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Contact Hours: **6**

## Medical Errors Prevention and Patient Safety

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**LEARNING OUTCOME AND OBJECTIVES:** Upon completion of this course, you will understand current, evidence-based interventions to prevent medical errors in the practice setting. Specific learning objectives include:

- Discuss the scope of medical errors in the U.S. healthcare environment.
- Define the terminology associated with medical errors.
- Describe the causes of medical errors.
- Review the most common medical errors and strategies to prevent them.
- Summarize the elements of effective communication and documentation.
- Identify error risks among populations of special vulnerability.
- Describe various initiatives of the patient safety movement.
- Discuss accrediting agency standards and goals.
- Outline institutional strategies to prevent medical errors.

### INTRODUCTION

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It would seem essential that every healthcare encounter a person has should be safe and free from harm. Unfortunately, this is not always the case. Although the vast majority of Americans are having positive experiences with the healthcare system, nearly a quarter of adults report having personally experienced a medical error. Errors occur in hospitals, clinics, surgery centers, doctors' offices, nursing homes, pharmacies, and even in patients' homes.

These facts make medical errors a serious public health issue, with every patient involved in the healthcare system a potential recipient of harm. Injuries and death can occur, for example, when patients develop healthcare-associated infections, receive a wrong medication or dose of medication, experience mistakes in surgery, receive treatments meant for another patient, experience a fall in the hospital, develop a pressure ulcer/injury, are misdiagnosed, orders are misinterpreted, or equipment fails.

Those in leadership roles claim that the main reason for preventable medical mistakes is a healthcare system that is inadequate for the complexities of 21st-century medicine. It is acknowledged that the U.S. healthcare system is resistant to change because it is a fragmented, nonuniform system that lacks any centralized control and that many healthcare systems do not adequately invest in patient safety by putting well-known safety improvement strategies in place (Kavanagh et al., 2017).

Errors can occur at any point in the healthcare system. Analyzing why medical errors happen has traditionally been focused on the human factor, concentrating on individual responsibility for making an error, and the solutions have involved training or retraining, additional supervision, or even disciplinary action. The alternative to this is a system-centered approach, which assumes that humans are fallible and that systems must be designed so that humans are prevented from making errors.

Acknowledging that errors happen, learning from them, and working to prevent errors in the future are important goals and represent a major change in the culture of healthcare—a shift from blame and punishment to analysis of the root causes of errors and the creation of strategies to improve. In other words, healthcare organizations need to create a culture of safety that views medical errors as opportunities to improve the system. Every person on the healthcare team has a role in making healthcare safer for patients and workers.

## SCOPE OF THE MEDICAL ERROR PROBLEM

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Current studies estimate that medical errors are the third leading cause of death in the United States, trailing heart disease and cancer. In 2016, the Leapfrog Group estimated there were 206,201 avoidable deaths in hospitals, and a Johns Hopkins University team estimated deaths at greater than 250,000. However, there is an ongoing debate regarding these estimates, as there are no well-established means as yet for calculating mortality caused by medical harm.

Such numbers are hard to determine because, although there are ICD codes to report mistakes, death certificates lack a place to indicate whether a medical mistake caused or contributed to a patient's death, and there remains the question as to whether physicians will want to report them on death certificates, which are usually considered public records (Kavanagh et al., 2017).

The great majority of healthcare takes place in the outpatient setting. It is estimated that 5% of adults in the United States experience a missed or delayed diagnosis each year, and 4.5 million outpatient visits occur every year due to adverse drug events. These are two of the most common problems encountered in ambulatory care. Over the past few years, efforts have been focused in



improving patient safety in this area. The Joint Commission has developed National Patient Safety Goals to improve patient safety and has issued Ambulatory Health Care National Patient Safety Goals effective January 2017 to provide further guidance in the enhancement of safety in all ambulatory facilities (AHRQ, 2017a).

A national survey released in September 2017 found that 21% of adults report having personally experienced a medical error, often with a lasting impact on their physical and emotional health, financial well-being, or family relationships. The survey also found that 31% of Americans report that an individual they are closely involved with experienced an error. Ambulatory settings were found to be a frequent site of errors, and errors related to diagnosis and patient-provider communications were the most common. The survey also found that 8 in 10 Americans believe that patient safety is the responsibility of healthcare providers, hospital leaders, and administrators, as well as family members and patients (NPSF, 2017; IHI, 2017a).

Looking at malpractice payout statistics in all settings provides a broad view of medical errors overall; however, these show only a fraction of the actual number of medical errors, as most patients who are harmed by error do not seek damages, and many who do are denied compensation. An analysis of malpractice payout statistics for 2016 based on the U.S. Department of Health and Human Services' National Practitioner Data Bank Public Use Data File are reported in the table below.

<b>MALPRACTICE PAYOUTS</b>	
<b>Patient type:</b>	<ul style="list-style-type: none"> <li>• 44% inpatient</li> <li>• 41% outpatient</li> </ul>
<b>Due to errors in:</b>	<ul style="list-style-type: none"> <li>• Diagnosis, 34%</li> <li>• Surgery, 24%</li> <li>• Treatment, 28%</li> <li>• Obstetrics, 10%</li> <li>• Medication, 4%</li> <li>• Monitoring, 4%</li> <li>• Other, 6%</li> </ul>
<b>Severity of outcome:</b>	<ul style="list-style-type: none"> <li>• Death, 31%</li> <li>• Significant permanent injury, 18%</li> <li>• Major permanent injury, 17%</li> <li>• Quadriplegic, brain damage, lifelong care, 14%</li> <li>• Minor permanent injury, 7%</li> <li>• Major temporary injury, 7%</li> <li>• Other, 6%</li> </ul>
Source: Diederick Healthcare, 2017.	



## Progress in Patient Safety

In 1999 the Institute of Medicine published *To Err Is Human: Building a Safer Health System*. Since that time, efforts have been ongoing to improve patient safety.

### IN INPATIENT SETTINGS

The U.S. Department of Health and Human Services' Agency for Health Research and Quality (AHRQ) estimates the incidence of medical errors that occur each year in U.S. hospitals. AHRQ reports that 2015 data indicated a 21% decline in hospital-acquired conditions compared to data from 2010. The following percentages reflect these reductions:

- Adverse drug events: 29% decrease
- Catheter-associated urinary tract infections: 33% decrease
- Central line-associated bloodstream infections: 91% decrease
- Falls: 15% decrease
- Obstetrical events: 10% decrease
- Pressure ulcers: 10% decrease
- Surgical site infections: 16% decrease
- Post-op venous thromboembolism: 76% decrease  
(AHRQ, 2016b)

AHRQ estimates that nearly 125,000 fewer patients died in the hospital as a result of hospital-acquired conditions and that approximately \$28 billion in healthcare costs were saved from 2010 to 2015.

The exact cause of the decline in patient harm is not fully understood; however, increased attention to safety to reduce adverse events by hospitals throughout the country has occurred. Likely reasons for this progress may be Medicare and Medicaid payment incentives, the U.S. Department of Health and Human Services Partnership for Patient Initiative, public reporting of hospital-level results, and technical assistance offered to hospitals by the Quality Improvement Organization program (AHRQ, 2016b).

### IN AMBULATORY CARE

Although there has been a great deal of research done on adverse events in hospital settings, AHRQ estimates that only 10% of patient-safety studies have been performed in outpatient settings, even though outpatient settings may pose the greater challenge (AHRQ, 2017c). As a result, far less is known about the nature, causes, or consequences of incidents in primary care, and no studies thus far have been able to confidently state the rate of patient safety incidents in such settings.



It is generally agreed, however, that the focus on outpatient patient safety is just beginning to be addressed, and efforts are underway to make improvements in this practice setting. An example of such an effort is the Health Partners Ambulatory Patient Safety Toolkit for 2017, which provides practical tools and suggestions to incorporate into clinical operation. The goal is to promote well-designed systems and processes that allow an organization to deliver care with reliability, consistency, and the ability to detect and quickly recover from an error before harm occurs (Health Partners, 2017).

The AHRQ also provides guidance in the improvement of patient safety in primary care settings by offering tools and resources that enhance the reliability of laboratory testing; establish a culture of patient safety; improve the safety of care transitions; and identify techniques, tools, and strategies for clinicians to improve teamwork and performance (AHRQ, 2017c).

## TERMINOLOGY ASSOCIATED WITH MEDICAL ERRORS

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### Adverse Events

*Medical error*, also referred to as *adverse event*, is a broad term ascribed to an act of commission (doing something wrong) or omission (failing to do something right) in medical management that leads to an undesirable outcome or serious potential for such an outcome that is unrelated to the patient's underlying condition. Such adverse events are unintended and may require additional monitoring, treatment, hospitalization, or result in disability or death.

Important subcategories of adverse events include:

- **Unpreventable** adverse events result from a complication that cannot be prevented. Example: A patient has an allergic reaction to a drug appropriately prescribed, dispensed, and administered.
- **Preventable** adverse events occur due to error or failure to apply an accepted standard for prevention. Example: A patient with diabetes has the wrong foot amputated.
- **Ameliorable** adverse events are those that could have been less harmful if different actions or procedures had been performed or followed. Example: A clinician fails to respond to medication-related symptoms.
- **Negligence** is the result of care that falls below the standards expected of clinicians in the community. Example: A clinician fails to check the patient's record, which indicates an allergy to the antibiotic being prescribed.  
(AHRQ, 2017b)

### Near Misses

Near misses are events that could have had an adverse consequence but did not. In a near miss, an error was committed but the patient did not experience clinical harm because of early



detection or sheer luck. They are indistinguishable from adverse events in all but outcome. Example: A nurse recognizes a potential drug overdose in a physician's prescription and does not administer the drug but instead calls the error to the physician's attention (AHRQ, 2017b).

## Sentinel Events

The Joint Commission defines *sentinel event* as a patient safety event, incident, or condition that could have resulted or did result in any of the following:

- Death
- Permanent harm
- Severe temporary harm and intervention required to sustain life

Sentinel events are so named because they signal the need for immediate investigation and response. Sentinel events and medical errors are not identical. Not all sentinel events occur because of an error, and not all medical errors result in sentinel events. For example, a patient has a severe allergic reaction to a medication taken successfully in the past (TJC, 2017a).

## Never Events

The National Quality Forum (NQF, 2017) has developed and endorsed a list of 29 events that are termed *serious reportable events (SREs)* and considered to be extremely rare medical errors. These errors are also referred to as *never events*—events that should never happen—and are grouped into seven categories, as follows:

### Surgical SREs

- Surgery/invasive procedure performed on wrong body parts
- Surgery/invasive procedure performed on the wrong patient
- Wrong surgical/invasive procedure performed on a patient
- Unintended retention of a foreign object in a patient post surgery/procedure
- Intraoperative or immediately postoperative/postprocedure death in an American Society of Anesthesiologists Class I patient (an otherwise healthy person with no medical problems beyond those which the proposed surgery is intended to address)

### Product/Device SREs

- Patient death/serious injury associated with use of contaminated drugs, devices, or biologics provided by the healthcare setting
- Patient death/serious injury associated with use or function of a device in patient care where the device is used for functions other than as intended



- Patient death/serious injury associated with intravascular air embolism occurring while being cared for in a healthcare setting

### **Patient-Protective SREs**

- Discharge or release of a patient/resident of any age who is unable to make decisions to other than an authorized person
- Patient death/serious disability associated with patient elopement
- Patient suicide, attempted suicide, or self-harm resulting in serious disability while being cared for in a healthcare facility

### **Care Management SREs**

- Patient death/serious injury associated with a medication error involving:
  - Wrong drug
  - Wrong dose
  - Wrong patient
  - Wrong time
  - Wrong rate
  - Wrong preparation
  - Wrong route
- Patient death/serious injury associated with unsafe administration of blood products
- Maternal death/serious injury associated with labor or delivery in a low-risk pregnancy while in a healthcare setting
- Death/serious injury of a neonate associated with labor/delivery in a low-risk pregnancy
- Artificial insemination with the wrong donor sperm/wrong egg
- Patient death/serious injury associated with a fall while cared for in healthcare settings
- Any stage 3, stage 4, or unstageable pressure ulcer/injury acquired after admission/presentation to a healthcare facility
- Patient death/serious disability resulting from the irretrievable loss of an irreplaceable biological specimen
- Patient death/serious injury resulting from failure to follow up or communicate laboratory, pathology, or radiology test results



### Environmental SREs

- Patient/staff death/serious disability associated with electric shock in the course of a patient care process in a healthcare setting
- Any incident in which a line designated for oxygen or other gas to be delivered to a patient contains no gas, the wrong gas, or is contaminated by toxic substances
- Patient/staff death/serious injury associated with burns incurred from any source in the course of patient care in a healthcare setting
- Patient death/serious injury associated with the use of restraints/bedrails while cared for in a healthcare setting

### Radiological SREs

- Patient/staff death/serious injury associated with the introduction of a metallic object into an MRI area

### Criminal SREs

- Any instance of care ordered or provided by someone impersonating a physician, nurse, pharmacist, or other licensed healthcare provider
- Abduction of a patient/resident of any age
- Sexual abuse/assault on a patient within or on the grounds of a healthcare setting
- Patient/staff death/significant injury resulting from a physical assault that occurs within or on the grounds of a healthcare setting

### Active and Latent Errors

**Active** errors (human errors) are those that involve individuals who are actively doing a task, and the effects are felt almost immediately. Example: A surgeon amputates the wrong foot.

**Latent** errors are errors in system or process design, faulty installation or maintenance of equipment, or ineffective organizational structure. They are accidents waiting to happen. Example: A hospital does not follow a consistent system for stocking central supply carts.

When a latent error combines with an active human error, an event occurs. Example: The hospital's lack of a consistent system for stocking central supply carts (latent error) may cause a nurse to select the wrong intravenous drip size tubing (active error), resulting in a drug overdose in a patient (AHRQ, 2017d).



### CASE: St. Vincent Hospital

At St. Vincent Hospital all cylinders containing medical gases used in the operating room are stored in metal tubes in a tank room. All cylinders containing any concentration of carbon dioxide are color-coded grey and labeled “carbon dioxide.” Beneath that, a continuation of the label identifies any other gas with which it is combined, such as oxygen. When the cylinders are in their metal tubes, the capped connecting neck and top several inches of each cylinder, as well as several inches of the top of the label, are visible above the top of the tube. (Since the full label is not visible, this is an example of a **latent error**.)

On Tuesday a delivery of medical gas cylinders containing CO<sub>2</sub> was accepted by a logistics technician from the cardiac catheterization lab. The delivery included at least one cylinder containing a CO<sub>2</sub>/O<sub>2</sub> blend. As there was inadequate storage space for the entire delivery in the cath lab’s tank room, the technician asked his counterpart in the OR to store an extra tank of the gas blend. The OR logistics technician agreed but did not inform anyone in his or the OR’s chain of command.

On Thursday, during a routine laparoscopic cholecystectomy, the alarm for the pressure indicator in the gas delivery system sounded. The circulating nurse went to the tank room to obtain a cylinder replacement. She unknowingly selected the tank with the CO<sub>2</sub>/O<sub>2</sub> blend and used it to replace the empty pure CO<sub>2</sub> tank in the OR. (Selecting an incorrect medical gas cylinder is an example of an **active error**).

The surgeon activated the electrosurgical cautery unit to stop oozing from the area of the liver from which the gallbladder had been bluntly dissected. There was a millisecond flash of flame (not an electrical arc, which can occur with the use of cautery) followed by a puff of smoke. The incident was confined to the contact area of the electrosurgical instrument, and careful examination indicated that there was no evidence of injury to the patient. (This is an example of a **near miss**; by chance, no adverse event occurred).

Investigation of the incident used the “fire triangle” concept and revealed that the patient’s tissue was the fuel; the medical-grade CO<sub>2</sub>/O<sub>2</sub> blend gas used to expand the patient’s abdomen was the oxidizing agent; and the instrument, the cord connecting it to the electrical generator, and the generator were the ignition source.

All elements of the system were eliminated as possible causes for the flash of flame except for one. The medical gas cylinder was found to contain not just CO<sub>2</sub> but a CO<sub>2</sub>/O<sub>2</sub> blend. The erroneous presence of this gas mixture was determined to be the single deviation from normal practice and the cause of the accident.

*(continued under “Root Cause Analysis” later in this course)*

## WHY DO MEDICAL ERRORS HAPPEN?

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In the past, medicine has viewed errors as failures on the part of individual healthcare providers that are the result of inadequate knowledge or skill. The current understanding is that most errors



occur due to predictable human failures in the context of poorly designed systems, and according to the AHRQ (2003), there are eight common causes of medical errors.

## Communication Factors

Breakdowns in communication are the **most common** causes of medical errors. These breakdowns can be either verbal or written and can occur between healthcare workers and the organization, between individual healthcare team members, or between team members and patients.

Communication breakdowns occur when there is a failure to provide timely, accurate information or when information is not understood by the recipient. Problems in communication can result from issues such as educational differences, skill level, ethnicity, language, personality, or past and present personal or professional experiences. Poor communication of patient information is the most frequent root cause of sentinel events.

## Human Factors

Research into why errors happen has studied different types of human information processing involved in the performance of tasks and has classified them using a knowledge-, rule-, or skill-based approach. These terms refer to the degree of conscious control exercised by an individual over his or her activities.

