Prevention of Medical Errors

DANA BARTLETT, RN, BSN, MSN, MA

Dana Bartlett is a professional nurse and author. His clinical experience includes 16 years of ICU and ER experience and over 20 years of as a poison control center information specialist. Dana has published numerous CE and journal articles, written NCLEX material, written textbook chapters, and done editing and reviewing for publishers such as Elsevire, Lippincott, and Thieme. He has written widely on the subject of toxicology and was recently named a contributing editor, toxicology section, for Critical Care Nurse journal. He is currently employed at the Connecticut Poison Control Center and is actively involved in lecturing and mentoring nurses, emergency medical residents and pharmacy students.

ABSTRACT

The identification and prevention of medical errors requires the participation of all members of the health team, including patients. The traditional way of coping with medical errors was to assume errors were the result of individual mistakes such as carelessness and inattention, creating a culture of blame. However, it has become clear this approach is not optimal. It does not address the root causes of medical errors, system problems, it discourages disclosure of errors, and without disclosure errors cannot be prevented. Enhancing health team knowledge levels and the environment of care helps to reduce the risk of a medical error.
Continuing Nursing Education Course Planners

William A. Cook, PhD, Director, Douglas Lawrence, MA, Webmaster, Susan DePasquale, MSN, FPMHNP-BC, Lead Nurse Planner

Policy Statement

This activity has been planned and implemented in accordance with the policies of NurseCe4Less.com and the continuing nursing education requirements of the American Nurses Credentialing Center's Commission on Accreditation for registered nurses. It is the policy of NurseCe4Less.com to ensure objectivity, transparency, and best practice in clinical education for all continuing nursing education (CNE) activities.

Continuing Education Credit Designation

This educational activity is credited for 2 hours. Nurses may only claim credit commensurate with the credit awarded for completion of this course activity.

Statement of Learning Need

The rates of medical errors remain a public health and safety risk. Safe patient care requires all members of the health team and the public to be educated on how to recognize and prevent a medical error, and to advocate for needed changes to improve the delivery of healthcare.
Course Purpose

To provide an overview of medical errors in today’s health care system and to identify the incidence and causes of medical errors and the risk factors disposing to medical errors, and to provide strategies to prevent medical errors in the healthcare setting, including by patients.

Target Audience

Advanced Practice Registered Nurses and Registered Nurses

(Interdisciplinary Health Team Members, including Vocational Nurses and Medical Assistants may obtain a Certificate of Completion)

Course Author & Planning Team Conflict of Interest Disclosures

Dana Bartlett, RN, BSN, MSN, MA, William S. Cook, PhD, Douglas Lawrence, MA, Susan DePasquale, MSN, FPMHNP-BC -all have no disclosures

Acknowledgement of Commercial Support

There is no commercial support for this course.

Activity Review Information

Reviewed by Susan DePasquale, MSN, FPMHNP-BC.

Release Date: 1/1/2016
Termination Date: 7/6/2017

Please take time to complete a self-assessment of knowledge, on page 4, sample questions before reading the article.

Opportunity to complete a self-assessment of knowledge learned will be provided at the end of the course.
1. True or false: A medical error and an adverse event are identical
   a. True
   b. False

2. Diagnostic errors occur when:
   a. an incorrect diagnosis is made
   b. the diagnosis is changed from the original diagnosis
   c. given the available data the correct diagnosis should have been made
   d. the diagnosis was made more than 72 hours after examination

3. A medication error is defined in part by the words:
   a. preventable and patient harm
   b. under-dosing and over-dosing
   c. adverse effect and therapeutic intervention
   d. avoidable and lack of vigilance

4. A common cause of medication error is:
   a. look-alike and sound-alike drug names
   b. adult drugs being used for pediatric patients
   c. patient refusal to accept the drug therapy
   d. undisclosed use of herbal supplements

5. True or false: medical errors should be disclosed to the patient.
   a. True
   b. False
6. **Diagnostic errors are more likely EXCEPT when**
   
a. the patient has a complex medical history.
b. when there are too many diagnostic resources
c. patient follow-up is sub-optimal
d. time available for diagnosis is limited or perceived to be limited.

7. **True or False. The healthcare setting is an influencing factor for diagnostic errors, such as one that is fast-paced and stressful.**
   
a. True.
b. False.

8. **A 2014 study showed a __________ error rate in medical dictation/transcription, and poor communication in the form of using non-standard abbreviations and the common use of sound-alike medications has long been known as a cause of medical errors.**
   
a. 15 %
b. 25 %
c. 30 %
d. 44 %

9. **Nurses providing teaching about medication to patients should include key points of points, such as**
   
a. the purpose for taking a medication
b. common side effects interactions
c. risk factors of taking the medication
d. All of the above.
10. **Starmer, et al. (2013)** wrote that communication errors are a leading cause of

a. sentinel events  
b. poor team dynamics  
c. medication errors  
d. documentation errors

11. True or False. It has been reported that improving handoff communication (i.e., transferring information about and responsibility for a patient) reduced medical errors from 38.3 per 100 admissions to 28.

a. True.  
b. False.

12. **Patient discharge** is

a. when medical errors can occur  
b. less of a risk factor than admission for a medical error  
c. less of a risk factor for a medical error than patient follow-up  
d. Both b and c above.

