<td>Wrong route</td>
<td>The use of a wrong route of administration of the correct drug.</td>
</tr>
<tr>
<td>Wrong time</td>
<td>A scheduled dose administered outside a facility’s acceptable predetermined time interval.</td>
</tr>
</tbody>
</table>

Source: Hicks et al., 2008.

who discovers the error. It is important to recognize that any health care professional can be involved in a medication error at any one of these levels.

Medication Error Case Study

A 56-year-old female with hyperkalemia was in a medical intensive care unit and was ordered to receive sodium polystyrene sulfonate (Kayexalate®) via rectal administration. The registered nurse caring for this patient inadvertently administered the medication through the urinary (Foley) catheter instead of the rectal tube. The patient developed cystitis because of the error, which required a consult by urology to determine treatment options.

Analysis of Report

If reporting this case internally and/or externally, it should be reported that the outcome was a Category E error (see Figure 2), indicating that the patient had temporary harm (such as the cystitis) directly resulting from the medication error (instilling Kayexalate into the bladder instead of the rectum). In 2008, USP reported that during 2006, 1% (n = 1,742) out of 176,409 medication errors were Category E events (Hicks et al., 2008). Furthermore, over a 5-year period, the incidence of harm ranged between 1.25% and 1.67%, based on slightly more than 1 million medication error records.

In this case study, the error originated in the administering phase of the medication use process, where violation of one of the “5 rights” (wrong route of administration) occurred. A recent MEDMARX report indicated that 29% of errors reported during 2006 originated in this phase (Hicks et al., 2008). From MEDMARX, wrong route errors were present in 2% (n = 3,066) of the 198,024 selections for cause of error in 2006. Wrong route errors were one of the leading types of errors associated with harmful outcomes.

This specific case study did not specify a cause or contributing factor. In terms of what caused the error, the nurse involved in the error should have had the requisite skills and knowledge to safely discharge this duty, and in this instance, failed to do so. As such, the cause of error would be one of performance deficit, which would be a human error in terms of the NCC MERP taxonomy. Over a 5-year period, about 40% of all errors reported to MEDMARX involved performance deficit, making it the leading cause of error (Hicks et al., 2008).

For this particular case, contributing factors could not be confirmed or speculated upon. The 2008 MEDMARX Data Report reported that distractions were the most common (representing 48% of the reported cases) contributing factor, meaning an interruption or interference in the discharge of a task during 2006 (Hicks et al., 2008).

In the case study presented, the product sodium polystyrene sulfonate was associated with the harmful error. This is not a product typically associated with harmful errors, as USP has routinely produced lists of such products. Some products appearing on multiple lists over the past several years include insulin, morphine sulfate, heparin, hydromorphone hydrochloride, warfarin, fentanyl, potassium chloride, vancomycin, and enoxaparin sodium (Hicks et al., 2008).
that the health care system recognized the importance of this drainage bag, which tube was connected to the patient. The court case in "To Err is Human: Building a Safer Health System" pointed out that the health care system harbors a "culture of blame" for individuals involved in medical (including medication) errors, and called for performance standards to prevent such occurrences (Kohn et al., 2000). The IOM argued that by redesigning the health care delivery system, errors were preventable. The report concluded that by focusing on systems-related problems, instead of blaming individual practitioners, a significant reduction in medical errors would be possible.

As one means of changing the present culture, the IOM recommended that health care facilities and practitioners participate with reporting programs that collect adverse event data (Kohn et al., 2000). Event reporting programs afford an opportunity to aggregate data from multiple occurrences in multiple organizations. Some events may be rare occurrences within a single institution, and may make investigation and interpretation difficult. Pertaining to this case, the wrong route administration of sodium polystyrene sulfonate likely would be a single (or rare) event in the institution. When externally reported, the ability to group the single event from multiple organizations exists, thus allowing for meaningful analysis (Leape, 2002). This strategy would suggest that an organization's perspective of a "rare" event may, in fact, be not so rare after all.

Participating in event reporting programs is one mechanism to expand knowledge about the underlying systems-related factors that contribute to the events. However, reporting adverse events alone without additional actions, such as causation analysis, is meaningless (Weinberg, 2002). Participating in event reporting also means that data are collected in similar manners in order to maximize value. Understanding the basic required fields in a medication error reporting program will lead to improvements when reporting errors and ultimately identify where improvements are needed within the medication use process.

The standardized approach utilizing a reporting mechanism that defined the error and all necessary parts was useful in examining the elements along the entire continuum of the medication use process. More importantly, the case presented the institution's willingness to share the experience with others in hopes of preventing future errors, thus fulfilling one of the recommendations of the IOM report of reporting externally to a nationally recognized reporting program.

The final important point in today's patient safety environment pertains to what actions are necessary to ensure that this type of error could not happen again. Clinical practice has allowed Foley catheters to be used as rectal tubes, and in turn, the rectal tubes have been connected to drainage bags. Labeling each tube may have prevented this error from occurring because labeling may have served as a visual cue. A redesigned system of tubing and connector syringes offers the best failsafe solution and the recognition of the need for a stronger pharmacologic background for all health care providers.
While the error type (wrong route) described in the case study is not one of the more common errors reported in MEDMARX, it is one that often results in harm. The similarity of the process for instilling medications via a urinary catheter and a rectal tube is partially responsible for harm to the patient. It was likely that the patient had both a Foley catheter and a rectal tube in place. The medication was put into a syringe that could be connected to both types of tubing, and the syringe was erroneously connected to the lumen of the urinary catheter rather than the lumen of the rectal tube. There is growing recognition of medical tubing problems contributing to medication errors (and other errors as well), and evidence exists that medications intended for one type of tubing have been mistakenly administered through other types of tubing (The Joint Commission, 2006).

Conclusion

Nurses providing urologic care must continue to report all adverse events, following nationally recognized standards. Reporting errors to a national database, such as the USP-ISMP Medication Errors Reporting Program, is just one example how nurses can contribute to improving the health care system. Urologic nurses, as well as all health care professionals, should be aware of national trends for patient safety, including emerging changes leading to best practices, updates to national patient safety goals, and changes in national policy.

References