- **Knowledge-based:** New situations in which learning must take place and knowledge stored. The task is carried out in an almost completely conscious manner. Example: A student nurse learning to perform urinary catheterization following step-by-step instructions in the lab.
- **Rule-based:** Application of stored rules to familiar problems, and conscious control is intermediate between knowledge and skill. Example: A new RN performing urinary catheterization who has memorized all the materials and steps required.
- **Skill-based:** Patterns of preprogrammed instructions have been stored, and virtually no conscious monitoring is required. Example: An experienced nurse who performs urinary catheterization steps smoothly in the right order.

Types of errors based upon these levels of performance include:

- **Knowledge-based mistakes:** Errors that occur in novel situations due to deficits in knowledge; intended actions do not achieve the intended outcome. Example: A clinician prescribing the wrong (inappropriate) medication due to lack of knowledge about the drug of choice (the interactions with medications the patient is already taking).
- **Rule-based mistakes:** Errors that occur in familiar situations due to incorrect application of a rule or an inadequate plan; actions do not achieve the intended outcome. Example: Making an incorrect diagnosis by failing to review all of the ordered diagnostic test



results and proceeding with an inappropriate treatment plan based on incomplete information.

- **Skill-based mistakes:** Errors that occur in experienced situations due to an attention slip or lapse of memory. Example: A nurse intending to give one medication but giving a different medication instead due to not reading the complete information on the unit-dose label.

(Gregory & Kaprielian, 2016)

## Patient-Related Factors

Issues related to patients arise from:

- Inappropriate patient identification
- Incomplete assessments of the patient
- Failure to obtain consent
- Complexity of care in intensive care, which involves multiple disciplines and sources of information
- Inadequate education of the patient
- Patient characteristics that are beyond the control of staff

## Organizational Transfer of Knowledge Issues

Errors can occur during the transfer of organizational, situational, or domain-specific knowledge and skills from one entity to another within or between organizations. Examples may include deficiencies in orientation of new or inexperienced staff or failure in quality or availability of protocols.

## Staffing and Workflow Factors

Studies show that unmanageable patient workloads, worker fatigue, and high provider-to-patient ratios increase the risk for medical errors by putting workers into situations where they are more apt to make a mistake. Increased workload can lead to tasks being left undone. Interruptions occurring while providing care affect patient outcomes by interfering with a healthcare worker's ability to complete essential tasks.

## Technical Factors

Technical issues involve failures of medical devices, equipment, implants, or grafts due to poor design, defects in material, or incorrect construction or set-up of equipment.



## Information Flow Factors

Errors occur when there is inadequate flow of information vital to a patient's care on transfer to another facility or discharge from one area to another, resulting in errors in making decisions about treatment or during communication of test results.

## Policy and Procedure Factors

Failures in the process of providing care can be the result of poorly documented, nonexistent, or clinically inadequate policies and procedures.

## COMMON MEDICAL ERRORS AND HOW TO PREVENT THEM

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Errors can be placed into five general categories: surgical, diagnostic, medication, devices and equipment, and systems failures (including healthcare-associated infections, falls, and healthcare technology). Common areas in each of these categories are described below.

### Surgical Errors

Wrong-site, wrong-procedure, and wrong-patient surgical errors are relatively rare. It is estimated that in the United States such errors occur in approximately 1 of 112,000 surgical procedures and are infrequent enough that an individual hospital would only experience one such incident every 5 to 10 years (AHRQ, 2017e).

The number of cases in which a foreign body is left behind during a procedure is estimated at 1,500 per year. Sponges are the most common foreign body retained after surgery. Surgical instruments also can be left behind, especially in the abdominal cavity. Approximately 88% of retained foreign body cases occur in a situation where the sponge and instrument counts were declared to be "correct" at the end of the procedure (Zejnnullahu et al., 2017).

Perioperative peripheral nerve injury following anesthesia and surgery is a rare event and in many instances is related to the positioning of the patient during the surgical procedure (Welch, 2017).

Anesthesia-related harm during surgery can include damage to teeth, nerve damage, organ damage, cardiopulmonary arrest, and death. Errors can lead to death or coma, but in recent decades improvements in operating room technology and education have led to fewer such events. Specialties with the highest risk of errors are neuro-, thoracic, and cardiovascular surgery followed by general surgery (Novak, 2016).



## PREVENTING SURGICAL ERRORS

Surgical errors are not the sole responsibility of the operating surgeon. All operating room personnel have a role in ensuring patient safety by verifying the surgical site and pointing out a possible error.

To reduce the risk of wrong-site, wrong-procedure, or wrong-person surgeries, the Joint Commission has developed a Universal Protocol checklist that includes the concept of a surgical “timeout,” a planned pause before beginning a procedure in order to review important aspects with all involved personnel. It was initially designed for operating room procedures but is now required before any invasive procedure (AHRQ, 2017e).

The WHO Surgical Safety Checklist was likewise developed by an international team of researchers to decrease errors and adverse events and to increase teamwork and communication in surgery. Since its inception, it has shown significant reductions in both morbidity and mortality and is now used by a majority of surgical providers around the world to increase patient safety and reduce intraoperative complications. An electronic version of this checklist has shown an increased compliance rate and a reduction in the number of risk events. In addition, OR personnel have stated a belief in its ability to have a positive impact on patient safety (Gitelis et al., 2017).

### ELEMENTS OF THE SURGICAL SAFETY CHECKLIST

A surgical checklist is an algorithmic listing of actions to be taken in any given clinical situation intended to make everyone aware that others expect these things to be done.

**“SIGN IN” checklist must be completed before induction of anesthesia** (with at least a circulating nurse and anesthesia provider)

1. Has the patient confirmed his/her identify, site, procedure, and consent?
2. Is the site marked?
3. Is the history and physical present?
4. Is the anesthesia machine and medication check complete?
5. Are diagnostic and radiologic test results present?
6. Are blood products available?
7. Is the pulse oximeter on the patient and functioning?
8. Are all special equipment, devices, and implants present?
9. Does the patient have a:
  - Known allergy?



- Difficult airway or aspiration risk?
- Risk of >500 ml blood loss (7ml/kg in children)?

**“TIME OUT” checklist must be completed before skin incision** (with circulating nurse, anesthetist, and surgeon)

1. Have all team members introduced themselves by name and role?
2. Has the patient’s name, procedure, and where the incision will be made been confirmed?
3. Has antibiotic prophylaxis been given within the last 60 minutes?
4. For the anticipated critical event:
  - Surgeon
    - What are the critical or nonroutine steps?
    - How long will the case take?
    - What is the anticipated blood loss?
  - Anesthetist
    - Are there any patient-specific concerns?
  - Nursing team
    - Has sterility (including indicator results) been confirmed?
    - Are there equipment issues or any concerns?
5. Is essential imaging displayed?

**“SIGN OUT” checklist must be completed before the patient leaves the operating room** (with circulating nurse, anesthesia provider, and surgeon)

1. Have the scrub and circulating personnel verbally confirmed:
  - The name of the procedure?
  - Completion of instrument, sponge, and needle counts?
  - Specimen labeling (read aloud specimen labels, including patient name)?
  - Whether there are any equipment problems to be addressed?
2. Have the surgeon, anesthetist, and nursing personnel discussed:
  - What are the key concerns for recovery and management of this patient?

Source: WHO, 2017a.



**CASE**

Cheryl, a left-hand-dominant author, was scheduled for a left carpal tunnel release to alleviate her left-hand pain. Immediately prior to her being transferred to the operating room, her surgeon verified the procedure and side with her and marked the surgical site with a purpose-made surgical site marker in accordance with facility policy.

After the “time out” and induction of general anesthesia, the site was prepped and draped, the surgeon made a Z-shaped incision from the proximal phalanx of Cheryl’s left middle finger to the middle of her left palm and began to carefully dissect down through the soft tissue. The scrub, an experienced perioperative nurse, was perplexed by the placement of the incision, since the usual incision for a carpal tunnel release goes from the palm (in line with the ring finger) toward the wrist. The scrub did not say anything, since the surgeon was new to the facility, had just completed a fellowship in hand surgery, and had already performed several newly developed procedures with which the nursing personnel were not familiar.

After examining the tissue in Cheryl’s palm, the surgeon commented on the lack of thickening of the ligament in the palm and the inconsistency between his findings and her reported symptoms of ring finger pain and difficulty in doing keyboard work. At this point, both the circulating nurse and anesthesia provider stated that the proposed procedure was a carpal tunnel release. This was confirmed by the surgeon, anesthesia provider, circulating nurse, and scrub visualizing the surgical schedule and Cheryl’s chart (history and physical, surgical consent, and surgical safety checklist).

The surgeon closed the incision and made an appropriate incision for a carpal tunnel release, and the procedure was completed without further issue. After Cheryl was transported to the postanesthesia care unit (PACU), the surgeon spoke with her husband. He informed him of the incident and told him that a complete review of all that had transpired would be done that day. The surgeon later spoke to Cheryl and told her that he would give her a complete explanation the following day once all of the medications she had received were no longer affecting her understanding or memory.

The surgeon met with Cheryl and her husband and adult daughter the following day. He described the nature of the error (that a trigger finger release incision was made instead of the carpal tunnel release incision intended), how it had occurred, and what steps would be taken to improve that aspect of OR safety. The night of surgery, the family had briefly considered filing a lawsuit, but after meeting with the surgeon, they were satisfied with the full and honest disclosure of the incident and decided not to sue.

**Diagnostic Errors**

Diagnostic errors are common, accounting for 17% of preventable errors in hospitalized patients. A systematic review of autopsy results done over four decades found that almost 9% of the deceased patients experienced a major diagnostic error that was not detected prior to death (AHRQ, 2017f).



Diagnoses can be unintentionally delayed (when sufficient information was available earlier), wrong (another diagnosis was made before the correct one), or missed (no diagnosis was made).

Diagnostic errors can be broken down into three subcategories:

- **No-fault errors** arise from factors that are outside the control of the clinician or the healthcare system. They can be attributed to masked or unusual presentation of a disease and to patient-related factors such as lack of cooperation or provision of misleading information.
- **System-related errors** include technical or organizational barriers, such as communication and care coordination problems, inefficient processes, and equipment or technical failures.
- **Cognitive errors** include inadequate knowledge, poor critical-thinking skills, lack of competency, problems in data collection, failure to synthesize data, and cognitive bias.

A clinician's **cognitive biases** (shortcuts or “rules of thumb”) can occur when making a provisional diagnosis, especially for a patient with common symptoms. Cognitive biases may include:

- Diagnosis of current patient biased by experience with past cases (e.g., chest pain assumed to be cardiac in origin)
- Relying on the initial diagnostic impression despite subsequent contradictory information (e.g., dismissing test results as being in error)
- Diagnostic decision-making biased by subtle cues and collateral information (e.g., assumption of heroin withdrawal rather than a perforated bowel)
- Placing undue reliance on test results or “expert” opinion (e.g., assuming the absence of a clinically obvious condition based on false-negative test results)

Underlying problems in the healthcare delivery system increase the risk for missed or delayed diagnoses. These may include poor teamwork and communication, a situation found to be common in emergency medicine and surgery. A lack of reliable systems for common outpatient situations and lack of structured protocols for telephone triage, teamwork, and communication training also increase the risk (AHRQ, 2017d; NAS, 2015).

Whatever causes an error in making a correct and timely diagnosis, the outcome can result in inappropriate treatment being given and failure or delay in appropriate treatment, which may reduce the number of treatment options a patient will be able to pursue (e.g., cancer treatments) (Singh, 2017).



**CASE**

A serious outbreak of the Ebola virus was underway in Liberia in western Africa. A man traveled from Liberia back to his home in Texas, where he began to experience fever, nausea, and abdominal pains, prompting him to go to the emergency room. There he reported to the nurse his recent travel to Liberia but denied contact with sick people. He was misdiagnosed and sent home. Days later he returned to the emergency room, tested positive for Ebola, began receiving care but died soon after.

Investigation of this misdiagnosis discovered that the patient's travel history was obtained by the nurse and entered into his electronic medical record (EMR). The patient, however, had not mentioned the fact that he had had contact with an Ebola patient prior to leaving Liberia. Additionally, the examining doctor did not see the travel portion of the patient's history because it was in the nursing section of the EMR, which doctors can, but often don't, routinely check.

Nurses are not required to inform doctors about everything they do and document. However, important information is generally personally communicated to the physician. Although the importance of this patient's travel history should have been recognized because of the amount of publicity surrounding the Ebola outbreak, the nurse did not inform the doctor personally.

Not all the information that nursing collects has to be reviewed by the doctor. Every facility makes choices about what information shows up routinely in what part of the EMR, and this hospital chose not to include the travel history in the physician section of the EMR.

The nurse asked the right questions about travel, but the patient failed to disclose important information for an unknown reason. The nurse correctly entered the travel history into the medical record but failed to verbally inform the physician, and the physician chose not to read the nurse's notes. All of these actions illustrate the importance of communication in the prevention of medical errors such as this misdiagnosis and delayed treatment.

## Medication Errors

Medication errors are one of the most common types of error and are of primary concern to clinicians who administer medications, practitioners who prescribe medications, and pharmacists who dispense them. Medication errors cause at least one death every day and injure approximately 1.3 million people annually in the United States (WHO, 2017b). Medication errors are considered preventable adverse drug events.

The National Coordinating Council for Medication Error Reporting and Prevention (2018) defines a medication error as:

Any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient, or consumer. Such events may be related to professional practice, healthcare products, procedures,



and systems, including prescribing; order communication; product labeling, packaging, and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use.

At least a quarter of all medication-related adverse events are preventable. Preventable adverse events include errors made by the clinician and systematic errors. Potential adverse drug events are medication errors that pose a significant risk but do not cause harm to the patient. It is estimated that 28% of adverse drug events requiring hospital admission are preventable. In the hospital setting, more than a quarter of adverse drug events are preventable, and 27% of adverse drug events following discharge from the hospital were found to be preventable (Zhu & Weingart, 2017).

The U.S. Food and Drug Administration (FDA) (2017a) notes that a medication error refers to an error of commission or omission at any step along the pathway that begins with prescribing a medication and ends when the patient receives the medication and is safely monitored following it. For each step along the pathways, there are also strategies recommended to prevent adverse drug reactions. Steps include:

- Prescribing
- Transcribing (order communication)
- Compounding
- Packaging, repackaging and nomenclature
- Dispensing
- Distribution
- Administering
- Education
- Use and monitoring

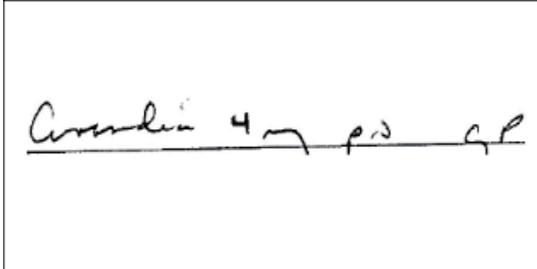
## **ERRORS IN PRESCRIBING AND TRANSCRIBING**

The FDA (2017a) reports that the majority of errors occur at the prescribing and transcribing stages. Prescribing and transcribing errors include:

- Incorrect drug selection for a patient
- Errors in quantity and indication
- Prescribing a contraindicated drug
- Inaccurate or incomplete medication history taking
- Illegible handwriting



- Confusion with the dosing or drug names
- Inappropriate use of decimal points
- Use of abbreviations



Illegible prescription: Avandia (a diabetic medication) confused with Coumadin (an anticoagulant), both available as 4 mg oral tablets. (Source: PNNNet, 2003.)

When prescribing, strategies recommended to prevent adverse drug reactions include:

- Review the patient’s medication list at each encounter and consider the dosages, directions, drug interactions, and side effects.
  - Consider making notations on the prescription to indicate the reason for the medication.
  - Be vigilant about high-risk drugs and avoid prescribing them whenever possible.
  - Replace high-risk drugs with drugs that are less likely to cause adverse events.
  - Discontinue unnecessary medications.
  - Consider drugs as a cause of any new symptom.
  - Avoid treating side effects with another drug.
  - Educate patients on indications for each medication, possible side effects, and alternative options.
  - Use computerized prescriber order entry (CPOE) to improve the medication ordering process. CPOE improves safety by:
    - Providing a means for standardization of practice
    - Improving completeness and legibility of orders
    - Being alerted to drug allergies, drug-drug interactions, and cumulative dose limits
    - Updating clinicians with current medication information
    - Providing dosage adjustment calculations based on patient characteristics
    - Offering timely communication of critical changes in a patient’s condition
- (Zhu & Weingart, 2017)



## MEDICATION RECONCILIATION

There are many facilities that have instituted the practice of medication reconciliation at all transitions in care to prevent adverse drug events. Medication reconciliation is the process of identifying any discrepancies between the medication ordered and those on the patient's medication list, making appropriate changes to the orders, documenting any changes, and communicating the updated list to the next provider within or outside the facility. Patients should also be provided with written information on the medications when discharged.

Strategies to prevent medical errors when transcribing include:

- Carefully check handwritten medication orders, clarify they are legible, and ensure they are interpreted correctly.
- Double check all math calculations before entering the dosage into the nursing documentation form.
- Utilize computerized medication records to eliminate the problem of misinterpretation. (Zhu & Weingart, 2017)

## VERBAL ORDERS

Verbal orders are especially susceptible to errors. Steps to follow to ensure safety include:

- Minimize the use of verbal orders whenever possible.
- Have the prescriber repeat and verify the verbal order.
- When possible, have another RN listen to the order.
- Record the verbal order in the patient's medical record, making sure to include:
  - Name of prescriber
  - Name of recipient of order
  - Name of person who implemented the order
- Read back the order to the prescriber as written down to confirm correct documentation.