13. True or False. **Equipment failures during anesthesia** are relatively uncommon.

a. True.  
b. False.
14. One example of the second strategy to eliminate cognitive errors involves a common error in the diagnostic process known as
   a. Time out  
   b. It-Takes-Two  
   c. Anchoring  
   d. Pause  

15. Approximately 25% of medication errors that occur in the United States involve
   a. verbal orders  
   b. name confusion  
   c. hand-written notes  
   d. an inexperienced nurse

**Introduction**

Medical errors are a significant problem in the healthcare system. The seminal 1999 monograph by The Institute of Medicine (IOM) reported that between 44,000 and 98,000 patients die each year in the United States as a result of a medical error, and that 7% of all hospital admissions experience a serious medication error,\(^1\) and this disturbing situation has not changed since then. This study module is an excerpt from a larger course on medical errors that provides nurses with a review of six types of medical errors: 1) Diagnostic errors; 2) Falls; 3) Laboratory errors; 4) Medication errors; 5) Surgical errors, and; 6) Treatment errors. The incidence, etiology, and risk factors of each will be examined, and strategies for their prevention will be discussed.
Definitions Associated With Medical Errors

The terminology associated with medical errors can be confusing: adverse events, adverse effects, errors of commission, errors of omission, medical errors, near misses, preventable adverse effects, and side effects are all frequently mentioned in discussions of medical errors. All of these have some relevance to the discussion of medical errors, but the terms that are important for this module are medical error and adverse event. This module will define a medical error as:

1. Failure of a planned action to be completed as intended, or,
2. the use of a wrong plan to achieve a goal.

Medical error

A medical error may result in injury or it may not, but the potential for injury is present. Medical errors can be errors of execution or planning. An execution error is one in which a plan of action such as a specific therapy is considered appropriate and correct but it was not properly carried out. Execution errors can be errors of commission or errors of omission. In the former, an incorrect action was done unintentionally and, in the latter, the correct action was unintentionally not done. A planning error is one in which the plan of action is not considered appropriate or correct for the patient.

Adverse event
An adverse event is defined as a preventable medical error that causes harm to the patient. Not all medical errors are adverse events and medical errors and not all medical errors become adverse events. The differences between a side effect and an adverse event are predictability, severity, and consequences.

At times the distinction between a side effect and an adverse event can be blurred. A side effect is typically considered to be predictable, minor in severity and often temporary in duration, and it will not cause harm or require treatment. An adverse event is typically considered to be (somewhat) unpredictable, moderate to severe, possibly permanent, and it may cause harm and/or require treatment and stopping the use of a medication suspected to be causing the adverse event.

**Diagnostic Errors**

Diagnostic errors are relatively common, but when compared to other medical errors such as falls and medication errors they have received much less attention and research.³ Despite the obvious and immediate effects of a medical error, such as a fall, diagnostic errors can be a significant cause of morbidity and mortality and at times more so than other types of medical errors.⁴ There is no universally accepted definition of a diagnostic error. This module will define a diagnostic error as follows:⁵

A diagnostic error has occurred if the wrong diagnosis was made; and, 1) there was adequate data to suggest the correct diagnosis, or, 2) the
clinical findings should have prompted the medical provider to do further evaluation in order to make the proper diagnosis.

In essence, a diagnostic medical error has happened when it could be reasonably expected that a competent and experienced medical provider should have been able to make the correct diagnosis; or, that further evaluation and testing should have been ordered in order to make a correct diagnosis given the clinical findings.

The true incidence of diagnostic errors is not known, but it is generally assumed to be approximately 10%-15%. However, the reported incidence has varied from 1% to 55%, and a recent (2014) survey estimated the incidence of diagnostic errors in the outpatient setting to be 5.08% or 12 million adults every year in the United States. This wide range can be explained by many factors, and some key factors are outlined in the sections to follow.

**Patient population**

Consideration of the patient population involves taking into account the demographics of the persons receiving care and the location where health care is delivered. Diagnostic errors will clearly be more likely if the patient has a complex medical history and multiple medical problems. Additionally, diagnostic errors will be more likely if diagnostic resources are limited, patient follow-up is sub-optimal and the time available for diagnosis is limited or perceived to be limited.

The setting in which health care is delivered is another influencing factor, such as, a setting that is particularly fast-paced and stressful can be predisposed to diagnostic errors. Skill and experience level of
the diagnostician is another obvious factor in the accuracy of the diagnostic process.

**Data sources**

Autopsy reports, chart reviews, clinical laboratory records and reviews, medical malpractice claims, patient and provider surveys, peer reviews, simulations and standardized patients, and voluntary reporting have all been used to determine the incidence of diagnostic errors. For this purpose, all of these have strengths and weaknesses, and they can all either under-report or over-report the incidence of diagnostic errors. Still, these all reveal an incidence of diagnostic errors that is disturbing.

Autopsy studies show an incidence of diagnostic errors of 10%-20%. The use, interpretation, or follow-up of laboratory data accounted for 44% of all diagnostic errors. There have been study reports that revealed: pediatricians had a diagnostic error of over 50% within one month of being surveyed; the ability of radiologists to detect breast cancers varied by up to 11%; and, simulations and standardized patients have demonstrated a rate of diagnostic accuracy of 25% - 57%.6,9-12

Some types of diagnoses are much more difficult to make than others. Patients in their early stages of an illness, such as an infection with HIV or tuberculosis, can be very difficult to correctly diagnose. The incidence of these medical errors clearly depends in part on how they are defined.
Causes of diagnostic errors

Research into the root causes of diagnostic errors has suggested that these errors occur from either a failure of the physicians’ intuitive reasoning process (i.e., pattern recognition and memory retrieval) or a failure of their consciousness reasoning process. Viewed this way, it is possible to understand in a generalized way how diagnostic errors occur. However, it is helpful to look at the specific situational causes of diagnostic errors.