## ERRORS IN DISPENSING

Dispensing errors can occur at any point along the dispensing pathway from when the prescription arrives in the pharmacy through the supplying of the dispensed medication to the patient or the healthcare worker who will administer it. Errors include:

- Selecting the wrong medication or strength



- Dispensing the wrong dose
- Dispensing to the wrong patient
- Failure to see dangerous complications such as harmful interaction of drugs
- Failure to warn of dangerous side effects of drugs

Errors happen due to:

- Heavy workload and long hours
- Insufficient pharmacist training
- Negligence in supervising pharmacy technicians
- Poor communication between pharmacists and prescribers
- Over-reliance on automated systems

(Woods, 2017)

Strategies to prevent medical errors when dispensing include:

- Check that the prescription entry is correct. Errors in transcription account for many errors in dispensing.
- Clarify any ambiguous information. Prescriptions that are illegible or ones that use nonstandard abbreviations and other symbols need verification.
- Check prescriptions thoroughly and consider verification by another person.
- Provide patient counseling.
- Check for drug-to-drug interactions and allergies.
- Supervise dispensing medications by pharmacist assistants.
- Open containers and show them to the patient. Patients can raise an alert if the medication looks different from what they usually take.
- Use different lettering and other strategies in order to reduce confusion between medications that look alike or sound alike. (“Tall man” lettering is the practice of writing part of a drug’s name in uppercase, e.g. chlorproMAZINE and chlorproPAMIDE.)

(Woods, 2017)

### **MEDICATION MANAGEMENT IN NONHEALTHCARE SETTINGS**

Many health professionals work or consult in nonhealthcare settings such as adult daycare, summer camps, schools, group homes, board-and-care facilities, and jails. These facilities are



usually licensed by the state but often use unlicensed staff members to dispense medications to patients. According to the National Coordinating Council for Medication Error Reporting and Prevention, medication errors are a significant problem in these settings.

The council recommends that nonhealthcare settings:

- Have written policies and procedures on medication management
- Provide training to all personnel with responsibilities for medication management
- Provide safeguards to prevent and detect theft and diversion of controlled substances
- Encourage the reporting of medication errors to appropriate state and national medication error reporting programs to identify significant trends that can lead to improved quality and safety

Source: NCCMERP, 2015.

## ERRORS IN ADMINISTRATION

Medication administration errors are very common in both inpatient and outpatient settings. In hospitals, most medication errors occur in medical-surgical units, followed by intensive care and then intermediate care units. Ten percent of errors cause harm to patients, and 11% of errors require increased monitoring. More than half of errors do not cause harm to patients, and approximately one fifth of errors are identified before reaching patients (Volpe et al., 2016).

A study that examined medication error (ME) incident reports made by RNs in hospital settings found that the most common drug class associated with MEs was cardiovascular drugs and that the most errors occurred with anticoagulants. Antimicrobial medications were the second most common drug class involved in errors, with vancomycin the most common in this category. Medication administration errors occurred more often in medical-surgical and intensive care units (Muroi et al., 2017).

Errors in administration include:

- Administration of the wrong drug
- Failure to administer a prescribed drug
- Administering via the wrong route
- Failure to check the patient's identity prior to administration
- Wrong dosage calculation
- Patient misuse due to poor understanding of directions
- Deliberate violation of medication administration guidelines, policies, and procedures



Factors that increase the risk for administration errors include:

- Poor communication
- Fatigue
- Workload and time pressures
- RN staffing
- Distractions or interruptions by both healthcare staff and patients
- Ambiguous product names, directions for use, medical abbreviations, or writing
- Poor procedures or technique
- Lack of standardized protocols and procedures
- Lack of practitioner knowledge or training
- Similar labeling or packaging of products
- Illegible handwriting
- Patient characteristics, including personality, literacy, language barriers, complexity of clinical case  
 (Parry et al., 2015)

At any point along the pathway from prescribing to administration, drugs with similar names or packing can lead to medication errors.

Safe medication administration requires the nurse to have sound knowledge about a drug, including:

- Mode of action
- Side effects
- Toxicity
- Appropriate dosage
- Rate and route of excretion
- Interaction with other drugs

Nurses should perform a three-way check prior to administering a medication, which includes the physician order compared with medication administration record compared with the pharmacy label. Each should be checked three times to ensure agreement.



Serious administration errors can be avoided by following these rules:

- Avoid interruptions and distractions.
- Prepare medications for one patient at a time.
- Administer the medication to the patient as soon as it has been prepared.
- Never leave medications at the bedside.
- Utilize barcode medication administration to guarantee accuracy.

In the past, nurses were instructed to follow the “5 rights” of medication administration. Currently, the list has expanded to include “10 rights” (see box below).

### **“10 RIGHTS” OF MEDICATION ADMINISTRATION**

#### **1. Right Patient**

- Check the patient’s identification bracelet.
- Ask the patient to state his or her name and date of birth.
- Compare the medication order to the identification bracelet and the patients’ stated name and date of birth.
- Verify patient’s allergies with the chart and with the patient.

#### **2. Right Medication**

- Perform a triple check of the medication’s label:
  - When retrieving the medication
  - When preparing the medication
  - Before administering the medication to the patient
- Always check the medication label with the prescriber’s order.
- Never administer a medication prepared by another person.
- Never administer a medication that is not labeled.

#### **3. Right Dose**

- Check the label for the concentration of the medication.
- Compare the dispensed dose with the medication order.
- Perform all medication calculations three times.
- Check all medication calculations with another nurse.



- Verify that the dosage is within the appropriate range for the medication and the patient.

#### **4. Right Time**

- Verify the schedule of medication with the order for:
  - Date to be administered
  - Time to be administered
  - Specific length of time to be administered
- Check when the last dose of the medication was given.
- Administer the medication within 30 minutes of the scheduled time (30 minutes before or 30 minutes after). This does not refer to PRN medications that must be given within an exact time limit, e.g. every 4 hours.

#### **5. Right Route**

- Verify the medication route with the medication order.
- Confirm that the patient can take or receive the medication by the ordered route.

#### **6. Right Assessment**

- Prior to medication being administered:
  - Assess patient and laboratory tests to determine if medication is safe and appropriate.
  - Confirm the rationale for the ordered medication.

#### **7. Right Evaluation**

- After the medication has been administered:
  - Assess the patient for any adverse side effects.
  - Assess the patient for effectiveness of the medication.
- Compare the patient's prior clinical status with postmedication status.
- Document the patient's response to the medication.

#### **8. Right Education**

- Inform the patient of the medication being administered.
- Inform the patient of the desired effects of a medication.
- Inform the patient of the side effects that may be expected from the medication.



## 9. Right to Refuse

- Know that the patient or legally responsible person has the right to refuse any medication.
- Inform the responsible person of the consequences of refusing the medication.
- Verify that the responsible person understands the consequences.
- Notify the ordering clinician of the refusal and document that notification.

## 10. Right Documentation

- Document:
  - Time given
  - Route
  - Site of injection, if applicable
  - Laboratory value or vital signs needed prior to administration, if indicated
- Document the refusal of a medication and that the responsible party understands the consequences.
- Never document before a medication has been administered.
- Document the patient's response to the medication.

Source: Nwagwu, 2016.

## ERRORS IN MONITORING

Monitoring and assessment are essential to the process of administration of medications. Errors can occur regarding the assessment of vital signs, lab values, ability to swallow, and patient's self-report. Monitoring involves observing the patient to determine if the medication is working, being used appropriately, and not harming the patient. Types of errors in monitoring that can occur include:

- Inadequate monitoring for side effects
- Drug levels not measured, or measured but not checked or acted upon
- Failure to educate patients about potential side effects
- Failure to monitor patient's subjective response
- Drug not discontinued if not effective or prescribed course completed
- Drug ceased before the course was completed
- Communication failures during handoff procedures to accepting nurse (NSO, 2017a)



**CASE**

In a large Midwestern city, a nurse working on the obstetrics unit of a local hospital was halfway through the second of two eight-hour shifts and asked to go home because she was tired. The hospital denied her request, stating staffing would be inadequate (fatigue and RN staffing). The nurse was assigned a young female in active labor. The patient stated that she had spoken to her doctor beforehand and had agreed to an epidural for delivery.

In order to save time (workload and time pressures), the nurse took a bag of epidural anesthesia from a storage locker without a doctor's order, brought it to the patient's room, and laid it on the work counter (deliberate violation of medication administration guidelines, policies, and procedures). The IV bag had a bright red label that read "for epidural use only."

In the meantime, an IV antibiotic was ordered and delivered to the patient's room. The nurse picked up what she believed was the IV antibiotic (similar packaging or product) and hung it (deliberate violation of medication administration guidelines, policies, and procedures). Shortly thereafter, the patient had a seizure and died. Her infant was delivered live by Caesarean section.

The investigation of the incident revealed that the nurse:

- Was fatigued and under time pressure
- Failed to follow hospital procedures requiring a doctor's order before removing drugs from the storage locker
- Failed to recognize the bright red intrathecal warning label on the IV bag
- Failed to follow the hospital's policy and procedure to scan medication labels before drugs were administered
- Failed to follow the "rights" of medication administration as described in the hospital's policy and procedure manual

Investigation further revealed that shortcuts were common practice on the unit.

Initially the nurse was charged with a felony, which was later reduced to civil charges, and her license was suspended.

**ERRORS AND HIGH-ALERT MEDICATIONS**

The Institute for Safe Medication Practices (ISMP) defines a *high-alert medication* as a drug that has a heightened risk of causing significant patient harm when used in error. Although errors may or may not be more common with such medications, the consequences of errors are much more devastating. High-alert medications are at the top of the list of drugs involved in moderate-to-severe patient outcomes when an error occurs. The ISMP lists high-risk medications according to what is commonly used in acute care settings, community settings, and long-term settings.



The Joint Commission standards require a hospital to develop its own list of high-alert medications, to have a process for managing them, and to implement that process. Many hospitals select medications from the ISMP's list, which is updated every few years based on error reports submitted to ISPM, reports of harmful errors in the literature, and input from practitioners and safety experts. It is agreed that it is essential for every hospital's list to include (when used):

- Concentrated electrolytes
- Neuromuscular blocking agents
- All opioids
- All anticoagulants
- Insulin
- Epidural or intrathecal medications
- Chemotherapeutic drugs

Other drugs should be added if use is prevalent or misuse is a concern. A hospital should update its high-alert medication list as needed and review the list at least every two years (Grissinger, 2017).

### ***Safe System Design for High-Alert Medications***

The Institute for Healthcare Improvement provides a how-to guide for the prevention of harm from high-alert medications, recommending three principles of safe system design: 1) design processes to prevent errors and harm, 2) design methods to identify errors and harm when they do occur, and 3) design methods to lessen the harm that may result from the error.

#### **Processes to prevent errors and harm:**

- Standardize the approach to treatment by developing order sets, preprinted orders, clinical pathways, or protocols.
- Standardize concentrations and dose strength to the minimum needed for safe care.
- Centralize pharmacist- or nurse-run anticoagulation, insulin management, and pain management services.
- Implement protocols for vulnerable populations (elderly, pediatric, obese patients).
- Use “tall man” lettering for pharmacy-produced labels for differentiation of drug names that look alike or sound alike.



**Methods to identify errors and harm when they do occur:**

- Include in order sets, protocols, and flow sheets reminders and other information about monitoring parameters.
- Ensure availability of critical lab information.
- Use independent double-checks.
- Educate patients to monitor for symptoms and when to contact their provider.

**Methods to lessen the harm that may result from the error:**

- Utilize protocols allowing for administration of reversal agents without having to contact the physician.
- Ensure rescue protocols are available.

(IHI, 2017b)

***FDA Warnings for High-Risk Medications***

The FDA requires high-risk medications with serious or life-threatening risks be given a label referred to as a *black box warning*, the FDA's strongest labeling requirement. Before adding a box warning, however, the FDA must have evidence that the drug poses a significant risk. This comes from observations and studies conducted after the drug has been on the market. Unfortunately, this means that new drugs that have just been put on the market rarely will have these warnings.

Despite these warnings, however, it has been shown there has been no associated reduction in prescribing such medications. This may be attributed to:

- Unawareness by prescribers that the FDA has issued the warnings
- Prescribers thinking that even though there is a high risk, the drugs have a superior benefit-risk ratio to alternative medications
- Prescribers thinking that the safety concern is not as severe as the warning suggests
- Prescribers choosing to continue prescribing them while using strategies to reduce risk, such as close monitoring of patients

***High-Alert Medications***

When administering high-alert medications, the following is recommended:

- Identify high-alert medications based on the facility's approved list.



- Monitor medication dosing carefully, especially if dosing adjustments are required due to narrow therapeutic windows.
- Obtain and review any laboratory values required for dosing adjustments; collaborate with the prescriber if values are out of the therapeutic range.
- Before administering a high-alert medication, ask another nurse to perform an independent double-check to verify:
  - The patient's identity
  - The medication is correct
  - Medication's indication corresponds with the patient's diagnosis
  - Dosage calculations are correct
  - Route of administration is safe and appropriate for the patient
  - If giving an infusion, that pump settings are correct and the infusion line is attached to the correct port
- Watch for adverse effects.  
(Lippincott Solutions, 2015)

#### **PREVENTING ADVERSE EVENTS DUE TO PATIENT-CONTROLLED ANALGESIA**

The Physician-Patient Alliance for Health and Safety (PPAHS) reports a cause for concern in patients using patient controlled analgesia (PCA), and there is a great lack of consistency in safety procedures followed by hospitals across the country. This is believed to account for a large proportion of adverse events and deaths related to its use. There is evidence that hospitals that continuously monitor their patients with pulse oximetry and/or capnography are better able to avert adverse events.

Checklists for safe use of PCA pumps are available. The PPAHS checklist recommends certain steps be taken when initiating, refilling, or reprogramming PCA pumps, and PCA checks to be taken at shift change and hourly.

#### **PCA pump initiation, refilling, or programming a change require:**

- Assessment of the patient for increased risk of respiratory distress:
  - Obesity
  - Low body weight
  - Current medication that can potentiate sedative effects
  - Preexisting conditions such as asthma, COPD, and sleep apnea
  - Advanced age



- Pre-procedural cognitive assessment to determine the capability of patient to participate in pain management (may not be suitable for pediatric patients)
- Provision of information to the patient on proper use of the PCA and purpose of monitoring
- Two healthcare providers independently double check:
  - Patient's identification
  - Allergies
  - Drug selection and concentration confirmed as prescribed
  - Any dose adjustment completed
  - PCA pump settings
  - Line is attached to the patient and tubing is inserted into pump
- Electronic monitoring:
  - Pulse oximetry
  - Capnography

**Change of shift and every hour require:**

- Assessing patient for level of pain, alertness, and adequacy of ventilation
- Verifying PCA pump settings
- Verifying electronic monitoring of pulse oximetry and capnography
- Documenting patient assessment and condition, PCA dosing, and monitoring

Source: PPAHS, 2016.

## Tubing Misconnections

The FDA reports that medical device misconnections can occur when one type of medical device is attached in error to another type of medical device that performs a different function. Tubing misconnections can occur for several reasons, including:

- Similar design of many connectors and the widespread use of connectors with similar shapes and in similar sizes
- Human error arising from conditions such as:
  - Multiple connections for one patient
  - Poor lighting



- Lack of training
- Time pressure
- Fatigue
- High-stress environment  
(FDA, 2017b)

#### **EXAMPLES OF TUBING MISCONNECTIONS**

- Enteral feeding tube connected to an IV
- Enteral feeding tube connected to ventilator-inline suction catheter
- Blood pressure cuff connected to an IV
- IV tubing connected to trach cuff
- IV tubing connected to nebulizer
- Oxygen tubing connected to a needleless IV port
- IV tubing connected to nasal cannula
- Syringe connected to trach cuff
- Epidural solution connected to a peripheral or central IV catheter
- Epidural line connected to an IV infusion
- Bladder irrigation solution utilizing primary IV tubing connected to a peripheral or central IV catheter
- Foley catheter connected to NG tube
- IV infusion connected to an indwelling urinary catheter
- IV infusion connected to a nasogastric tube
- Primary IV tube connected to a blood product meant for transfusion



Patient's feeding tube is incorrectly connected to the instillation port on the ventilator in-line suction catheter, delivering tube feeding into the patient's lungs, causing death. (Source: FDA, 2017b.)

## PREVENTING TUBING MISCONNECTIONS

Because tubing misconnections continue to cause patient injury and death, new International Organization for Standardization (ISO) tubing connector standards went into development in 2014. These new standards for manufacturing connectors are meant to make it physically impossible for misconnections to occur. It is predicted that as they become more available, the likelihood of risk for misconnection errors is expected to decrease (FDA, 2017b).

Bringing new, safer connectors to the healthcare market requires coordination between manufacturers, medical-device companies that incorporate connectors into their equipment, and healthcare facilities. As a result, the transition to new and safer connectors has been slow. Some facilities have not yet started the process of evaluating how long their current inventory of tubing and connectors will last in order to determine when to make the changeover. Internationally, the shift to new connectors is inconsistent, with just a few countries now introducing mandates or campaigns to encourage use of new connectors.

California is the only state requiring facilities to switch to new enteral feeding and epidural connectors in 2016 and 2017 (MD+DI, 2016; California Legislature, 2015).