Singh, et al. (2013) examined diagnostic errors that were made in primary care settings and five distinct factors were identified as primary causes of diagnostic errors:

1. Patient related
   Singh reported that in 16.3% of all cases patient related factors were the primary causes of diagnostic error. These factors included failure of the patient to provide an accurate medical history, failure of the patient to seek help in a timely manner, a communication barrier between the patient and the practitioner.

2. Patient-practitioner
   An issue between the patient and the practitioner during the clinical encounter was identified in 78.9% of all cases of diagnostic errors. Specific problems were: errors made by the clinician during the physical examination; failure to review medical records; failure to ask questions needed to make the diagnosis (i.e., data gathering); failure to order the appropriate
diagnostic and laboratory tests; and, failure to take a comprehensive medical history.

3. Diagnostic tests
   Incorrect use, incorrect interpretation, and incorrect follow-up of diagnostic tests were identified in 13.7% of all cases of diagnostic errors.

4. Follow-up and tracking
   Inadequate follow-up and tracking errors, such as, failure to have a follow-up system in place or failure to follow-up diagnostic tests were identified in 14.5% of all cases of diagnostic errors.

5. Referrals
   In 19.5% of all cases, diagnostic error mistakes in the referral process were identified. These included failure to contact the appropriate expert, failure to identify when a referral was needed, lack of knowledge that would have helped the practitioner identify the need for a referral, failure to consider the patient’s condition serious enough to require a referral, or an error when taking a medical history.

In 43.7% of all cases in which the correct diagnosis was not made, more than one of the five factors identified above was operative. The researchers noted that in 37.9% of all cases the failure to correctly diagnose the patient’s problem could have resulted in considerable harm, and in 14.2% of the cases the patient could have suffered
immediate or inevitable death.⁵ The clinical problems were not highly complex or unusual; pneumonia, congestive heart failure, acute renal failure, and urinary tract infections were among the diagnoses that were commonly missed.⁵

The research indicates that practitioner errors involving mistakes in information gathering and synthesis and reasoning are the most common cause of diagnostic errors,⁵,¹⁴-¹⁷ and this fact could be dismissed by some as, in part, inevitable; *people make mistakes.* However, the wide variation in the incidence of diagnostic errors clearly shows that they are not inevitable and that some practitioners are *not* making cognitive errors during the diagnostic process. The hope is that the habits and techniques of a successful diagnostic process can be identified and taught, and that the incidence of diagnostic errors could be reduced. Several strategies for doing this have been researched and will be discussed later in this study module.

**Patient Falls**

Patient falls are very common medical errors, and they are one of the most common adverse events that happen to hospital in-patients.¹⁸ It has been estimated that up to 20% of all in-patients suffer a fall at least once during a hospital stay,¹⁹ and the rate of falls in acute care hospitals has been reported to be between 1.3 to 8.9 per 1000 hospital days.²⁰

**Joint Commission definition of a sentinel event:**

an unexpected occurrence involving death or serious injury or psychological injury, or the risk thereof. The term sentinel is applied to these events because they indicate the need for immediate investigation and response, and, the possibility of serious systemic errors in the healthcare facility and/or the delivery of healthcare.
Falls can be very serious. Between 30%-50% of all patient falls result in an injury, and patients who suffer a fall have longer hospital stays and higher health care costs.²⁰,²¹ The Joint Commission considers a fall that results in death or major permanent loss of function, as a result of injuries sustained in the fall, to be a reviewable sentinel event; and, fall prevention is one of the Joint Commission’s National Patient Safety Goals.²²,²³ Additionally, the World Health Organization (WHO) defines fall as an event that results in a person coming to rest inadvertently on the ground or some lower level.²⁴

Several risk factors identified with falling exist, such as being elderly or having urinary frequency.²⁵ Healthcare teams frequently use assessment tools to identify patients that are at risk for falling and there are many screening tools and fall risk algorithms available through the Center of Disease Control (CDC) website, a helpful resource with multiple fall prevention patient handouts at: http://www.cdc.gov/homeandrecreationalsafety/falls/adultfalls.html.

**Laboratory Errors**

Laboratory medical errors can be divided into three categories: pre-test, testing, and post-test. The incidence of testing performance errors, which are errors that occur with the technical processing of specimens, is comparatively low as standardization of analytical methods and materials and improved instrumentation have greatly decreased the incidence of in-laboratory analytical error.²⁸,²⁹
Most in-laboratory errors involve specimen mis-labeling,\textsuperscript{30,31} and the incidence of inaccurate test performance is very low, estimated at 0.002\%.\textsuperscript{32} However, pre-test and post-test medical errors involving the clinical laboratory are quite common.\textsuperscript{28,29} A ten-year study of laboratory errors showed that 69.1\% of all laboratory errors occurred in the pre-test phase, 15.0\% in the testing phase, and 23.1\% occurred in the post-test phase.\textsuperscript{33} Pre-test and post-test errors are outlined below:

Pre-test errors:
\begin{enumerate}
\item Inappropriate ordering of tests, \textit{i.e.}, ordering a test that has no relevance to the clinical situation;
\item Test performance and specimen collection errors such as improper site preparation, specimen contamination, improper performance of the test, not using the correct specimen containers or tubes, mislabeling of specimens, and performing a test on the wrong patient.
\end{enumerate}

Post-test errors:
\begin{enumerate}
\item Errors in receiving, such as test results being incorrectly transmitted by the sender, test results being incorrectly recorded by the receiver, and test results not transmitted to the right person or not transmitted in a timely manner;
\item Errors in interpretation;
\item Errors in follow-up, such as failure to check for test results, failure to use test results in a timely manner, failure to order further testing that would be indicate by the previous test results, failure to appropriately use test results to change
therapies, and failure to send test results to patients or to contact them about test results.\textsuperscript{28,32}

Plebani (2010) noted that laboratory errors could result in mistakes in digoxin or heparin therapies, inappropriate admissions, and other clinical problems.\textsuperscript{33} Additionally, 24\%-30\% of laboratory errors had an effect on patient care, and the risk for adverse events from laboratory errors was 2\%-12.7\%.\textsuperscript{33} Such studies highlight the serious harm to patients that can occur as a result of laboratory errors.

\textbf{Medication Errors}

A medication error is defined in this section as follows:

"\textit{Any preventable effect that may cause or lead to inappropriate use or patient harm while the medication is in control of the healthcare professional, patient, or consumer.}"\textsuperscript{34}

Two terms in this definition that should be remembered are \textit{preventable} and \textit{patient harm}; indicating that the medication error was preventable and may have caused or lead to patient harm. In this study module, the medication errors presented are divided into four categories:

1. Prescribing
2. Administration or preparation
3. Dispensing
4. Monitoring

\textbf{Prescribing errors}
Prescribing errors include but are not limited to:

1. Wrong drug because of drug-drug interactions and/or drug allergies;
2. Incorrect dose, concentration, route, or frequency;
3. Drug prescribed for the wrong patient;
4. Duplicate drugs prescribed;
5. The appropriate drug not prescribed;
6. The prescription was written illegibly or improper abbreviations were used.

Transcribing errors involve a mistake that was made when the order was transcribed, either in the pharmacy or in a clinical setting.

**Administration and preparation errors**

Administration errors are often the same as prescribing errors and include:

1. Missed doses or doses given at an incorrect time;
2. Medication given by someone unauthorized to do so;
3. Improper administration technique;
4. Incorrect rate of administration;
5. Administration of an expired drug;
6. Drug prematurely discontinued or administered for too long;
7. Duplicate administration, i.e., a double dose;
8. Incorrect dosage calculations;
9. Failure to document administration of a drug or incorrect documentation;
10. Failure to use medication administration safeguards, i.e., double checking calculations;
11. Failure to comply with medication administration policies, i.e., leaving medications unattended, and not watching a patient take a medications;
12. Improper or incomplete administration directions given to a patient.

Preparation errors are typically a drug improperly constituted or incorrectly concentrated.

**Dispensing errors**

Dispensing: A drug can be dispensed to the wrong patient, the drug may not be dispensed in a timely manner, or the wrong drug can be dispensed.

**Monitoring errors**

Monitoring is a very important part of medication therapy to ensure the medication is effective, tolerated, and to make dose adjustments. Safe use of medications like digoxin, lithium, and warfarin requires periodic laboratory testing of blood levels, and other drugs require measurement of blood glucose, electrolytes, or renal function in order to measure their effectiveness or to detect adverse effects. *Monitoring errors* includes:

1. Not ordering the proper laboratory tests;
2. Not responding appropriately to laboratory tests;
3. Ordering test but the test are not performed;
4. Failure to monitor for drug effectiveness, adverse effects, and side effects.

Monitoring errors appear to be less common than prescribing, administering, and dispensing errors, but there is limited data and a wide variation in monitoring errors has been reported. In a 2012 study, 6048 prescriptions written by general practitioners showed a 0.9% rate of monitoring errors,\textsuperscript{35} but a 2009 study of nursing homes showed a 14.7% rate of monitoring errors.\textsuperscript{36}

Clearly, medication errors are not unusual, but for several reasons the exact incidence of medication errors is not known. Firstly, there is no universally used system for detecting and reporting medication errors. Self-reporting, incident reports, chart reviews, direct observation, and trigger tools can and have been used as tools for detecting medical errors, but each one yields different results. Self-reporting appears to greatly underestimate medication errors while direct observation consistently detects a large number of medication errors.\textsuperscript{37} Secondly, the definition of a medication error is a significant influence on the reported incidence of medication errors.

Keers, \textit{et al.} (2013) did a systematic review of 91 direct observational studies of medication errors and found a median error rate of 19.6\%,\textsuperscript{37} but if timing errors (\textit{i.e.}, the medication was not given at the prescribed time) were excluded, the median error rate was 8.0\%.\textsuperscript{37} The issue is further complicated by different definitions of timing error.
Some of the studies Keers, et al., reviewed defined a timing error as a delay of 30 minutes or more while some simply reported timing errors but did not provide a definition of what a timing error was considered to be. In addition, 28 of the 91 research papers either did not define a medication error or used a definition that was exclusive to the study.