In those instances where the old connectors remain in use, the Joint Commission and the ECRI Institute (formerly the Emergency Care Research Institute) recommend the following safety measures for nurses and other healthcare providers:

- Clearly label each device, especially certain high-risk catheters such as epidural, intrathecal, and arterial.
- Do not use catheters that have injection ports.
- Trace all lines back to their origin before connecting any new devices or replacing old ones.
- Check and recheck Luers to ensure proper connections prior to each use.
- Develop a policy of positioning different lines on different sides of the patient, or route tubes and catheters with different purposes in unique and standardized directions (e.g., IV lines routed toward the head, enteric lines toward the feet).
- Ensure good communication between healthcare staff during patient transfers.
- Recheck connections and trace all patient tubes and catheters to their sources upon the patient's arrival in a new setting or service as part of the handoff process. Standardize this line reconciliation process.
- Inform nonclinical staff, patients, families, and caregivers they must get help from clinical staff whenever there is a real or perceived need to connect or disconnect devices or tubing.
- Do not force connections; if it is difficult or not secure, it may not be the right pairing.
- Do not use adaptors unless they are very clearly intended for the application.
- Identify and minimize conditions and practices that may contribute to healthcare worker fatigue and take appropriate action.

(FDA, 2017d)

## Problems Related to Medical Devices and Equipment

Design flaws, misuse, and malfunction of medical devices and equipment are all common causes of medical errors. Subtle differences in a familiar pattern using a device can affect the speed and accuracy of data entry, and the lack of standardization invites user mistakes. Poor medical device design and lack of usability testing have also been repeatedly discussed as being key factors in many device-related incidents.

An increasing number of medical devices are also implanted in patients. These include complex programmable cardiac pacemakers, defibrillators, deep brain stimulation neurotransmitters, and laser surgical devices. Any malfunction of such devices can be serious and even life threatening.



The FDA regulates devices that support or sustain human life, are of substantial importance in preventing impairment of human health, or present a potential unreasonable risk of illness or injury by using a process of scientific and regulatory review to evaluate safety and effectiveness. The FDA has three levels of classification for medical devices and equipment:

- **Class I** devices include those with “low risk,” such as bedpans, bandages, and examination gloves.
- **Class II** devices are a higher risk and include such things as infusion pumps, powered wheelchairs, and surgical drapes.
- **Class III** devices are seen as “life sustaining.” These have the highest risk and are therefore subject to the most stringent regulatory controls. Such devices include pacemakers and artificial heart valves, among many others.

Medical devices have become more and more complex and are increasingly used in a life-sustaining way. New, innovative devices have increased rapidly in every area of medical practice, bringing with them the risk for complications and failures. Along with a rise in Class III devices, there has been an increase in the number of adverse events reported to the FDA. Each year, the FDA receives several hundred thousand medical device reports of suspected device-associated deaths, serious injuries and malfunctions, with nearly 700,000 reports of medical device adverse events being reported in 2017.

Mandatory reporting of such events must be done by manufacturers, importers, and device user facilities. Healthcare professionals, patients, caregivers, and consumers are also encouraged to voluntarily report adverse events. The FDA uses the reported information to monitor device performance, detect potential device-related safety issues, and contribute to benefit-risk assessments of these products (FDA, 2016; FDA 2017c).

Health professionals should familiarize themselves with their institution’s procedures for reporting adverse events to the FDA. Under the Safe Medical Devices Act of 1990, facilities (hospitals, ambulatory surgical centers, nursing homes, or outpatient centers) are required to:

- Report to the FDA and to the manufacturers any suspected medical device–related deaths
- Report medical device–related serious injury only to the manufacturer, if known; if the manufacturer is unknown, report serious injury to the FDA
- Submit an annual report to the Secretary of Health and Human Services summarizing adverse events attributed to medical devices (FDA, 2016)

#### CASE

Jory, a 17 year-old boy, fractured his arm in several places following a tackle and fall while playing football. He was taken to the nearby hospital, where he underwent surgical repair. Postoperatively he was placed on morphine delivered via a pump. His heart rate, respirations, and blood oxygen levels were being monitored. Through the evening hours, Jory was alert,



oriented, and had stable vital signs. When the night shift took over, it was ordered that the morphine should be shut off and that he should be placed on routine vital sign checks and oral pain medication.

During the night, the nurse entered his room to assess his vital signs and found that he was nonresponsive and barely breathing. It was discovered that the morphine pump, a newly acquired piece of equipment, had not been shut off but had accidentally been turned to the “high” setting. Jory was lucky; he survived the overdose.

The following investigation found that the new device was designed differently than the old one, with an additional step required in the shut-off process, and the nurse had not received training in the use of the new pump.

## Healthcare-Associated Infections (HAIs)

HAIs are infections that a patient gets while receiving medical treatment in a healthcare facility. HAIs are considered system failures and are often preventable. The CDC reports that on any given day approximately 1 in 25 hospital patients has at least one healthcare-associated infection. Common types of HAIs include:

- **Catheter-associated urinary tract infections (CAUTIs).** Among UTIs acquired in the hospital, about 75% are associated with a urinary catheter, and the most important risk factor is prolonged use.
- **Surgical site infections (SSIs).** These can be superficial incisional, deep incisional or organ or space SSIs.
- **Central line–associated bloodstream infections (CLABSIs).** Central lines pose the greatest risk of device-related infections compared to other types of medical devices. They are the main source of bacteremia and septicemia in hospitalized patients and a major cause of morbidity and mortality.
- **IV catheter–related bloodstream infections (CRBSIs).**
- ***Clostridium difficile* (*C. diff*) infections (CDIs).** Those most at risk are patients—especially older adults—who take antibiotics and also receive medical care. CDIs are related to poor antibiotic prescribing practices. Many studies have shown that 30% to 50% of antibiotics prescribed in hospitals are unnecessary or incorrect.
- **Pneumonias.** Healthcare-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) both may be caused by a wide variety of pathogens, can be polymicrobial, and can be due to multidrug-resistant organisms (MDROs). Among all hospital-acquired infections, HAP is the leading cause of death.  
(CDC, 2015; File, 2017)



Efforts have been made to reduce these infections, and research shows that when healthcare facilities and teams, individual doctors, and nurses become aware of the issue and take steps to prevent them, rates of some HAIs can decrease by more than 70%. In 2017, the CDC reported a national decrease of 50% in central line–associated bloodstream infections since 2008 as a result of those efforts. The financial benefit of this decrease is estimated to be \$25 billion to \$31 billion in medical cost savings (CDC, 2017a).

Failure of physicians, nurses, and other caregivers to practice basic hand hygiene helps spread bacteria, some of which are antibiotic-resistant and can prove life threatening. Studies show that on average healthcare providers clean their hands less than half of the times they should, contributing to the spread of HAIs (CDC, 2017b).

### **PREVENTING CATHETER-ASSOCIATED URINARY TRACT INFECTIONS**

The CDC (2016a) recommends the following actions supported by evidence-based research for preventing urinary tract infections:

- Insert catheters only for appropriate indications.
- Leave catheters in place only as long as needed.
- Avoid use of urinary catheters in patients and nursing home residents for management of incontinence.
- Avoid routinely using urinary catheters in operative patients unless necessary.
- For operative patients requiring an indwelling catheter, remove as soon as possible, preferably within 24 hours.
- Perform hand hygiene immediately before and after insertion or any manipulation of catheter device or site.
- Ensure that only properly trained persons insert and maintain catheters.
- In acute-care hospital settings, insert catheters using aseptic technique and sterile equipment
- In nonacute-care settings, use clean technique for intermittent catheterization.
- If ultrasound bladder scanners are used, ensure that equipment is adequately cleaned and disinfected between patients.
- Follow aseptic insertion; maintain a closed drainage system.
- If breaks in aseptic technique, disconnection, or leakage occur, replace the catheter and collection system.
- Maintain unobstructed urine flow.
- Keep collecting bag below level of bladder at all times.



- Do not rest collecting bag on the floor.
- Empty collecting bag regularly using separate, clean container for each patient; avoid contact of spigot with the container.
- Obtain urine samples aseptically. If small amount needed, aspirate from needleless sampling port with sterile syringe/cannula adapter after cleaning the port with a disinfectant.
- If obstruction occurs and catheter material is contributing to obstruction, change the catheter.
- Comply with CDC hand hygiene recommendations and Standard Precautions.

Also consider:

- Alternatives to indwelling urinary catheterization in selected patients
- Urinary catheter systems with preconnected, sealed catheter-tubing junctions
- Use of portable ultrasound devices for assessing urine volume to reduce unnecessary catheterizations
- Use of antimicrobial/antiseptic-impregnated catheters

#### CASE

Brenda is a nursing assistant instructor at the local technical college. Today she has taken a group of students to their clinical site, the Marshall Green Nursing Home, which has had a higher than usual number of urinary tract infections over the last several months. One of her students, Annie, is assigned to an elderly gentleman who has an indwelling urinary catheter in place. The care plan indicates he should use a bedside drainage bag during the night and a leg bag during the day. The nursing assistant assigned to the patient tells Brenda his leg bag is in the bedside stand wrapped in a towel.

When Annie locates the bag, it is in a washbasin wrapped in a towel. She finds there is no cap on the end of the tubing that is to be inserted into the catheter, and she shows this to Brenda. Annie has been taught that the end of the tubing must be protected by capping it with a sterile cap in order to maintain a closed system and to prevent bacteria from contaminating the system. Brenda approaches the nursing assistant and tells her about the lack of the cap and the risk for infection. The nursing assistant replies, “We never put a cap on the end of it.”

Brenda tells Annie to obtain a new leg drainage bag, instructing her to ensure that she cleans the end of the bedside drainage bag connection and caps it with the cap removed from the new leg-bag tubing before storing it in the bedside cabinet. She then brings the contaminated leg bag to the supervising nurse, who says she will report it and speak to the nursing assistant about it. With the help of Brenda, Annie completes an incident report.



## PREVENTING SURGICAL SITE INFECTIONS

CDC (2017c) recommendations for preventing surgical site infections include:

### Before surgery:

- Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines.
- Avoid inappropriate use of broad-spectrum antibiotics or prolonged courses of prophylactic antibiotics.
- Instruct patients to shower or bathe with soap or an antiseptic agent prior to operation.
- Avoid hair removal at the operative site unless it will interfere with the operation; use clippers, not razors.
- Use the appropriate antiseptic agent and technique for skin preparation in the period prior to surgery and immediately before the placement of surgical drapes.

### During surgery:

- Keep OR doors closed during surgery except as needed for passage of equipment, personnel, and the patient.
- Use at least a 50% fraction of inspired oxygen intraoperatively and immediately postoperatively in select procedure(s).
- Exclude surgeons or other care providers with infections.
- Use closed suction drains.
- Do not apply topical antimicrobial agents to the surgical incision.
- Delay primary closure for heavily contaminated wounds.
- Consider the use of triclosan-coated sutures.

### After surgery:

- Perform hand hygiene with each patient contact.
- Maintain immediate postoperative normothermia.
- Protect primary closure incisions with sterile dressing.
- Control blood glucose level during the immediate postoperative period
- Discontinue antibiotics according to evidence-based standards and guidelines.



## PREVENTING CENTRAL LINE–ASSOCIATED BLOODSTREAM INFECTIONS

CDC (2016d) guidelines for prevention of CLABSIs include a checklist that covers the following:

### For clinicians:

- Promptly remove unnecessary central lines.
  - Perform daily audits to assess if each central line is still needed.
- Follow proper insertion practices.
  - Perform hand hygiene before insertion.
  - Adhere to aseptic technique.
  - Use maximal sterile barrier precautions (mask, cap, gown, sterile gloves, and sterile full body drape).
  - Perform skin antisepsis with >0.5% chlorhexidine with alcohol.
  - Choose the best site to minimize infections and noninfectious complications.
  - Avoid femoral site in obese adult patients.
  - Cover the site with sterile gauze or sterile, transparent, semipermeable dressings.
- Handle and maintain central lines appropriately.
  - Comply with hand hygiene requirements.
  - Bathe ICU patients over 2 months of age with chlorhexidine preparation on a daily basis.
  - Scrub the access port or hub immediately prior to each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
  - Access catheters only with sterile devices.
  - Replace dressings that are wet, soiled, or dislodged.
  - Perform dressing changes under aseptic technique using clean or sterile gloves.

### For facilities:

- Ensure healthcare personnel are educated about indications for central lines, proper procedures for insertion and maintenance, and appropriate infection prevention measures.
- Empower staff to stop nonemergent insertion if proper procedures are not followed.
- “Bundle” supplies (e.g., in a kit) to ensure items are readily available for use.
- Provide the checklist above to clinicians to ensure all insertion practices are followed.



- Ensure efficient access to hand hygiene.
- Monitor and provide prompt feedback for adherence to hand hygiene.
- Provide recurring education sessions on central line insertion, handling, and maintenance.

**Supplemental strategies:**

- Use 2% chlorhexidine for bathing ICU patients over 2 months of age.
- Use antimicrobial/antiseptic-impregnated catheters.
- Use chlorhexidine-impregnated dressings.

**PREVENTING IV CATHETER–RELATED BLOODSTREAM INFECTIONS**

- For peripheral catheters, an upper extremity site is preferred in adults. In pediatric patients, the upper or lower extremities or the scalp (in neonates or young infants) can be used.
- Avoid steel needles when administering fluids and medications that might cause tissue necrosis if extravasation occurs.
- Wear clean gloves, rather than sterile, for insertion. Use sterile gloves when touching the catheter site after prepping the skin.
- Prep skin at insertion site with an alcohol/chlorhexidine solution, scrubbing back and forth for 30 seconds, and then air dry. If chlorhexidine is contraindicated, use tincture of iodine or 70% alcohol.
- Use sterile transparent dressing. If patient is diaphoretic or site is bleeding or oozing, use sterile gauze dressing until resolved.
- Do not use topical antibiotic ointment or creams on catheter insertion sites.
- Use closed IV catheter systems with integrated extension sets and stabilization platforms.
- Minimize contamination risk by scrubbing the access port with an appropriate antiseptic.
- Replace peripheral catheters no more frequently than every 72 to 96 hours. Replace peripheral catheters in children only when clinically indicated.
- Change needleless components at least as frequently as the administration set.
- Evaluate site by palpation and inspection at least every 2 hours with continuous infusions, or at least twice in a 24-hour period when IV site is locked for intermittent infusions.
- Remove peripheral venous catheters if patient develops signs of phlebitis, infection, or a malfunctioning catheter.
- Encourage patients to report any changes in their catheter site or any new discomfort.



- Assess the necessity of peripheral IV lines on a daily basis or per facility policy.
- Do not submerge catheter or catheter site in water when bathing or showering.
- Do not hang IV fluids mixed by pharmacy or nursing longer than 24 hours, unless otherwise indicated.
- Do not hang premixed fluids for adults longer than 96 hours.
- Change tubing for adults every 96 hours for continuous infusions or every 24 hours for intermittent infusions.  
 (CDC, 2017d; CHCS, 2015)

### PREVENTING CLOSTRIDIUM DIFFICILE INFECTIONS

- Use antimicrobials only as necessary.
- Perform hand hygiene per CDC/WHO recommendations. (Note that not all hand hygiene products are effective against *C. diff.*)
- Since spores may be difficult to remove from hands even with handwashing or hand sanitizer, adhere strictly to glove use.
- Presumptively isolate symptomatic patients pending confirmation of CDI.
- Isolate patients with CDI and initiate Contact Precautions immediately.
- Private rooms are preferred for patients with fecal incontinence.
- Maintain Contact Precautions until discharge, as patients continue to shed spores following treatment.
- Use disposable or dedicated patient care equipment (e.g., stethoscopes, BP cuffs, and thermometers).
- Clean room surfaces thoroughly on a daily basis and upon discharge or transfer.
- Clean and disinfect equipment and environment using EPA-approved sporicidal disinfectant.
- Communicate Contact Precautions at shift handoff and notify new facility on transfer.
- Implement an antimicrobial stewardship program.  
 (CDC, 2017e)

### PREVENTING MULTIDRUG-RESISTANT ORGANISM INFECTIONS

- Comply with hand hygiene as recommended by the CDC.
- Implement Contact Precautions when working with patients with MDRO infection and for those who have been previously identified as being colonized.



- Use antibiotics only when needed and for the shortest time possible.
- Place patients with an MDRO infection in a private room or share a room with others who have the same infection. When this is not possible, place in rooms with patients who are at low risk for acquiring an MDRO and who are likely to have short lengths of stay.
- Dedicate noncritical medical items (e.g., BP cuffs, stethoscopes, thermometers) for patients known to be infected or colonized with MDROs.
- Clean and disinfect all patient care items, equipment, and room surfaces every day; utilize a checklist to ensure compliance.
- Wear masks when performing splash-generating procedures, when caring for patients with open tracheostomies or potential projectile secretions, and in circumstances where there is evidence of transmission from heavily colonized sources such as burn wounds. (CDC, 2017f)

### PREVENTING VENTILATOR-ACQUIRED LUNG INFECTIONS

- Follow routine infection control practices and hand hygiene.
- Keep head of bed elevated 30 to 45 degrees.
- Assess daily readiness for extubation.
- Change ventilator circuit if visibly soiled or mechanically malfunctioning.
- Use sterile suctioning techniques and handling of respiratory equipment.
- Perform oral care at least every 2 to 4 hours with an antiseptic swab to clean the oral cavity and teeth. Brush the teeth twice a day.
- Combine respiratory therapy with nursing in performance of oral care. (HRET, 2017)

### Falls

Falls are common, especially for older adults, both in the community and in healthcare settings. The CDC estimates that 1 in 3 U.S. adults age 65 or older and 50% to 75% of nursing home residents fall every year. AHRQ states that between 70,000 and 1 million people fall in hospitals each year (ECRI Institute, 2016).