Despite the difficulty in determining the true incidence of medication errors, the reviews of the literature and the studies of medication errors are very instructive. Regardless of study design or the definition of medical error that was used, the research consistently shows that the incidence of medication errors is disturbingly high and that there are *multiple* and easily identifiable causes of medication errors. Baumgart-Huckels (2014), et al., studied the rate of medication errors, and the causes and consequences of medication errors in a large teaching hospital over a four-year period.\(^38\) The use of medication was divided into a process of five steps:

1. Prescribing
2. Transcribing
3. Preparation
4. Administration
5. Monitoring

Medication errors in the 2014 study were categorized as the wrong patient, wrong dose, wrong drug, wrong dose, wrong quantity, or a medication omitted/not given. Medication errors recorded in the four-year period amounted to 1591 incidents, and most of the errors occurred during the medication preparation and administration steps.
The majority of the medication errors, 74.2%, involved more than one-step in the medication use process, and only 25.8% were detected early in the process. The authors report that 84.3% of the errors reached the patients and 8.8% reached the patient and required monitoring to confirm no harm or intervention to prevent harm. The authors also reported that inattention was the most common cause of the medication errors (60.5%). This was followed by work conditions, such as poor staffing and heavy workload (31.4%). Ryan, et al. (2014) also examined the prevalence and causes of prescribing errors made by trainee physicians. A prescribing error was defined as:

“One which occurs when, as a result of a prescribing decision or prescription writing process, there is an unintentional significant reduction in the probability of treatment being timely and effective or an increase in the risk of harm when compared with generally accepted practice.”

A total of 44,276 prescriptions were examined, and the error rate was 7.5%. The most common prescribing order error is omission, such as, when a medication was not ordered but should have been. Doses that were too low or too high were also common; however, fortunately, prescribing medications that would result in a harmful interaction and prescribing a medication for the wrong patient were uncommon, which accounted respectively for 1.5% and 0.5% of the errors.

Ryan, et al. (2014) identified that prescribing errors were “of frequent and of complex causation”. The authors also found that the work environment and the lack of knowledge of medications by health staff were the most common causes of the medication prescribing errors. It
is interesting to note that a potential cause of a prescribing error was due to the physicians’ perception that if they made a prescribing error it was likely to be detected by other physicians or hospital staff and the error corrected before a medication administration error occurred.

Honey, et al. (2014) also studied 2491 prescriptions that were written by medical residents and found a prescribing error rate of 5.88%. Doses that were too high, too low, or of unclear quantity were the most common prescribing errors, which accounted respectively for being 17.3%, 13.8%, and 12.7% of the errors made. The study was of pediatric patients; and, the relatively high rate of dosage errors were presumed to be because drug dosages for children are more frequently based on body weight than drug dosaging for adults, thus, more proneness to human error of drug dosing calculations made by the prescriber.

Beardsley, et al. (2013) examined the medical records of all patients who had been discharged from a general medical practice. Patient records were examined for a period of 60 days prior to discharge and for a period of 60 days after discharge. The authors found prescribing errors in 34.5% of the pre-discharge records and in 17% of the post-discharge records. Medication omission and dosage errors were the most common, and 3% of the errors were considered to be serious, such as:

- the route of administration could have led to severe toxicity;
- the dose was 4-10 times the normal and the drug had a low therapeutic index;
• the dose was too low and the patient had a serious condition;
• the dose was too high and led to a blood level that was potentially toxic.

The risks of medication errors increase if the patient is very young, very old, has complex medical problems, or is taking multiple medications. The risk for medication errors has also been associated with specific drugs. The United States Pharmacopeia published a list of medications that were commonly involved in medication errors:

\[
\begin{array}{|c|c|}
\hline
\text{MEDICATION NAME} & \% \text{MEDICATION ERROR} \\
\hline
\text{Insulin} & 4\% \\
\text{Morphine} & 2.3\% \\
\text{Potassium chloride} & 2.2\% \\
\text{Albuterol} & 1.8\% \\
\text{Heparin} & 1.7\% \\
\text{Vancomycin} & 1.6\% \\
\text{Cefazolin} & 1.6\% \\
\text{Acetaminophen} & 1.6\% \\
\text{Warfarin} & 1.4\% \\
\text{Furosemide} & 1.4\% \\
\hline
\end{array}
\]

The list above was similar to one published by Grissinger in 2007, which is outlined in the table below:
<table>
<thead>
<tr>
<th>Medication</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin</td>
<td>8%</td>
</tr>
<tr>
<td>Anticoagulants</td>
<td>6.2%</td>
</tr>
<tr>
<td>Amoxicillin</td>
<td>4.3%</td>
</tr>
<tr>
<td>Aspirin</td>
<td>2.5%</td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole</td>
<td>2.2%</td>
</tr>
<tr>
<td>Hydrocodone/acetaminophen</td>
<td>2.2%</td>
</tr>
<tr>
<td>Ibuprofen</td>
<td>2.1%</td>
</tr>
<tr>
<td>Acetaminophen</td>
<td>1.8%</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>1.6%</td>
</tr>
<tr>
<td>Penicillin</td>
<td>1.3%</td>
</tr>
</tbody>
</table>

Desai, *et al.* (2013) in a study of medications errors that occurred in nursing homes and residential facilities found that anxiolytics/sedatives/hypnotics, anti-diabetic agents, anticoagulants, anticonvulsants, and ophthalmic preparations were “frequently and disproportionately involved in errors in nursing homes . . .”, and “. . . certain drug classes are more likely to be involved in medication errors in nursing home patients regardless of the extent of their use.”

**Other Medical Errors**

There are other medical errors noted in the literature, which would be outside the scope of this study. This includes a wide body of research and literature on surgical and other treatment errors in healthcare settings.

**Surgical errors**

Major complications occur in 3%-16% of all surgical procedures and the rate of permanent disability or death from surgery has been
reported to be 0.4%-8%\textsuperscript{45} Each year in the United States there are over 70 million applications of anesthesia\textsuperscript{52} and errors are inevitable. Equipment failures during anesthesia are relatively uncommon. Most involve a disconnection or misconnection of the breathing circuit and the rate of these errors has been estimated to range from 0.06% to 0.7%,\textsuperscript{53} however, these types of errors account for approximately 20% of all critical anesthesia events.\textsuperscript{54} The incidence of medication errors in the practice of anesthesia has been reported to be 1 in every 13,000 administrations.\textsuperscript{55}

Antibiotics, inhalation gases, local anesthetics, muscle relaxers, opiates, and vasoactive drugs are the medications most commonly involved in anesthesia medication errors.\textsuperscript{56} Failure to read labels or misreading labels, distractions, carelessness and inattention, lack of vigilance, stress and poor communication are the root causes of anesthesia medication errors; and, they usually result in a missed dose, an incorrect dose, improper drug substitution, omission, double dosing, or the use of an incorrect route.\textsuperscript{57}

**Treatment errors**

Other *treatment* errors are those errors that occur during the performance of an operation, test, or procedure.\textsuperscript{1} The following list includes examples of treatment errors, and is not all-inclusive.

- Administering blood and blood products
- Advanced monitoring, \textit{i.e.}, intracranial pressure monitoring
- Intravenous insertions
- Nasogastric tube insertions
- Phlebotomy
• Urinary catheterization

Surgical errors have been closely studied to help health teams identify mistakes most likely to happen. The basic types of errors that can be made when nurses are performing a procedure, such as collecting a specimen or doing a treatment during post-operative care, are errors identified during planning performance and follow-up. The root causes of treatment errors involve human factors and system factors.

**Prevention Of Medical Errors**

Human factors and system factors are the root causes of medical errors, but there are certain ways in which people perform and that healthcare systems are organized which are the specific causes of medical errors. These human and system factors are discussed below.

**Fragmentation**

The use of multiple medical specialists or medical systems to care for one individual is a large contributor to errors. Information does not always follow patients; there is no one place that knows all about one patient’s health. Fragmented health services are largely responsible for health care information not being centralized.

One medical provider caring for all of a patient’s medical needs is not the norm in today’s health care setting. Fragmentation leads to duplicate medications and services, which is not only costly but increases the risk of a medical error. An individual with diabetes, heart failure, prostate cancer and depression could be seeing six providers including an endocrinologist, cardiologist, urologist, oncologist,
psychiatrist, and a primary care provider. The increasing use of hospitalists is another piece of the health care system that leads to fragmentation.

The hospitalist is a medical provider specializing in the care of the patient who is admitted to the hospital. These providers are experts in caring for hospitalized patients, but they are not primary care providers and the lack of familiarity with the patient and (perhaps) incomplete access to a patient’s medical history can be a source of errors. Fragmentation can also be a result of the use of different pharmacies and hospitals.

**Time constraints**

Health care takes place at a rapid pace. Each day, providers are seeing a large volume of patients, pharmacists are filling a large number of prescriptions, and nurses are often caring for more patients than they should. Many health care providers are overworked. They need to work fast to meet the demands of administrators, patients and the financial bottom line. When people are working quickly - perhaps too quickly - the risk of errors is increased. Nurses often report that they do not have enough time to properly perform their work.

**Poor communication**

Poor communication is often identified as a major cause of medical errors. Communication errors are common and can happen anywhere within the healthcare system. For example, a 2014 study showed a 30% error rate in medical dictation/transcription, and poor
communication in the form of using non-standard abbreviations and the common use of sound-alike medications has long been known as a cause of medical errors.

Starmer, et al. (2013) wrote that communication errors are a leading cause of sentinel events, and that improving handoff communication (i.e., transferring information about and responsibility for a patient) reduced medical errors from 38.3 per 100 admissions to 18.3. Poor communication is also an issue between healthcare providers and patients. Good listening requires that the health care provider listen fully and hear their patient. In addition to listening, health care providers need to communicate information accurately and simply.

**Lack of knowledge**

Both researchers and healthcare professionals often identify lack of knowledge as a major cause of medical errors, and lack of knowledge affects all parts of the healthcare delivery process. They also note that there is a lack of resources and/or time for increasing knowledge.

**Healthcare setting**

Emergency rooms, intensive care units, and the operating room are high-risk areas for medical errors. The health acuity of the patients (intensive care and emergency room), sudden and unexpected increases in patient census (emergency room), and the use of anesthesia and the need for strict adherence to infection control protocols (operating room) all contribute to an increased incidence of medical errors in these settings of patient care.
Admission and discharge to the hospital are common times in which medical errors occur. A medical provider who is unfamiliar with the patient’s medical history often admits the patient to the hospital, and the patient is often in his/her most vulnerable condition at the time of admission. Discharge requires patient teaching, perhaps many new medications that the patient must take, and follow-up care; these are multiple opportunities for mistakes to be made and medical errors to occur.