According to the Joint Commission (2015a), hundreds of thousands of patients fall in hospitals each year, 30% to 50% of which result in injury. Between 2009 and 2015, TJC received 465 reports of falls with injuries, the majority occurring in hospitals, with 63% resulting in death. Hip fractures are one of the most common types of serious injury resulting from a fall.



Fall-related injuries result in significant healthcare costs, and according to the CDC (2017g), costs for fall injuries for individuals 65 or older are \$34 billion annually. The Joint Commission reports the average cost for a fall resulting in injury is \$14,000. In 2008 the Centers for Medicare and Medicaid Services stopped reimbursing for care resulting from injuries occurred from in-hospital falls if the fall could have been prevented.

The Joint Commission identifies the most common **contributing factors** to falls with injury as follows:

- Inadequate assessment
- Communication failures
- Lack of adherence to protocols and safety practices
- Inadequate staff orientation, supervision
- Inadequate staffing levels or skill mix
- Deficiencies in the physical environment
- Lack of leadership

The CDC and ECRI Institute consider both intrinsic and extrinsic risk factors. Intrinsic factors include issues that generally cannot be changed and concern the patient’s medical, psychological, and physical issues. Extrinsic factors that generally can be changed address environmental risks that patients encounter. Examples include:

**Intrinsic Risk Factors**

- Advanced age
- Previous falls
- Muscle weakness
- Gait and balance problems
- Poor vision
- Postural hypotension
- Chronic conditions such as arthritis, stroke, incontinence, diabetes, Parkinson’s disease, dementia
- Fear of falling

**Extrinsic Risk Factors**

- Lack of stair handrails



- Poor stair design
- Lack of bathroom grab bars
- Dim lighting or glare
- Obstacles and tripping hazards
- Slippery or uneven surfaces
- Psychoactive medications
- Improper use of assistive devices
- Ill-fitting or inappropriate footwear
- Prolonged length of stay
- Use of restraints
- Attachment to equipment such as heart monitor or intravenous lines  
(ECRI Institute, 2016; TJC, 2015a; CDC, 2017c)

Older patients are not the only population at risk. Any patient who has had excessive blood loss may experience postural hypotension, increasing the risk of falling. Maternity patients or other patients who have epidural anesthesia are at risk for falls due to decreased lower-body sensation.

### **PRACTICE ERRORS IN REHABILITATION THERAPY**

Practice errors occur throughout the healthcare industry, including the fields of physical and occupational therapy. However, compared to other healthcare professions, few studies have been conducted to examine the nature of those practice errors, and there are few articles in the allied health literature that address the topic of error or the analysis of error using a system approach.

Of those studies that have been done, most errors in both occupational and physical therapy practice realms have been shown to occur in the intervention phase of the therapy, which includes:

- Communication
- Education
- Documentation
- Supervision
- Treatment



Errors have been attributed to:

- Misjudgment
- Lack of preparation
- Lack of experience
- Overload or time constraints
- Insufficient or miscommunication
- Lack of knowledge
- Issues related to the patient
- Inadequate preparation

It has been noted that physical therapists may be less involved than other medical providers in error reduction efforts because physical therapy is often perceived as a lower-risk profession in that the errors made by therapists may be less likely to be life-threatening (Van Zytveld et al., 2016).

## PREVENTING FALLS

Preventing falls involves assessing patients for risk for falls, developing a personalized plan of care, and utilizing consistent preventive interventions.

### ***Patient Assessment***

A fall risk assessment should be done on admission, and reassessment should be done whenever there is a change in a patient's condition or when a patient is being transferred to another unit. A reliable, standardized, and validated assessment scale should be used that includes a history of falls, mobility problems, use of assistive devices, medications, and mental status.

While some institutions have created their own assessment tools, tools that have been studied the most are recommended. These include:

- Morse Fall Scale
- STRATIFY Scale
- Henrich II scale
- Medication Fall Risk Scale and Evaluation Tools
- Delirium Evaluation Bundle



Additional tools found to be valid for use in outpatient settings include:

- Timed Up & Go (TUG)
- 4-Stage Balance Test
- Berg Balance Test  
(CDC, 2017h; CDC, 2017i; Physical Therapy Haven, 2017)

Although there are several pediatric falls assessment tools, none have been found to be reliable and valid across institutions and diverse populations (DiGerolamo & Davis, 2017).

### MORSE FALL SCALE (MFS)

The MFS is used widely in both hospital and long-term care inpatient settings. The MFS requires systematic, reliable assessment of a patient's fall risk factors upon admission, after a fall, upon change in status, and at discharge or transfer to a new setting. MFS subscales include assessment of:

Risk Factor	Score
History of falling, immediate or within 3 months	No = 0
	Yes = 25
Secondary diagnosis	No = 0
	Yes = 15
Ambulatory aid	None, bed rest, wheelchair, nurse = 0
	Crutches, cane, walker = 15
	Furniture = 30
IV/heparin lock	No = 0
	Yes = 20
Gait/transferring	Normal, bed rest, immobile = 0
	Weak = 10
	Impaired = 20
Mental status	Oriented to own ability = 0
	Forgets limitations = 15

MFS Score	Risk Level	Action
0–24	None	Basic nursing care
25–50	Low	Standard fall prevention interventions
51+	High	High-risk fall prevention interventions

Source: AHRQ, 2017g.



### **Fall Prevention Plan**

AHRQ (2017g) states that the cornerstone of any hospital's fall prevention program is the use of **universal fall precautions** because they apply to all patients at all times, regardless of fall risk. These precautions include:

- Familiarize the patient with the environment.
- Have the patient demonstrate call light use.
- Maintain call light within reach.
- Keep the patient's personal possessions within patient safe reach.
- Have sturdy handrails in patient bathrooms, room, and hallway.
- Place the hospital bed in low position when a patient is resting in bed; raise bed to a comfortable height when the patient is transferring out of bed.
- Keep hospital bed brakes locked.
- Keep wheelchair wheel locks in locked position when stationary.
- Keep nonslip, comfortable, well-fitting footwear on the patient.
- Use night lights or supplemental lighting.
- Keep floor surfaces clean and dry; clean up all spills promptly.
- Keep patient care areas uncluttered.
- Follow safe patient handling practices.

Once risk assessment is completed and universal fall precautions are in place, additional interventions are tailored to individual patient's needs. Examples may include:

- More intense supervision such as sitters or 15-minute checks for a cognitively impaired patient who is agitated or tries to wander
- Participation in a mobility program through physical or occupational therapy for a patient with impaired gait or mobility at risk for deconditioning
- An hourly (scheduled) rounding protocol for all patients, during which toileting needs are assessed



## PHYSICAL AND OCCUPATIONAL THERAPY FALL INTERVENTIONS

Both physical and occupational therapists have a significant impact in preventing falls.

**Physical therapists** help prevent falls by:

- Assessing individual patients for risk factors
- Making a patient's home as safe as possible
- Measuring strength and assessing balance and mobility
- Designing individualized exercises and balance training
- Providing patient education about medical risk factors linked to falls
- Working with other healthcare professionals and community services to create programs for people who want to reduce the risk of falling

**Occupational therapists** consider how the person functions in their day-to-day environment. They assess for hazards and patient limitations that contribute to falls and offer education in safety to patients and/or caregivers during activities of daily living. Occupational therapists can also earn specialty certification in fall prevention.

**Fall risk factors** addressed by occupational therapy include:

### Intrinsic Risk Factors

- Lower-extremity weakness
- Impaired balance
- Cognitive impairment
- Urinary incontinence
- Sensory impairment
- Fear of falling
- Side effects of medication

### Extrinsic Risk Factors

- Throw rugs and loose carpeting
- Lighting and glare
- Pets
- Clutter
- Uneven sidewalks and thresholds
- Unstable or nonexistent handrails

Source: APT, 2017; AOTA, 2017.



**CASE**

Julie is a 78-year-old woman admitted to the surgical unit following repair of a fracture of the left ankle. The nurse completes her initial assessment, including an assessment for risk for falls using the Morse Fall Scale. She notes that:

1. Julie has a history of falling twice in the past three months, the first on the ice in her driveway, the last one this morning tripping over her cat (25 points).
2. Julie has a diagnosis of adult-onset diabetes with lower extremity neuropathy (15 points).
3. She does not use an ambulatory aid (0 points).
4. She arrives at the unit with one heparin lock and one IV infusing (20 points).
5. She will require assistance with transfers and gait (20 points).
6. Julie has dementia requiring assistance with ADLs (15 points).

The nurse totals Julie's risk for falls and records a score of 95. She then adjusts Julie's care plan to include the evidence-based interventions required for her high-risk fall status, including close supervision with 15-minute checks and referrals to both OT and PT for prevention of deconditioning as well as for gait training.

## Health Information Technology Problems

Healthcare facilities across the United States have made great efforts in moving from paper to electronic systems and processes since the Health Information Technology for Economic and Clinical Health (HITECH) Act was passed in 2009. In 2008, only 17% of physicians and 9% of hospitals had at least a basic electronic health record (EHR). In 2015, 96% of hospitals and 78% of physician offices used certified EHR technology. Hospitals across the country have also achieved increases in electronic health information exchanges. However, there remain a number of significant problems that need to be addressed and overcome (U.S. DHSS, 2016).

Compared to paper records, EHRs improve healthcare quality and safety. There are numerous studies that support health information technology's important role in patient safety. CPOE (computerized physician order entry) systems can improve patient safety by eliminating transcription errors due to illegible handwriting, providing clinical decision support, and alerting clinicians to a potentially dangerous order (U.S. DHSS, 2016).

Other studies point out unintended consequences of health information technology (IT), noting that if technology is designed and applied inappropriately, it can add additional complexity to an already complex delivery of healthcare, leading to unintended adverse consequences. Errors can occur at the interface between a computer user and the health IT system, and glitches can occur in how the equipment software functions (U.S. DHSS, 2016).



## HUMAN-TO-COMPUTER-RELATED ERRORS

If an individual uses the health IT system incorrectly, there are several problems that can lead to errors. These include:

- Failure to identify the patient properly, causing clinical information to be entered into the wrong record
- Multiple open records, leading to data being entered into the wrong record
- Data not entered into the system
- Incomplete and missing data from the entry
- User ignoring or overriding an alert
- Delay in data entry due to inadequate number of devices or equipment for providers
- Lab test results not reviewed in a timely manner
- Scanning an item from an outside source into the wrong patient record
- Lack of evidence in the patient record of a written order or care provided
- Data from an archived paper record not being available at the time of a patient's visit
- Test results sent to the wrong provider, causing delay in taking appropriate action
- Processes being missed or done incorrectly due to inadequate training of staff
- Text entries not shared due to poorly designed interfaces between systems
- Failure to document reasons for not using clinical decision support

## COMPUTER-RELATED ERRORS

Health IT system glitches in how the software functions can also lead to errors. Such problems include:

- Improperly displayed data in the system
- Down or slowed network
- Interface issues with a laboratory system, causing delays in retrieving data
- Outdated software
- Software that does not meet the needs of the provider
- Improperly functioning software
- Lost data



- Internet or server connectivity issues that prevent real-time data entry
- Breach in the security of the system (virus or malware)
- Use of unapproved data-entry devices  
(ONC/HealthIT, 2017)

## DEVELOPING EFFECTIVE DOCUMENTATION AND COMMUNICATION

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It is clear that good communication lies at the heart of good practice and thus promotes patient safety. Many errors have been demonstrated to arise from the lack of adequate or accurate communication. There is a great deal of support for the development of effective documentation and communication in the provision of safe patient care.

### Documenting to Prevent Errors

Documentation must be credible and timely and must accurately reflect the patient's condition as well as the care given. Illegible writing and poor transfer of information (both within a department and when a patient transfers to another department or facility) can cause medical errors. Healthcare professionals must learn and follow their facility's policies and procedures about charting.

To help prevent medical errors, the following **charting measures** should be taken:

- Record all pertinent health or drug information (e.g., drug allergy, post-radical mastectomy/lymph node dissection status) in order to prevent adverse events.
- Record nursing observations or changes in a patient's condition and interventions, actions taken, and further monitoring or intervention that may be required in order to prevent other providers from being unaware.
- Record that a medication was given in order to prevent a patient from being over-medicated, possibly leading to an adverse response or death.
- Follow up on an ordered medication that was not charted as given (by asking the patient if the medication was given, calling the pharmacy to determine if the dose had been dispensed, or calling the handoff nurse at home).
- Record in the correct chart. (Adverse events can occur when there are two patients with the same last name, two patients in the same room, two patients with the same condition, or two patients with the same doctor. Always read the name on the chart and compare it to the patient's ID band. When there are two patients with the same name, it is best practice to avoid assigning the same nurse to both.)



- Document a medication that has been discontinued for any reason in order to prevent a patient continuing to receive an unnecessary medication or to experience an adverse event related to a medication's effects or side effects.
- Record drug reactions. (When a patient complains of new symptoms after receiving a first dose of a medication, consider the possibility of an adverse reaction, take appropriate action, and document the patient's condition and intervention.)
- Transcribe orders accurately in the correct patient's chart in order to prevent a patient from missing a needed medication or treatment, receiving an unnecessary medication or treatment, or receiving the wrong dosage of medication.
- Obtain clarification from the prescribing clinician when there is a suspect order.
- Follow charting guidelines on paper or electronic medical record (see box below). (NSO, 2017b)

#### **CHARTING GUIDELINES**

- If handwriting is difficult to read, print.
- Sign full name and title on each page used.
- Do not leave blank spaces, lines, or boxes. If space is not used, draw a line through it or write "N/A" (not applicable).
- Record all entries in ink.
- Use only facility-approved abbreviations.
- Chart in chronological order.
- Record nursing actions as soon as possible following their completion.
- Never alter a record. If an error is made, mark through with one line, indicate correction made, and initial or sign the correction.
- Record only the facts. Charting should contain only what is seen, heard, felt, smelled, measured, and counted, not assumptions or opinions (e.g., do not chart "the patient fell out of bed" unless it was witnessed or the patient reports it. Instead chart "patient found lying on the floor").
- Do not document what someone else said, heard, felt, or smelled unless it is pertinent, and if so, place it in quotation marks, and identify the other individual.
- Document in a timely manner throughout the shift.
- Never document before completing an action.



- Avoid documenting for another person. However, if it is necessary to document care, tasks, or procedures performed by another provider, indicate clearly the individual who rendered the care.
- Never document the existence of an incident report; it is an internal document meant to facilitate improvement of systems and processes within the healthcare facility.  
(NSO, 2017b)

## Communication Tools to Prevent Errors

Research indicates that poor communication is a root cause of the great majority of all sentinel events. Whether it is nurse-to-nurse, nurse-to-physician, or physician-to-physician communication, having a standard framework and proven tools for reporting and sharing information can enable more effective communication.

### SBAR

One increasingly popular communication tool is the SBAR format: Situation (S), Background (B), Assessment (A), and Recommendation (R). It was originally developed by the U.S. Navy and since the 1990s has been used in healthcare settings. This tool can be used for hand-offs between shifts and between caregivers, as well as for debriefings on internal issues, information on new procedures, and email communication.

<b>S</b>	Situation	What's happening right now?
<b>B</b>	Background	What are the circumstances that led up to this situation?
<b>A</b>	Assessment	What do I think the problem is with this patient?
<b>R</b>	Recommendation	What should be done to correct the situation?

Source: IHI, 2017c.

## ERROR RISKS AMONG POPULATIONS OF SPECIAL VULNERABILITY

The safety of all patients is of paramount concern for all care providers. However, some patients—for example, the very young, the very old, and the very sick—are particularly vulnerable to the effects of medical errors, often due to their inability to participate actively as a member of the healthcare team due to communication issues. In addition, their physical status (including but not limited to body weight and body mass composition, nutritional status, and metabolism) may also cause them react differently to interventions, putting them at special risk. Healthcare providers need to recognize the special needs of these patients and act accordingly.



## Older Adults

There are multiple issues of concern when providing healthcare to an aging individual. Failure to recognize the unique problems of this age group can result in adverse events.

**Polypharmacy**, the use of more than five medications, some of which may be clinically inappropriate and/or incompatible, creates a significant risk for adverse drug events. Up to 30% of hospital admissions of older adults are the result of adverse drug events (Cantlay et al., 2016). With age there are significant changes in drug pharmacokinetics (how the body responds to a drug) and pharmacodynamics (how the drug affects the body). Factors that can affect these actions include reductions in body weight, renal excretion, and liver enzyme function.

The older adult is more sensitive to the effects of certain drugs, particularly those that affect the central nervous system, and aging is associated with decreased regulatory functions. Therefore, an antihypertensive medication, for example, can more easily result in postural hypotension, increasing the risk for falls. Opiates can increase the risk of respiratory depression.

Older patients often have multiple comorbidities, putting them at risk for polypharmacy. When a patient enters a hospital, clinicians may not have access to the patient's current or previous medication list and/or may fail to realize that a new symptom is an adverse drug reaction or a side effect, and so another drug may be prescribed to treat that symptom. Patients who see several different physicians at several different locations also increase the risk of duplicated medications or drug interactions. Other problems may arise due to repeat prescribing without proper review, failing to do regular medication reviews with patients, and poor knowledge of drug interactions on the part of the clinician.

Polypharmacy can also negatively affect medication adherence in the older adult due to a number of factors, such as visual or hearing impairment, cognitive or functional impairment, social isolation, and complexity of the therapeutic regimen.

**Confusion and/or delirium** in the older adult, especially someone with preexisting cognitive impairment, can be due to certain aspects of hospitalization, such as changes in environment and sensory deprivation. Delirium can also be the result of polypharmacy. The most common medications to cause delirium are opiates, benzodiazepines, and anticholinergics. Anticholinergic effect can also worsen a developing dementia. Confusion can also worsen when sensory input is affected, such as when the patient does not have access to eyeglasses or hearing aids.

**Functional decline** may be the result of lack of mobility resulting in physical deconditioning and muscle weakness. The older adult experiences functional decline when unable to engage in activities of daily living. When an older adult is hospitalized, functional decline can occur as early as the second day of hospitalization. In 30% of hospitalized older people, functional decline is unrelated to their primary diagnosis, and only 50% recover postdischarge (SA Health, 2016).

**Risk for falls** is increased in the older adult and may be due to the effects of acute illness compounded by an unfamiliar environment and side effects of treatments. Tethering medical devices such as urinary catheters, IV lines, cardiac monitor leads, and restraints make it more



difficult to mobilize patients safely and are associated with increased rates of delirium, infection, and falls.

**Immobility** in the older adult can result in skin integrity issues such as pressure ulcers/injuries and venous thromboembolic disease. The older adult often has fragile skin, poor mobility, and decreased blood circulation. Incontinence of urine and stool may also be related to reduced mobility, increasing the risk for skin breakdown.

**Malnutrition and dehydration** in older patients may result due to impairment in cognition, restriction of movement, no access to dentures, difficulty with self-feeding, missed meals or interrupted meals, reduced appetite due to illness or lack of activity, lack of assistance with meals and drinks, and severely restricted diet orders, such as nothing by mouth (Mattison, 2017; Cantlay et al., 2016; SA Health, 2016).

## Infants and Children

The potential for **adverse drug events** is higher in the pediatric population than in hospitalized adult patients. Children and infants often do not look as sick as they are, and they can get sick very quickly. The factors that place them at higher risk include:

- Different and changing pharmacokinetic parameters between patients at various ages and stages in development
- Fewer internal reserves to buffer any medication errors that may occur
- Need for calculation of individualized doses based on the patient's age, weight, body surface area, and clinical condition (weight changes requiring recalculation can occur quickly, particularly in neonates)
- Inadequate availability of appropriate dosage forms and concentrations needed.
- Need for precise dosage measurement and appropriate delivery systems

A recent study identified an 11% rate of adverse drug events in pediatric patients and has shown the most common types of harmful pediatric medication errors to be:

- Improper dose or quantity (37%)
- Omission error (20%)
- Unauthorized or wrong drug (14%)
- Prescribing error (9%)

These errors were followed in frequency by:

- Issues related to administration technique



- Drug given at the wrong time
- Drug prepared incorrectly
- Drug given in the wrong dosage form
- Drug given by the wrong route  
(Patient Safety Movement, 2017a)

Such errors demonstrate the need to check the label, compare the dispensed dose with the medication order, perform all medication calculations three times, check all medication calculations with another nurse, and verify that the dosage is within the appropriate range for the medication and the patient.

Infants and young children do not have the **communication** abilities needed to alert clinicians to effects they experience. Parents of infants and children need to be fully informed and involved in their child's care during any encounter with the healthcare system and must be educated to question caregivers about medications and procedures.

## **Pediatric Patients with Special Needs**

Children and adolescents with medical complexity and special needs are a fast-growing population in pediatrics. Because of the complexity of their care, these children and their families depend on a variety of services from multiple disciplines. It is not uncommon for such a child to have as many as 25 ongoing healthcare needs that are being met by 10 or more different providers. As a result, their health services are rarely integrated or reliable, and because of these systemic shortcomings, they experience the highest rates of adverse events, including medical errors, of all children. The development of a shared plan of care can minimize such errors and adverse outcomes (Berry, 2015).

There is moderate support for the hypothesis that medical homes provide improved outcomes for children with special health care needs, however, further research is recommended (Homer et al., 2017). A medical home extends beyond facility walls to provide comprehensive primary care through partnerships between patients, clinicians, medical staff, and families by offering specialty care, educational services, family support, as well as other services as needed (Calvin, 2017).

## **Intensive Care Patients**

Intensive care patients are severely ill and receive a great number of medical interventions, making them prone to injury from medical errors. These patients often have more comorbidities and are less resilient to errors. They may receive more medications, and pharmacokinetics can be altered in critically ill patients. Additionally, they are often unable to help facilitate their own care.



The ICU is a complex setting where healthcare personnel interact with complicated equipment while under conditions of high stress. Errors most commonly occurring in an ICU are due to medications, ventilation, central line insertions, and nosocomial infections. Medication errors may occur because of the use of multiple medications and high-risk potent drugs. Drugs used in the ICU often require dose calculations and are administered as boluses or continuous infusions (Chiche et al., 2015; Kruer et al., 2014).

## **Patients in Isolation**

Patients who are placed in isolation have been found to be at higher risk of harm, including delays in treatment and increased incidence of adverse events. They risk physical harm as well as psychological harm with increased levels of anxiety and depression. Hospitalized older patients may be especially vulnerable to such harm.

Patients in isolation have less time in contact with providers despite the fact their acuity may be higher. Vital signs are more likely to be inaccurate, incomplete, or not completed as ordered. In hospital teaching settings, patients in isolation are less likely to be examined by an attending physician.

There are a higher number of reported incidents related to IVs, medication, and treatments. Patients in isolation are eight times more likely to experience a failure in supportive care, which may be attributed to the limits personal protective equipment place on effective patient assessment and disincentive to enter the isolation room (James, 2015).

## **Patients with Low English Proficiency**

Persons with low English proficiency (LEP) have a limited ability to read, speak, write, or understand English. There are more than 300 languages spoken or signed in the United States. About 20% of the U.S. population speaks a language other than English at home, and approximately 9% are defined as having LEP. Individuals with LEP have problems with language competence that negatively affect communication and can greatly define the ease with which they navigate all areas of the healthcare system. Because of this, they experience adverse events resulting in physical harm at rates over 50% higher than English-proficient persons (TJC, 2015b).

LEP patients can experience:

- Longer hospital stays when professional interpreters are not used on admission and/or discharge
- Greater risk of line infections, surgical infections, falls, and pressure ulcers/injuries
- Greater risk of surgical delays due to difficulty understanding instructions, including how to prepare for a procedure



- Greater chance for readmission for certain chronic conditions because of difficulty understanding how to manage their condition and take their medications, which symptoms should require a return to care, or when to follow up

Factors that contribute to failure in communication errors include:

- Use of family members, friends, or nonqualified staff as interpreters (the most commonly reported cause of errors)
- Provider reliance on basic language skills that allow one “to get by”
- Cultural beliefs and traditions that affect care, such as expression of pain, respecting authority, gender roles, and class biases

Other people who may have identical issues include:

- Patients who have limited proficiency or literacy in any language
- Patients who have visual or hearing impairments
- Patients on ventilators
- Patients with cognitive impairments
- Children  
(TJC, 2015b; Halado & Lundy, 2017)

## **Patients with Low Health Literacy**

Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions. Health literacy requires numerical literacy, ability to communicate, ability to fill out forms, and ability to understand concepts such as risk and probability. Health literacy is not necessarily tied to years of education or to general reading ability. Someone who has no difficulties at home or work may have minimal or inadequate literacy in a healthcare setting.

Low health literacy contributes to longer length of hospital stays, delays in seeking care, suboptimal adherence to plans of care, and errors due to:

- Failure to follow instructions
- Inability to recognize and/or articulate signs and symptoms
- Difficulty understanding prescription medication warning labels
- Misuse of prescription medications
- Lack of understanding of treatment options



The populations most impacted by low health literacy are:

- Patients over 65 years of age
- Members of racial and ethnic minority groups
- Immigrants
- Patients with low socioeconomic status
- Patients with chronic physical or mental illness

(James, 2015)

## PATIENT SAFETY INITIATIVES

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When the book *To Err Is Human* made headlines across the country in 1999, it captured the attention of the public and launched the modern patient safety movement. Federal funding for patient safety initiatives increased, accreditation and reporting standards tightened, and research on effectiveness of patient safety measures expanded. Over the ensuing years, the patient safety movement has grown to involve many agencies and organizations in both the public and private sectors, and many important milestones have been achieved along the way. Annually, the Patient Safety Movement Foundation meets to nominate and elect new patient safety challenges to be addressed for the following year in attempt to reach their primary goal of zero preventable deaths by 2020 (PTSF, 2017b).

### AGENCIES AND ORGANIZATIONS IN THE PATIENT SAFETY MOVEMENT

**AAAHC** - Accreditation Association for Ambulatory Health Care. Develops standards to advance and promote patient safety, quality care, and value for ambulatory healthcare settings, including ambulatory surgery centers, community health centers, medical and dental group practices, medical home practices, and managed care organizations, as well as Indian and student health centers.

**ABMS** - American Board of Medical Specialties. Recognizes medical specialists and establishes standards for physician certification.

**ACGME** - Accreditation Council for Graduate Medical Education. Responsible for accrediting the majority of medical residency and internship programs.

**AHRQ** - Agency for Healthcare Research and Quality. Produces evidence to make healthcare safer, of higher quality, more accessible, more equitable, and more affordable, working with the U.S. Department of Health and Human Services.

**ANA** - American Nurses Association. Represents the interests of registered nurses to advance the profession to improve healthcare.



**CDC** - Centers for Disease Control and Prevention. Promotes health and disease prevention and preparedness.

**HCUP** - Health Care Utilization Project. Maintains hospital care data enabling research on a range of health policy issues.

**HRET** - Health Research and Education Trust. A research and education affiliate of the American Hospital Association that promotes research and education efforts.

**IHI** - Institute for Healthcare Improvement. Redesigns healthcare into a system without errors, waste, delay, or unsustainable costs.

**IOM** - Institute of Medicine. Asks and answers the nation's most pressing questions about health and healthcare.

**ISMP** - Institute for Safe Medication Practices. Watchdog organization devoted to medication error prevention and safe medication use.

**NGC** - National Guideline Clearinghouse. A public resource for evidence-based clinical practice guidelines.

**NIH** - National Institutes of Health. Conducts medical research.

**NPSF** - National Patient Safety Foundation. Advances patient and healthcare workforce safety; disseminates strategies to prevent harm.

**NQF** - National Quality Forum. Leads national collaboration to improve health and healthcare quality through measurement.

**TJC** - The Joint Commission. Accredits and certifies healthcare organizations and programs in the United States.

**WHO** - World Health Organization. WHO World Alliance for Patient Safety serves as the directing and coordinating authority for health within the United Nations system.

## Federal and State Efforts

In 2006, Congress passed the Deficit Reduction Act of 2005, authorizing Medicare and Medicaid to tie healthcare facilities' Medicare eligibility to the occurrence of preventable never events. At the onset, the Center for Medicare and Medicaid Services (CMS) listed only eight types of hospital-acquired conditions, but as of August 2013, CMS revised the list to include additional conditions raising the total to fourteen, closely mirroring the NQF's list of serious reportable events (Zung, 2014).



In 2007, CMS issued a new rule giving hospitals a powerful incentive to reduce medical errors. This rule denied reimbursement to hospitals for treatment of preventable errors, injuries, and infections. This rule also stipulated that these charges may not be passed along to the beneficiary. This new rule was mandated by the Patient Safety and Quality Improvement Act to take effect in October 2008 (CMS, 2015).

Follow up of this initiative in 2015 showed improvements, with a reduction of 11% in the rate of central line–acquired bloodstream infections and a 10% reduction in the rate of change in catheter-associated urinary tract infections, conditions for which there is strong evidence that better hospital processes produce better outcomes. However, the initiative has not shown improvements in injuries from falls or hospital-acquired pressure ulcers/injuries, conditions for which there is less evidence that changing hospital processes leads to significantly better outcomes (Waters et al., 2015).

More than 25 states and the District of Columbia have mandatory reporting of never events, but only a few states report publicly. Minnesota has had a mandatory reporting program in place since 2005 and has averaged approximately 100 to 150 reported never events each year (Leapfrog Group, 2016).

#### **PREVENTABLE COMPLICATIONS (NEVER EVENTS) NOT COVERED BY MEDICARE AND MEDICAID**

The following preventable complications are not reimbursed by Medicare and Medicaid if acquired during an inpatient stay:

- Foreign object retained after surgery
- Air embolism
- Blood incompatibility
- Stage III and IV pressure ulcers
- Falls and trauma:
  - Fractures and dislocation
  - Intracranial injuries
  - Burns
  - Crushing injuries
  - Other injuries
- Manifestations of poor glycemic control:
  - Diabetic ketoacidosis
  - Nonketotic hyperosmolar coma



- Secondary diabetes with ketoacidosis
- Secondary diabetes with hyperosmolarity
- Catheter-associated urinary tract infection
- Vascular catheter-associated infection
- Surgical site infection following:
  - Mediastinitis following coronary artery bypass graft
  - Bariatric surgery for obesity
  - Laparoscopic gastric bypass
  - Gastroenterostomy
  - Laparoscopic gastric restrictive surgery
- Surgical site infection following certain orthopedic procedures:
  - Spine
  - Neck
  - Shoulder
  - Elbow
- Surgical site infection following cardiac implantable electronic device
- Deep vein thrombosis/pulmonary embolism following total knee or hip replacement
- Iatrogenic pneumothorax with venous catheterization

Medicare and Medicaid also will not reimburse for wrong-site, wrong-procedure, and wrong-patient surgery.

Source: CMS, 2015.

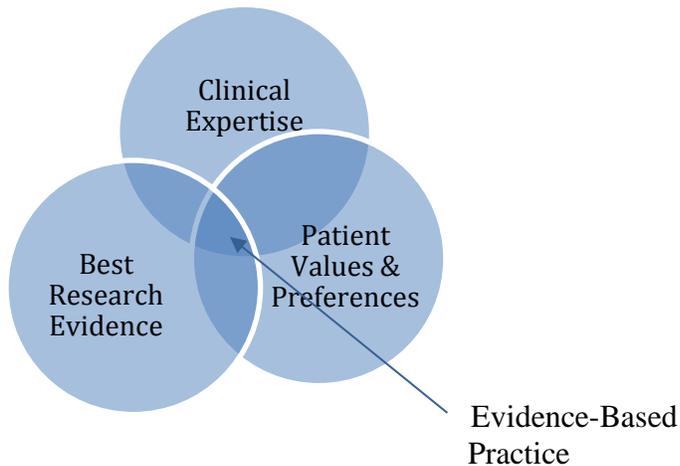
Since Medicare initiated its nonpayment policy for preventable errors, many private insurers have followed suit, further benefiting patient safety. In addition, some have implemented incentives for hospitals that adhere to standards designed to improve patient safety.

## Evidence-Based Practice

Evidence-based practice (EBP) is vital for the improvement in the quality of treatment and for assuring patient safety. EBP attempts to standardize practices in order to make outcomes more predictable. EBP involves collecting, evaluating, and implementing practices that can improve patient care safety and outcomes. EBP is beneficial in decreasing healthcare costs and reducing medical complications. It is the integration of clinical expertise, patients' values and preferences,



and best research evidence into the decision-making process for providing patient care (Duke University Medical Center, 2017).



Components of evidence-based practice. (Source: J. Swan.)

#### FIVE STEPS TO IMPLEMENT EVIDENCE-BASED PRACTICE

1. **Ask:** Assess the patient and formulate a well-written clinical question.
2. **Acquire:** Identify appropriate resources, including background and quantitative and qualitative research findings, and search the literature.
3. **Appraise:** Critically appraise the evidence to determine its validity and potential usefulness.
4. **Apply:** Integrate the evidence with clinical expertise and patient preferences and apply to practice.
5. **Assess:** Evaluate performance through a process of self-reflection, audit, or peer assessment to determine whether the action taken has achieved the desired results.

Source: Duke University Medical Center, 2017.

#### CASE

Jai, a pharmacist working in skilled nursing facilities, was involved in reviewing and updating a facility's manual of medication policies and procedures. While reviewing the section on digoxin monitoring, he found that an apical pulse should be taken daily before administering digoxin, and the drug should not be given if the pulse is below 60 beats per minute.

While looking over medication administration records, he found that residents with hypertension receiving antihypertensives had their blood pressure taken once a week and other residents had vital signs done once a month. Apical pulses for residents receiving digoxin were obtained daily.

As he thought about this, he realized that in all the time he has been working as a pharmacist in healthcare facilities, he could only recall digoxin being withheld once or twice because of a pulse below 60. He began to question the necessity for performing apical pulses and **asked**, “Why are medication nurses in skilled nursing facilities checking apical pulses daily?”

With that question in mind, Jai began to **acquire** relevant resources by talking with medication nurses, directors of nursing, and other pharmacists about their experiences with digoxin monitoring. All of the nurses he questioned had been in nursing for 10 or more years in skilled nursing facilities, and none could remember holding digoxin more than once or twice for a pulse below 60 on a single day which returned to normal on the next day. This number was compared to the hundreds of doses they had administered over their careers.

Jai then began to search databases for the best evidence for digoxin monitoring. He found that the initiation of digoxin occurred in hospital settings, and that it was critical to take apical pulses to determine the correct dosage. Once the patient was properly dosed and discharged, this monitoring was no longer required. Indeed, the research showed that patients discharged to “home” are not instructed to monitor their apical pulse every day and there were no negative outcomes reported.

Following his critical **appraisal** of the resources, Jai determined that persons who reside in nursing homes have been discharged to their “home” and that medication nurses were performing a time-consuming unnecessary procedure.