**Medical Errors And Reduction Strategies**

Reducing the number of medical errors is an important part of improving the American health care system. There is a three-tier approach to reducing the number of errors. The first is an overall improvement in the health care system. Currently, there is a national focus with health care leaders working to collect data, enhance knowledge to reduce the number of medical errors. The second is an effort on each individual health care provider to provide safe and effective care. Lastly, each patient needs to be an active consumer of health care. Some specific interventions that can be used to reduce types of medical errors will be presented first in this section, followed by a short discussion on helping patients prevent medical errors.

**Diagnostic errors**

Thammasitboon and Cutrer (2013) categorized diagnostic errors and found cognitive mistakes that were common to many diagnostic errors. Their strategies to eliminate cognitive error and improve diagnostic accuracy focused on three areas. The first strategy was
expanding clinical expertise, which is simply involves identifying the gaps in the knowledge base and to try to eliminate them. The second strategy is to avoid cognitive processing errors, and this is subtler; the authors described eight cognitive errors that can cause a diagnostic error and strategies for correcting them.

One example of the second strategy to eliminate cognitive errors involves a common error in the diagnostic process known as *anchoring*, which involves the clinician staying with the original diagnosis despite evidence to the contrary. In order to correct or reduce anchoring, clinicians can be trained to consciously use de-biasing techniques, to periodically re-evaluate evidence, and to *pause* during the diagnostic process and to re-examine their assumptions. In the final strategy to eliminate cognitive errors, wrong diagnoses can be avoided by reducing the cognitive burden. This can be achieved through appropriate requests for consultations (*i.e.*, another medical specialist or ancillary health service), the use of checklists, or by team consensus or decision-making.

**Medication error prevention**

The causes of medication errors are complex, and there are many possible approaches to the problem. A simple and effective way to avoid medication errors is through the use of the *eight rights* of medication administration. These eight rights of medication administration include:

1. *Right patient*
   All healthcare facilities have a procedure for identifying patients. The minimum number of identifiers is two, and the patient must
be correctly identified in person and on all medication orders. Making sure the nurse is giving a medication to the right patient is largely a matter of communication.

2. **Right drug**
   The medication and the order must be checked against one another to make sure that the right drug will be given. Also, before giving a drug that is new for a patient, the nurse should re-check drug allergies, re-check possible drug-drug-interactions, and make sure that at some time the patient has been asked about her/his use of herbal supplements.

3. **Right dose**
   The right dose should be checked using current references, with the pharmacy or an appropriate staff member as secondary resources. Nurses should be aware of common dosing errors such as a 10-fold increase in dose, and calculations should be double-checked.

4. **Right route**
   These are important questions a prudent nurse would want to consider related to patient status and the right route. The nurse should always check to see that the route is correct.

5. **Right time**
The nurse should always check to see when the last medication dose was given to make sure that it is not being administered too early or too late.

6. Right documentation
   Proper documentation should include the time and route of administration, and, if needed, the patient’s vital signs before and after medication administration.

7. Right reason
   A medication should be appropriate for the patient and for the clinical condition it is supposed to treat, and nurses have a responsibility to check this information before giving a drug.

8. Right response
   The definition of a drug is a substance that is given to prevent or treat an illness, and which has a measurable effect. In order to avoid medication errors nurses should have a basic understanding of how a drug works, and how its effectiveness can be measured or monitored.

Two other preventive strategies for avoiding medication errors are: 1) awareness of look-alike and sound-alike drugs; and, 2) using abbreviations properly. Approximately 25% of medication errors that occur in the United States involve name confusion, and these errors have the potential to cause great harm. Several websites include The United States Pharmcopeia and The Institute for Safe Medication
Practices, which can be accessed by nurses. Regarding proper use of abbreviations, each healthcare facility should have a list of acceptable abbreviations and nurses should know where the list is and what it contains.

Commonly used abbreviations related to medication administration that can be used mistakenly or misidentified are ones, such as: U (or u) intended to mean unit but easily mistaken for a 0 or 4; SC intended to mean subcutaneous but easily mistaken for SL (sublingual); and, QOD intended to mean every other day but easily mistaken as QD (every day) if it is written sloppily. The Institute for Safe Medication practices has a list of dangerous abbreviations and dose designations on its website at: http://www.ismp.org/newsletters/acute-care/articles/dangerousabbrev.asp.

**Avoiding surgical errors**

There are many approaches to avoiding medical errors involving surgery, but one of the simplest and most commonly used is the World Health Organization (WHO) Surgical Safety Checklist. This can be viewed on the WHO website at http://www.who.int/patientsafety/safesurgery/ss_checklist/en/.

The Surgical Safety Checklist has three components: the sign in, the time out, and, the sign out. These three components correspond to before anesthesia, before skin incision, and the post-operative period.
Prevention of treatment errors

Methods for preventing treatment errors are essentially the same as those used for preventing the other medical errors that have been discussed previously. These methods include health team members having a good knowledge base, good communication, and team adherence to the healthcare facility’s protocols.

Preventing Medical Errors: Helping The Patient

Medical errors by patients, especially medication errors, are very common and may cause serious harm. Acetaminophen is very popular and very safe when taken in therapeutic amounts. However, in recent years acetaminophen overdose has been the leading cause of acute liver injury in the United States, and many of these cases are not deliberate overdoses done with the intent to cause self-harm but therapeutic mistakes made by the lay public.

Teaching patients about medication safety is an important part of preventing medication errors. Prescribers, nurses and pharmacists should spend time teaching patients about their medications. Nurses providing teaching about medication to patients should encourage them to write this information down. Key points of patient teaching and medication administration and safety should include such concerns as the purpose for taking a medication and common side effects, interactions and risks that require ongoing monitoring.

Disclosure Of Medical Errors
Medical errors should be disclosed to the patient and, if appropriate, to family members. Disclosure of an error is difficult, but it is vital for the patient’s physical and emotional wellbeing. Disclosure of an error is also vital for the well being of the healthcare system as acknowledging errors is the first step in correcting them.

In many jurisdictions the disclosure of medical errors is mandatory and most health care facilities have, or should have, a policy that outlines how and by who a medical error should be disclosed. This policy should be reviewed before a medical error is disclosed.

**Summary**

The prevention of medical errors is not easy. Hospitals and other healthcare facilities are complex organizations and the work environment is fast-paced. There is significant external and internal pressure on staff to perform the work correctly, which requires experience and specialized knowledge. The traditional culture of blame has made it hard to disclose errors and learn from them. However, other organizations that share many of these stresses, such as the airlines, are remarkably error free. They have done this by a commitment to preventing errors and not reacting to errors. If safe patient care is the goal, perhaps modeling other public service industries that have successfully reduced errors is the way for the healthcare industry moving forward.
Please take time to help NurseCe4Less.com course planners evaluate the nursing knowledge needs met by completing the self-assessment of Knowledge Questions after reading the article, and providing feedback in the online course evaluation.

Completing the study questions is optional and is NOT a course requirement.

1. **True or false: A medical error and an adverse event are identical**
   a. True
   b. False

2. **Diagnostic errors occur when:**
   a. an incorrect diagnosis is made
   b. the diagnosis is changed from the original diagnosis
   c. given the available data the correct diagnosis should have been made
   d. the diagnosis was made more than 72 hours after examination

3. **A medication error is defined in part by the words:**
   a. preventable and patient harm
   b. under-dosing and over-dosing
   c. adverse effect and therapeutic intervention
   d. avoidable and lack of vigilance

4. **A common cause of medication error is:**
   a. look-a-like and sound-alike drug names
   b. adult drugs being used for pediatric patients
   c. patient refusal to accept the drug therapy
   d. undisclosed use of herbal supplements
5. True or false: medical errors should be disclosed to the patient.
   a. True
   b. False

6. Diagnostic errors are more likely EXCEPT when
   a. the patient has a complex medical history.
   b. when there are too many diagnostic resources
   c. patient follow-up is sub-optimal
   d. time available for diagnosis is limited or perceived to be limited.

7. True or False. The healthcare setting is an influencing factor for diagnostic errors, such as one that is fast-paced and stressful.
   c. True.
   d. False.

8. A 2014 study showed a __________ error rate in medical dictation/transcription, and poor communication in the form of using non-standard abbreviations and the common use of sound-alike medications has long been known as a cause of medical errors.
   a. 15 %
   b. 25 %
   c. 30 %
   d. 44 %
9. **Nurses providing teaching about medication to patients should include key points of points, such as**
   
a. the purpose for taking a medication  
b. common side effects interactions  
c. risk factors of taking the medication  
d. All of the above.

10. **Starmer, et al. (2013) wrote that communication errors are a leading cause of**
   
a. sentinel events  
b. poor team dynamics  
c. medication errors  
d. documentation errors

11. **True or False. It has been reported that and that improving handoff communication (i.e., transferring information about and responsibility for a patient) reduced medical errors from 38.3 per 100 admissions to 28.**
   
a. True.  
b. False.

12. **Patient discharge is**
   
a. when medical errors can occur  
b. less of a risk factor than admission for a medical error  
c. less of a risk factor for a medical error than patient follow-up  
d. Both b and c above.
13. True or False. Equipment failures during anesthesia are relatively uncommon.

a. True.
b. False.

14. One example of the second strategy to eliminate cognitive errors involves a common error in the diagnostic process known as

a. Time out
b. It-Takes-Two
c. Anchoring
d. Pause

15. Approximately 25% of medication errors that occur in the United States involve

a. verbal orders
b. name confusion
c. hand-written notes
d. an inexperienced nurse

Correct Answers:

1. b  6. b  11. b
2. c  7. a  12. a
3. a  8. c  13. a
4. a  9. d  14. c
5. a  10. a  15. b
References Section

The reference section of in-text citations include published works intended as helpful material for further reading. Unpublished works and personal communications are not included in this section, although may appear within the study text.


59. David GC, Chand D, Sankaranarayanan B. Error rates in physician


67. Ostini R, Roughhead EE, Kirkpatrick CMJ, Monteith GR, Tett SE. Quality use of medications – medication safety issues in naming: look-


The information presented in this course is intended solely for the use of healthcare professionals taking this course, for credit, from NurseCe4Less.com.

The information is designed to assist healthcare professionals, including nurses, in addressing issues associated with healthcare.

The information provided in this course is general in nature, and is not designed to address any specific situation. This publication in no way absolves facilities of their responsibility for the appropriate orientation of healthcare professionals.

Hospitals or other organizations using this publication as a part of their own orientation processes should review the contents of this publication to ensure accuracy and compliance before using this publication.

Hospitals and facilities that use this publication agree to defend and indemnify, and shall hold NurseCe4Less.com, including its parent(s), subsidiaries, affiliates, officers/directors, and employees from liability resulting from the use of this publication.

The contents of this publication may not be reproduced without written permission from NurseCe4Less.com.