Jai brought his findings to the director of nursing and the medical director, and together they **enacted** (applied) a new policy that stated the apical pulse rate of residents receiving digoxin is to be obtained once a week. If the apical pulse is less than 60, digoxin should be given as ordered, and the apical pulse is to be monitored daily for three days while continuing to give the medication. If it continues to be below 60 after three days, the medication should be withheld and the attending physician notified.

The change in policy was explained to patients and their families so there would be no perception of the staff “cutting corners” once the new practice started. Aside from a few joking comments by patients about missing the “hand holding,” there was no push back.

The policy was **assessed** after it was in place for nine months. During that time there was not a single dose of digoxin held. It was determined that this change resulted in one less procedure to be performed by the medication nurse, leaving more time to provide other care for the patients.

Source: Vogenberg, 2004.

Attitudes towards EBP are mostly positive within the nursing, occupational therapy, and physical therapy fields. There does remain, however, resistance to acceptance of EBP despite scientifically supported knowledge. Many practices that are **not** evidence-based continue, including:



- Taking vital signs every 4 hours during the night on stable patients, disrupting sleep needed for recovery
- Treating children with asthma in the ER using nebulizers instead of a bronchodilator with a metered-dose inhaler and spacer, which has been shown to be more effective
- Removing urinary catheters only upon a physician's order, even though nurse-driven protocol is more efficient and may prevent urinary tract infections
- Continuing the practice of 12-hour nursing shifts when research evidence demonstrates adverse outcomes for both nurses and patients  
(Meinyk, 2016)

### **SAFE HARBOR LEGISLATION**

Traditionally, healthcare has operated on a “culture of blame.” One of the common tools for redress in a culture of blame is the lawsuit. The fear of being sued presumably leads to more careful and safer behavior by health professionals. But neither studies nor anecdotal evidence bear this out. On the contrary, fear of being sued leads to the practice of defensive medicine. Defensive medicine involves ordering diagnostic tests or procedures, making referrals, or taking other treatment steps that are not based on best practice and are not of benefit to the patient's care primarily to protect the clinician against litigation.

The Agency for Healthcare Research and Quality has offered funding grants to investigate the effects of “safe harbor” legislation as a way to reform the malpractice system and improve patient safety by inducing greater clinician adherence to evidence-based care guidelines.

Safe harbors grant liability protection to clinicians if they can demonstrate adherence to state-endorsed, evidence-based medical guidelines. A legal safe harbor gives clinical practice guidelines a special status in the medical liability system and is intended to provide greater clarity about the standard of care expected of a medical professional.

Such a grant was provided to the state of Oregon to conduct a survey of more than 2,000 providers, with the goal of obtaining input about the feasibility of implementing a legal safe harbor. Respondents to the survey agreed that a safe harbor rule would likely reduce the impact of medical liability, would increase their adherence to guidelines, and would result in improved patient safety.

Source: AHRQ, 2016a.

## **Quality Assurance and Performance Improvement (QAPI)**

Quality Assurance is the process of meeting quality standards and assuring that care reaches an acceptable level, and Performance Improvement is the continuous analysis of performance and the development of systematic efforts to improve it. Beginning in 2011, the Centers for Medicare and Medicaid Services began mobilizing some of the best practices in nursing homes. QA and PI were combined and a prototype QAPI program was begun in a small number of facilities, which



provided the agency with best practices for helping nursing homes upgrade their current quality programs.

QAPI is made up of five elements:

**1. Design and Scope**

- a. Must be comprehensive and ongoing
- b. Should address all systems of care and management practices
- c. Aims for safety and high quality with all clinical interventions
- d. Emphasizes autonomy and choice in daily life for residents
- e. Utilizes the best available evidence to define and measure goals

**2. Governance and Leadership**

- a. Develops a culture that seeks input from facility staff, residents, and families
- b. Assures adequate resources exist
- c. Designates person(s) to be accountable
- d. Ensures staff time, equipment, and technical training as needed
- e. Ensures that policies are developed to sustain QAPI
- f. Ensures a culture of safety

**3. Feedback, Data Systems, and Monitoring**

- a. Uses performance indicators to monitor a wide range of care processes and outcomes
- b. Reviews findings against established benchmarks or targets
- c. Includes tracking, investigating, and monitoring of adverse events
- d. Develops action plan to prevent adverse event recurrences

**4. Performance Improvement Projects**

- a. Gathers information systematically to clarify issues or problems
- b. Intervenes to make improvements

**5. Systematic Analysis and Systemic Action**

- a. Uses a systematic approach to determine when in-depth analysis is needed
- b. Uses a thorough and highly organized structured approach to examine the way care and services are organized or delivered



- c. Develops policies and procedures and demonstrates proficiency in the use of Root Cause Analysis
- d. Takes systemwide actions to prevent future events
- e. Focuses on continual learning and continuous improvement (CMS, 2016)

## JOINT COMMISSION AND AAAHC STANDARDS AND GOALS

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### The Joint Commission

The Joint Commission is an independent, not-for-profit agency whose mission is to continuously improve the safety and quality of care provided to the public. The Joint Commission accredits and certifies more than 21,000 healthcare organizations and programs in the United States, including hospitals and healthcare organizations that provide ambulatory and office-based surgery, behavioral health, home health care, laboratory, and nursing care center services.

Accreditation by the Joint Commission is not mandatory. Healthcare organizations, programs, and services voluntarily pursue accreditation and certification. Joint Commission surveyors visit accredited healthcare organizations a minimum of once every 39 months (two years for laboratories) to evaluate standards compliance. This visit is referred to as a survey. All regular Joint Commission surveys are unannounced, and accreditation and certification decisions are rendered two weeks to two months following the survey.

During a survey, the surveyors randomly select patients, and using their medical records, the surveyors evaluate standards compliance. As they review each patient's experience, they talk to doctors, nurses, and other staff who interacted with the patients. They also observe doctors, nurses, and other caregivers providing care and often speak to the patients themselves.

The standards of the Joint Commission focus on patient safety and quality of care. They are updated regularly, number more than 250, and address patient rights and education, infection control, medication management, preventing medical errors, improving practices and procedures, and how the organization verifies that its doctors, nurses, and other staff are qualified and competent (TJC, 2017b).

### SENTINEL EVENT POLICY

The Joint Commission encourages, but does not require, reporting of any sentinel event. However, in the interest of continuous improvement in safety and quality of care, the Joint Commission requires that healthcare organizations:

- Have a process in place to recognize sentinel events



- Conduct thorough and credible root cause analyses (see below) that focus on process and system factors, not on individual blame
- Document a risk-reduction strategy and internal corrective action plan within 45 days of the organization becoming aware of the sentinel event

The sentinel event policy has four **goals**:

1. To have a positive impact in improving patient care, treatment, and services and preventing sentinel events
2. To focus the attention of an organization that has experienced a sentinel event on understanding the factors that contributed to the event (such as underlying causes, latent conditions and active failures in defense systems, or organizational culture) and on changing the organization's culture, systems, and processes to reduce the probability of such an event in the future
3. To increase the general knowledge about sentinel events, their contributing factors, and strategies for prevention
4. To maintain the confidence of the public and accredited organizations that patient safety is a priority in accreditation practices  
(TJC, 2017a)

Although accredited facilities are expected to identify and respond appropriately to all sentinel events, but not to report them, if the Joint Commission becomes aware of an event, facilities are required to submit the findings of their root cause analyses and corrective action plans. This information can be included in the Joint Commission's review of sentinel events, helping to track national trends and develop strategies for improving patient safety.

## **NATIONAL SAFETY GOALS**

The Joint Commission's National Patient Safety Goals program assists accredited organizations to address areas of concern regarding patient safety. Such assistance involves the advice provided by a panel of patient safety experts referred to as the Patient Safety Advisory Group. This group assists in the identification of emerging patient safety issues and advises on how best to address them, such as through sentinel event alerts, standards and survey processes, performance measures, educational material, and the Center for Transforming Healthcare projects. Such projects that have been addressed include:

- Hand hygiene
- Hand-off communications
- Preventing avoidable heart failure hospitalizations
- Preventing falls
- Preventing surgical site infection



- Reducing sepsis mortality
- Safety culture
- Safe and effective use of insulin
- Safe surgery  
(TJC, 2017c; 2017d)

### “DO NOT USE” ABBREVIATION LIST

Misreading medical abbreviations can be a cause of serious medication errors, and the Joint Commission has created a “do not use” list of abbreviations that endanger patients’ safety and that it requires its members to follow.

<b>JOINT COMMISSION “DO NOT USE” LIST</b>		
Applies to all orders and all medication-related documentation that is handwritten (including free-text computer entry) or on preprinted forms.		
<b>Do Not Use</b>	<b>Potential Problem</b>	<b>Instead Use</b>
U, u	Mistaken for “0” (zero), the number “4” (four), or “cc”	Unit
IU	Mistaken for IV (intravenous) or the number 10 (ten)	International unit
Q.D., QD, q.d., qd	Period after the Q mistaken for “I” “O”	Daily
Q.O.D., QOD, q.o.d, qod	“O” mistaken for “I”	Every other day
Lack of leading zero	Decimal point is missed	0.X mg
MS	Can mean morphine sulfate or magnesium sulfate	Morphine sulfate or Magnesium sulfate
MSO <sub>4</sub> and MgSO <sub>4</sub>	Confused for one another	Magnesium sulfate
Trailing zero*	Decimal point is missed	X mg
* Exception: A “trailing zero” may be used only where required to demonstrate the level of precision of the value being reported, such as for laboratory results, imaging studies that report size of lesions, or catheter/tube sizes. It may not be used in medication orders or other medication-related documentation.		
Source: TJC, 2017e.		

The Institute for Safe Medication Practices has also compiled an extensive list of abbreviations, symbols, and dose designations that are frequently misinterpreted and involved in harmful medication errors, which can be accessed online (*see also “Resources” at the end of this course*).



## ROOT CAUSE ANALYSIS

The Joint Commission has mandated the use of root cause analysis (RCA) to analyze sentinel events since 1997. It requires that a thorough, credible root cause analysis and corrective action plan be performed for each reported sentinel event within 45 days of the event's occurrence or of the organization's becoming aware of the event (TJC, 2017f).

Root cause analysis is a widely used method in healthcare and other industries to analyze adverse events and near misses. The **central principle** of a root cause analysis is to identify:

- What happened (the course of events)
- Why an incident happened (the root cause or causes)
- How to prevent it from occurring again in the future (corrective actions)

Root cause analysis does not seek to lay blame on individuals for errors but rather to work toward preventing them.

**Strategies** for an effective root cause analysis include:

- Finding and resolving latent conditions as well as root causes
- Treating the cause rather than trying to change people
- Following through to ensure change

A thorough and credible root cause analysis should:

- Be precise
- Be accurate
- Be relevant
- Be complete
- Be systematic
- Possess depth
- Possess breadth of scope

RCAs follow a specific protocol that collects data and reconstructs the event through record review and participant interviews. A multidisciplinary team analyzes the sequence of events leading to the error, attempting to identify how the event occurred, why it occurred, and how to eliminate the latent errors that underlie the event (AHRQ, 2017h).

Since 2016, however, experts have reported ongoing problems with root cause analysis in healthcare, most importantly emphasizing the difficulty of measuring the impact of the process



on reducing future risk. The National Patient Safety Foundation and others have made recommendations for improvement and also recommend renaming RCA to demonstrate reinvention of this process (Gupta & Lyndon, 2017; Peerally et al., 2016).

#### **ROOT CAUSE ANALYSIS AND ACTION PLAN TEMPLATE**

1. The Joint Commission has developed a template to be used while conducting a root cause analysis that recommends the following questions be asked and answered and an action plan developed for any finding that can be considered a risk-reduction strategy.
2. What was the planned flow of the procedure?
3. What steps in the procedure did not occur as planned?
4. What human factors were pertinent to the outcome?
5. How did performance of equipment affect outcome?
6. What controllable environmental factors directly affected the outcome?
7. What external controllable factors affected the outcome?
8. Were there any other factors that directly affected the outcome?
9. In what other areas of the organization could this happen?
10. Was the staff properly qualified and currently competent at the time of the event?
11. How did real staffing compare with ideal levels?
12. What is the plan for dealing with unforeseen staffing problems?
13. Were such problems a factor in this event?
14. Did staff perform to expectations during the event?
15. Was all the necessary information available when needed? Was it accurate, complete, and explicit?
16. Was communication among participants sufficient for this situation?
17. Was this the appropriate physical environment for the situation?
18. What systems are in place to recognize environmental risks?
19. What planned and tested emergency and failure-mode responses are in place?
20. How does the culture support risk reduction?
21. What barriers exist to the communication of potential risk factors?
22. What methods are utilized to communicate the high priority of prevention of adverse outcomes?



23. What orientation and in-service training revisions are necessary to reduce risk of events in the future?
24. Was available technology used as intended?
25. What technology or redesign of technology might reduce risk in the future?

Source: TJC, 2017f.

### CASE: St. Vincent Hospital

*(continued from above under "Active and Latent Errors")*

Following identification of the cause of the accident in St. Vincent Hospital's operating room, a root cause analysis was begun that day. The root cause was determined to be the use of an inappropriate gas mixture to expand the abdomen during laparoscopic surgery.

#### **Contributing factors** included:

- All extra cylinders containing medical gases used in the OR are stored in metal tubes in a tank room, but only the top several inches of each cylinder and a portion of each tank's label is visible above the top of the storage tubes. The tube height is to provide adequate support for the cylinders, so shortening the tubes to allow visualization of the entire label is not an appropriate option.
- All tanks containing any percentage of CO<sub>2</sub> are color-coded the same (grey). This is an industry standard over which individual facilities have no control.
- When an OR logistics technician allowed a logistics technician from the cath lab to store an extra CO<sub>2</sub>/O<sub>2</sub> tank in the OR tank room, no one in the OR, anesthesia, or logistics chain of command was informed. This is an example of well-intentioned interunit cooperation gone awry due to lack of appropriate communication.
- The circulating nurse mistakenly replaced an empty CO<sub>2</sub> tank with a blended CO<sub>2</sub>/O<sub>2</sub> tank, not noticing the difference because they were both grey, with similar labeling, and because there was no history of anything but pure CO<sub>2</sub> being stored in the OR tank room or used in the OR.
- There was no pin indexing at the connection point between the cylinder and the gas delivery system that differentiates between pure CO<sub>2</sub> and CO<sub>2</sub> blends. Any cylinder containing any percentage of CO<sub>2</sub> fits to any yoke designed to accept CO<sub>2</sub> in any concentration.

**Corrective actions** included policy changes and an intensive education initiative for all involved personnel:

- Only medical gases intended for use in the OR are to be stored in the OR tank room.



- Should a deviation from this policy be indicated for safety reasons and no other alternatives exist:
  - Tanks containing gases not used in the OR are to be stored in the OR tank room only until safe storage elsewhere is available.
  - If no alternative storage is available, storage in the OR tank room may be approved only by the senior professional and technical personnel in the OR **and** the anesthesia service. If the decision is made during “off” hours by a shift charge person, that person is responsible for notifying the appropriate senior personnel by the next shift or delegating and documenting that this notification is to be made by a specific, named person.
  - Any such tanks are to be indicated by orange fluorescent tags reading “Not for use in the OR” and placed in the most remote storage tubes in the tank room.
  - Information about the temporary storage is to be conveyed at each OR and anesthesia shift report and in the OR shift change log until the tank is removed.
- Medical gases are elevated to the status of medications and the triple-check policy used for medications has been implemented for medical gases.
- The OR manager will personally brief each shift for the next two days to minimize rumors.
- All members of the involved surgical and logistics teams will be debriefed by their supervisors.
- A description of the incident and follow-up will be published in the quality assurance journal for the healthcare system.

## CASE

Céline is an 82-year-old patient who has suffered a stroke and been transferred to a local nursing home where inadequate staffing has been a recurrent problem. Céline has right-sided paralysis and requires total care. Her care plan includes repositioning every two hours. Today the nurse does the required biweekly skin assessment and finds a small open crater with visible subcutaneous tissue on the heel of her right foot, a stage 3 pressure injury.

The nurse documents and reports this long-term care sentinel event and a root cause analysis is begun. By asking questions as outlined in the facility’s root cause analysis template, the first step is to **identify and define the problem**:

- Stage 3 pressure injury (damage to tissue leading to death of tissue) has developed on the heel of the patient’s right foot.
- Tissue damage has negatively impacted the goal of patient safety.



The second step is to **identify the cause**:

- Death of tissue caused by mechanical damage
- Mechanical damage caused by pressure
- Pressure injury due to patient remaining in same position
- Patient remaining in same position due to failure to reposition every 2 hours
- Failure to reposition every 2 hours due to inadequate level of staffing

The third step in the process is to **select the best solution** to reduce the risk of pressure injuries in the future.

- Reposition patients at risk every 2 hours and document the action.
- Utilize pressure-relieving devices such as beds, mattresses, or overlays.
- Review and revise staffing formulas; improve staffing to meet the U.S. Department of Health and Human Services recommendations of 1 hour per resident per day for total licensed staff, 27 minutes per day for RNs, and 2 hours per day for nursing assistants.

Following completion of the root cause analysis, the facility determines to **institute the action plan**:

- Alternating pressure pads are applied to the beds of all residents at high risk for pressure injuries.
- The use of heel/elbow protectors becomes standard for all patients with immobility issues.
- Documentation on a turning schedule is instituted for each resident with immobility.
- Staffing issues remained unresolved due to budget restraints, but ongoing exploration of means to improve the staffing level is being carried out.

## Accreditation Association for Ambulatory Health Care

The Accreditation Association for Ambulatory Health Care (AAAHC) was founded in 1999 by the AAAHC Institute for Quality Improvement, which offers ambulatory healthcare organizations opportunities to learn about and become involved in performance measurement, benchmarking, and quality improvement. Since its beginning, the AAAHC has promoted a voluntary, peer-based, consultative, and education survey process to advance patient care.

Ambulatory care organizations are offered accreditation by AAAHC to demonstrate that the organization takes part in ongoing self-evaluation, peer review, and education to continuously



improve its care and services. The organization performs on-site surveys by healthcare professionals at least every three years. Areas surveyed by AAAHC include:

- Adherence to patient rights
- Governance processes
- Administration policies and procedures
- Quality of care
- Quality management and improvement policies and procedures
- Clinical records and health information
- Infection prevention and control
- Facility environment
- Anesthesia services
- Surgical and related services
- Personnel professional improvement  
(AAAHC, 2016)

## INSTITUTIONAL STRATEGIES FOR ADDRESSING ERRORS

Changes in organizational culture, involvement of leadership, education of providers, development of patient safety committees, adoption of safe protocols and procedures, and use of technology are all essential strategies healthcare facilities must consider in their efforts to reduce medical errors.

### **Creating a Culture of Safety**

The mistaken attitude in healthcare that errors are solely the fault of individual practitioners has proven a major barrier to reporting. Instead of analyzing the multiple factors that contribute to errors, past efforts have often focused on making clinicians more careful and afraid of punishment when they fail.

When the reporting of medical errors focuses on the identification and punishment of individual health professionals, there is a huge disincentive for reporting errors, and this punitive attitude severely limits the reporting of errors. This “culture of blame” bypasses the opportunity for analysis and corrective measures to prevent recurrence.

One of the main goals of organizations working to improve patient safety should be to encourage the creation of a “culture of safety” in which medical errors are discussed openly and addressed



thoroughly. When an organization values safety, this commitment is evident throughout the organization from top management to the bedside. Creating a culture of safety requires:

- Recognition that errors occur and are a part of the healthcare industry, requiring a nonpunitive approach unless specific behavior warrants disciplinary action
- Effective teamwork, communications, and shared learning
- Recognition that it is everyone's role to watch for errors or system failures
- Openness or transparency, which indicates an acceptance of the human elements in error, and a conscious means of reporting any error, near miss, or identified potential for an error
- A "just culture" where retribution is confined to reckless or malicious behavior (see below)
- Accountability to ensure everyone is aware of their responsibility to maintain safety (AHRQ, 2016b)

## **JUST CULTURE MODEL**

A culture of safety promotes open reporting of adverse events and risky situations, and even stop-work in certain situations, in a blame-free context. However, leaders must include the necessary component—a just culture. Such a culture does not default to punishment but rather makes an effort to determine if discipline is necessary when an incident occurs.

An important aspect of a just culture is the systematic, fair, and nonarbitrary method of determining system versus individual accountability. A just culture seeks to determine whether an incident was due to human error, at-risk behavior, or reckless behavior. Reckless behavior may be grounds for disciplinary action and civil and/or criminal charges. Punishment may be the appropriate consequence, including termination.

A just culture acknowledges that competent professionals make mistakes and recognizes that competent professionals may develop unhealthy norms such as shortcuts and routine rule violations, but has zero tolerance for reckless behavior (Moriates & Wachter, 2015).

## **Leadership**

As the field of safety has grown, so has the recognition that organizational leadership plays a significant role in prioritizing patient safety. In the past, hospital board members have been leaders in the community who may have little or no healthcare experience. Despite being accountable for the quality and safety of the care being provided in their organization, the boards, executives, and medical staff leadership at most U.S. hospitals placed little importance on identifying and addressing issues of safety. They often lacked the knowledge to understand the complex information and data about quality and safety of care.



Today, however, there is a shift toward more direct oversight of safety and quality of care at the organizational level. Hospital boards now use strategic initiatives to influence quality and safety, however data shows that executives and management can further improve safety by having more direct interactions with frontline workers. Visits by management (walkarounds) to clinical areas to engage in open and frank discussions with the staff about safety concerns have been shown to have a positive impact on safety culture. To be credible among frontline staff during these walkarounds, however, it is important that issues raised by the staff be addressed promptly and that leaders follow up sufficiently after an error has been reported.

Leadership can also directly address safety concerns by recognizing that disruptive and unprofessional behavior by clinicians poses a definite threat to patient safety, increasing the potential for medical errors and preventable deaths. For instance, disruptive and disrespectful behavior by physicians has been shown to be connected to adverse events in operating rooms.

In an environment where caregivers at the frontline are demeaned or harassed, there is an imbalance in decision-making power, contributing to a breakdown in teamwork and poor communication, the leading cause for medical errors. Although there is limited evidence at this time about strategies leadership can use to address this issue, some organizations are emphasizing early intervention using a structured approach for clinicians who exhibit recurrent unprofessional behavior or are the focus of multiple patient complaints (AHRQ, 2017i).

## Technology

Health information technology (IT) encompasses a technical system of computers and software that operates in the context of a larger socio-technical system. Health IT has great potential for improvement in the quality and safety of health care. Electronic health records (EHRs) should help reduce medication errors, avoid the need to repeat laboratory tests, and improve continuity of care across the healthcare system.

Expectations for health IT include the enhancement of workflow and making it easy to transfer information to and from other organizations and providers. All healthcare providers within a system are expected to have access to accurate and complete information when they need it.

Facilities should carefully select the best system available, adopt best practices for EHR implementation and management, monitor how the health IT system is used, and report any adverse events.

## CONCLUSION

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For nearly two decades, patient safety has been a topic of both national and international concern. Everyone has a stake in the safety of the healthcare system—healthcare workers as well as the general public. In the past, patient safety was not a traditional part of the education of most healthcare workers, but today this is no longer true. All healthcare workers are being actively educated about their roles in the prevention of avoidable negative outcomes for those we care



for. It is essential that all clinicians understand the journey every patient makes through the system, recognizing how the system can fail, and take action to prevent those failures.

To counter errors and safeguard patients, changes must continue to be made in how the workforce is deployed; in how work processes are designed; and in the leadership, management, and the culture of healthcare organizations. Because communication issues are so commonly involved in medical errors, it is crucial that physicians, nurses, therapists, and other healthcare personnel work together as a team, respecting each other's contributions to the well-being of the patients in their care. Collaborative teamwork is essential for optimizing quality and safety in healthcare.



## RESOURCES

Error-prone abbreviations, symbols, and dose designations (Institute for Safe Medication Practices)  
<https://www.ismp.org/Tools/errorproneabbreviations.pdf>

Hospital Safety Score  
<http://www.hospitalsafetyscore.org>

Institute for Healthcare Improvement  
<http://www.ihl.org>

List of high-alert medications (Institute for Safe Medication Practices)  
<http://www.ismp.org/Tools/highalertmedications.pdf>

National Coordinating Council for Medication Error Reporting and Prevention  
<http://www.nccmerp.org>

National Patient Safety Foundation  
<http://www.npsf.org>

National Quality Forum  
<http://www.qualityforum.org>

Patient Safety Network  
<http://psnet.ahrq.gov>

VA National Center for Patient Safety  
<http://www.patientsafety.va.gov>



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## TEST

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1. Which is a **correct** statement about the scope of the problem of medical errors?
  - a. The number of deaths from medical errors continues to rise.
  - b. There are well-established means for calculating mortality caused by medical harm.
  - c. Medical errors are declining in number.
  - d. Medical errors are the tenth leading cause of death in the United States.
  
2. An adverse event is defined as:
  - a. The use of the wrong plan to achieve a certain aim.
  - b. The failure of a planned action to be completed as intended.
  - c. A failure to solve problems of practice, procedures, or systems and to make appropriate changes.
  - d. An act leading to an undesirable outcome unrelated to a patient's underlying condition.
  
3. Which is an example of a near miss?
  - a. An undetected design flaw in an airplane causes a pilot to lose control of the plane.
  - b. An incorrect intravenous infusion rate is discovered and changed within the first minute of infusion.
  - c. A dead battery on an automatic external defibrillator causes a delay of treatment and death.
  - d. The improper marking of a surgical site leads to wrongful amputation of the patient's foot.
  
4. According to the Joint Commission, a patient safety event that results in death, permanent or temporary harm, and intervention required to sustain life is referred to as a(an):
  - a. Sentinel event.
  - b. Medical error.
  - c. Near miss.
  - d. Adverse event.
  
5. The National Quality Forum's list of extremely rare serious reportable events (SREs) are also referred to as:
  - a. Negligence.
  - b. Never events.
  - c. Near misses.
  - d. Latent events.



- 6.** A nurse floating to another unit begins preparing a continuous IV heparin infusion. Microdrip and macrodrip tubing are stored in bins next to each other on the supply cart. The placement of the bins on the supply cart is different from the unit in which the nurse normally works. The nurse mistakenly uses the macrodrip instead of the microdrip tubing, resulting in a drug overdose to the patient. This scenario is described as:
- A latent error only.
  - Negligence.
  - A near miss.
  - A latent and active error.
- 7.** The most common cause of medical errors is:
- Inadequate staff or supervision.
  - Technical failure of equipment.
  - Breakdown in communication.
  - Deficiency in education and training.
- 8.** Which is a **correct** statement about surgical errors?
- Improvements in technology and education have led to fewer surgical errors.
  - Wrong-site, wrong-procedure, wrong-patient errors are common.
  - Perioperative peripheral nerve injury cannot be related to patient positioning.
  - Surgical instruments are the most commonly retained foreign body after surgery.
- 9.** To reduce the risk of wrong-site, wrong-procedure, and wrong-person errors, the Joint Commission's Universal Protocol introduced the concept of:
- A sign-in checklist before induction of anesthesia.
  - Completion of a surgical checklist following any invasive procedure.
  - Completion of an instrument, sponge, and needle count.
  - A "timeout" or planned pause before beginning a procedure.
- 10.** Which is a **correct** statement about a surgical safety checklist?
- Checklists improve communication among operating room staff.
  - Checklists have had no impact on postoperative complications.
  - Checklists do not require extensive staff interaction.
  - Checklists are not effective in detecting potential safety hazards.



- 11.** A clinician makes a diagnosis of myocardial infarction for a patient with chest pain, but the actual diagnosis was a ruptured thoracic aortic aneurysm. This is an example of a:
- System-related error.
  - No-fault error.
  - Cognitive error.
  - Technical error.
- 12.** Most medication errors occur when drugs are being:
- Prescribed and transcribed.
  - Compounded and packaged.
  - Dispensed and administered.
  - Monitored and discontinued.
- 13.** A physician prescribes amoxicillin for a pediatric patient, unaware that the patient is allergic to penicillin. This is an example of an error in prescribing related to:
- Confusion with dosing or drug names.
  - Inaccurate or incomplete medication history taking.
  - Incorrect drug selection.
  - Error in quantity and indication.
- 14.** Which is a **correct** statement regarding the prevention of medication errors?
- Use only computerized medical records.
  - Compare the dispensed dose with the medication order.
  - Prepare all medications well in advance of administering them.
  - Treat side effects with another medication.
- 15.** When administered high-alert medications, best practice includes:
- Using only preprinted orders.
  - Avoiding the use of infusion pumps.
  - Asking another nurse to perform an independent double check.
  - Identifying high-alert medications based only on the FDA's list.



- 16.** A 12-year-old male patient who is taking no medication is to undergo repair and pinning of a compound ankle fracture. After discussing pain medication options with the patient’s nurse, the patient, and his parents, and assessing the patient’s understanding of managing his pain, the anesthesia provider, with agreement by the surgeon, orders patient-controlled analgesia (PCA) for the patient’s immediate postoperative pain. This decision was based on the clinicians’ joint assessment of this pediatric patient’s:
- Risk for respiratory distress.
  - Level of expected post-op pain.
  - Current medication that could potentiate sedative effects.
  - Cognitive capability to participate in PCA pain management.
- 17.** Recommendations to reduce the incidence of line and tubing misconnections include:
- Requiring that all Luer locks be discontinued.
  - Designing equipment to make IV and enteral systems incompatible.
  - Eliminating tubing that contains phthalates.
  - Using catheters that have injection ports.
- 18.** Which is a **correct** statement about healthcare-associated infections?
- The most important factor for developing an urinary tract infection is a breach in sterile technique when inserting the catheter.
  - Among all hospital-acquired infections, healthcare-acquired pneumonia (HAP) is the leading cause of death.
  - Peripheral intravenous catheters are the main source of bacteremia and septicemia.
  - Clostridium difficile* infections occur because of poor isolation techniques.
- 19.** One of the most important, but sometimes overlooked, procedures common to practitioners in preventing all types of healthcare-related infections is:
- Staying at home when the practitioner has a cold.
  - Always wearing a mask when caring for patients.
  - Complying with CDC hand hygiene recommendations.
  - Avoiding the use of urinary catheterization.
- 20.** Which is a **correct** action for avoiding central line–associated bloodstream infections?
- Performing audits every 7 days to assess the need for each central line
  - Accessing catheters only with sterile devices
  - Avoiding the femoral artery site in children
  - Providing a yearly in-service to new healthcare staff



**21.** An 89-year-old patient with mild dementia was recently started on antihypertensive medications and is attached to a heart monitor. During the night she gets up to go to the bathroom. She does not put on her footwear, does not use her walker, and does not turn on the lights. A nurse finds her lying on the floor just outside the bathroom door. Which two **intrinsic** factors could have contributed to her falling?

- a. Dim lighting and attachment to a heart monitor
- b. Improper use of an assistive device and previous falls
- c. Advanced age and lack of appropriate footwear
- d. Advanced age and postural hypotension

**22.** A nonambulatory older adult patient is admitted to the hospital with a right arm fracture following a fall while attempting to rise from her wheelchair. After conducting a falls assessment, the clinician determines the patient is at high risk for another fall. Which intervention is appropriate to include in the patient's care plan?

- a. Keeping the patient's personal possessions within safe reach
- b. Keeping the head of the bed slightly elevated
- c. Making rounds and toileting every four hours
- d. Providing a night light for ambulation

**23.** Which problem is **not** considered a human-to-computer-related issue that could lead to error?

- a. User ignoring or overriding an alert
- b. Scanning an item from an outside source into the wrong patient record
- c. Improperly functioning software
- d. Incomplete and missing data from an entry

**24.** Which is a charting guideline recommended to help prevent errors?

- a. Wait until the end of the shift to document.
- b. Always document the existence of incident reports.
- c. Never document for another person under any circumstances.
- d. Document only facts.

**25.** An 85-year-old alert and oriented patient with congestive heart failure, hypertension, and diabetes enters the hospital with an ischemic stroke resulting in right-sided hemiplegia. On admission, the patient is most vulnerable for medical errors related to:

- a. Delirium and dehydration.
- b. Malnutrition and dehydration.
- c. Polypharmacy and immobility.
- d. Confusion and delirium.



- 26.** Which characteristic common to children puts them at risk for adverse medical events?
- Cognitive impairment
  - Changing pharmacokinetic parameters
  - Frequent falling
  - Hyperactivity
- 27.** A recent study has found that the most common type of harmful pediatric medication error is due to:
- Incorrectly prepared drug.
  - Omission.
  - Wrong drug.
  - Improper dose or quantity.
- 28.** The most common reason for errors occurring when caring for a patient with low proficiency in English is:
- Use of family member, friends, or nonqualified staff as interpreters.
  - Provider reliance on basic language skills that allow one “to get by.”
  - Patient and/or home caregiver misuse of prescription medications.
  - Patient and/or family cultural beliefs and traditions.
- 29.** The primary goal of the Patient Safety Movement Foundation is to:
- Implement checklists to reduce or eliminate medical errors.
  - Reach zero preventable deaths by 2020.
  - Determine pockets of excellence.
  - Accredit nursing education programs nationally.
- 30.** Which preventable condition do Medicare and Medicaid **not** reimburse for if acquired during an inpatient stay?
- Viral pneumonia
  - Diabetic ketoacidosis
  - Tenosynovitis
  - Obstetrical complications

- 31.** Which is a **true** statement about evidence-based practice (EBP)?
- EBP treatments prioritize a clinician’s personal experience over research findings.
  - EBP decreases patient safety but increases patient outcome.
  - EBP replaces standardized treatments with treatments that reflect individual patient autonomy.
  - EBP is beneficial in decreasing healthcare costs.
- 32.** What is the **appropriate** way to document a medication according to the Joint Commission’s “Do Not Use” list of abbreviations?
- Morphine sulfate 10 mg
  - Regular insulin 2 units QD
  - MS 10.0 mg
  - Regular insulin 2 U daily
- 33.** The purpose for a root cause analysis of an error is to:
- Determine who was at fault.
  - Find ways to prevent the error from occurring again.
  - Reeducate the person who made the error.
  - Determine the impact of the error on the patient.
- 34.** A practice that promotes a culture of safety is:
- Creating a blame-free environment.
  - Clearly spelling out the penalties for reporting safety violations.
  - Filing incident reports at the end of every month.
  - Establishing staff and patient error committees.
- 35.** A culture that is systematically fair and nonarbitrary in determining system versus individual accountability is known as a:
- Safety culture.
  - Just culture.
  - Blaming culture.
  - Tolerant culture.
- 36.** Visits by management (walkarounds) to clinical areas are done to:
- Determine if there is proper supervision of staff.
  - Identify environmental safety hazards.
  - Observe for harassment among staff members.
  - Have open and frank discussions with frontline workers.

