Prevention of Medical Errors

COURSE OBJECTIVE: The purpose of this course is to prepare healthcare professionals to prevent medical errors in the practice setting using current, evidence-based information.

LEARNING OBJECTIVES

Upon completion of this course, you will be able to:

- Define medical error, adverse event, near miss, never event, and sentinel event.
- List causes and types of medical errors.
- Discuss the scope and significance of medical errors in the current U.S. healthcare environment.
- Identify populations of special vulnerability to medical errors.
- Outline the evolution of the patient safety movement.
- Discuss regulatory and accrediting agency standards and goals.
- List strategies for addressing medical errors.
- Describe elements of a root cause analysis.
- Describe interventions to prevent medical errors.
- Review documentation requirements and methods to improve communication.

Medical errors are a serious public health problem that threatens patient safety. In the 1950s medical errors were considered to be the price paid for modern diagnosis and therapy. But over the ensuing decades, medical errors have increased to epidemic proportions and currently are the third leading cause of death in the United States. Those in leadership roles claim that error reduction is extremely difficult due to the complex nature of healthcare facilities and the fact that patients are very sick. Our expanding awareness of this issue demands improvement in our understanding of the problem and in finding effective solutions and prevention strategies to make our healthcare system safer.
Under this expanded definition, patient safety encompasses three complementary activities: preventing errors, making errors visible, and mitigating the effects of errors.

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. Such errors are classified as knowledge-based, rule-based, or skill-based, and the solutions have involved training or retraining, additional supervision, or even disciplinary action. The alternative to this is the 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 future errors represents 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.

Adverse Events, Sentinel Events, and Near Misses

An adverse event is an injury caused by medical management rather than the underlying condition of the patient. An adverse event attributable to an error is a preventable adverse event.

The Joint Commission defines a sentinel event as “an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. The phrase ‘or the risk thereof’ includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome.” Hospitals have some latitude in establishing specifics for defining “unexpected,” “serious,” and “the risk thereof.”

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 (JC, 2013a).

Near misses are potential adverse events, errors that could have caused harm but did not, either by chance or because something or someone in the system intervened. For example, a nurse who 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 has prevented an adverse drug event. Such close calls provide opportunities for developing preventive strategies and actions and should receive the same level of scrutiny as adverse events.

Never Events

In 2002, the National Quality Forum (NQF) released its initial list of “27 Serious Reportable Events (SREs),” revised in 2011 to 29. These errors are referred to as “never events”—events that should never happen—and are grouped into seven categories, as follows (CMS, 2014):
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/post-procedure 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 ulcers 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

• Death/serious injury of a patient/staff associated with the introduction of a metallic object into 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 or assault on a patient within or on the grounds of a healthcare setting
• Death/significant injury of patient/staff member resulting from a physical assault that occurs within or on the grounds of a healthcare setting
Classification of Errors

Research on why humans make errors (Reason, 1990) has identified two types of errors: active and latent. **Active errors** (human errors) are those that involve individuals who are actually doing a task, and their effects are felt almost immediately. **Latent errors** are errors in system or process design, faulty installation or maintenance of equipment, or ineffective organizational structure. For example, an undetected design flaw in an airplane (a latent error) may, years after the aircraft was built, cause the pilot to lose control of the plane (an active error) and result in a crash.

Latent errors are present but hidden and may go unnoticed for a long time with no ill effect. However, when a latent error combines with an active human error, an event occurs. The active human error triggers the hidden latent error causing an adverse event.

### 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 are 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 are visible above the top of the tube, as well as several inches of the top of the label. (Since the full label is not visible, this is an example of a latent error.)

On Tuesday a delivery of medical gas cylinders containing CO₂ was accepted by a logistics technician from the cardiac catheterization lab. The delivery included at least one cylinder containing a CO₂/O₂ 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 a blend of CO₂ and O₂ and used it to replace the empty one 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 carbon dioxide 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 CO₂ but a CO₂/O₂ 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)

The modern field of systems analysis pioneered by James Reason has led to fundamental insights into the nature of preventable adverse events. The aviation industry has benefited greatly from these insights, and the Institutes of Medicine recommended that the aviation industry’s crew resource management (CRM) program be implemented in healthcare (Gaba, 2012). The Federal Aviation Administration (2014) recognizes that errors fall into the categories of human, environment, and actions, as follows:

**Human**

- Physical (size, age, strength, and sensory) limitations
- Psychological (lifestyle, chemical dependency, mental or emotional state)
- Physiological factors (health, workload, fatigue, nutrition)
- Job skills (experience, knowledge, training, attitude)
- Psychosocial factors (interpersonal conflicts)

**Environmental**

- Physical factors (workspace, shift, lighting, sound level, temperature, safety hazards)
- Organizational factors (team make-up, leadership, pressures, morale, culture)
- Distractions
- Housekeeping

**Action**

- Steps to perform a task
- Sequence of activity
- Number of people involved
- Information control requirements
- Knowledge requirement
- Skill requirements
Root Causes of Medical Errors

A root cause is an action, deficiency, or decision that if corrected, eliminated, or avoided will eliminate the undesirable consequence. The most common root cause of medical errors is communication problems, which can include unclear lines of authority, inadequate error sharing, or disconnected reporting systems. Other root causes involve:

- Human factors, which are aberrations in mental functioning that include unconscious glitches in automatic activity, misapplied expertise, lack of knowledge, or misinterpretation of a problem
- Patient-related issues, including improper patient identification, incomplete assessment of the patient, failure to obtain consent, inadequate patient education, and the complexity of care in areas such as ICU
- Organizational transfer of knowledge, including deficiencies in orientation or training, lack of education, or inconsistent education and training for healthcare providers
- Staffing patterns and work flow, including inadequate staffing or supervision
- Technical failures involving devices/equipment and complications or failure of implants or grafts
- Inadequate policies and procedures that show a commitment to patient safety (Leape, 2014)

The Institute of Medicine (IOM) (2012) has stated that people are working in bad systems that need to be made safe. Flaws in the healthcare delivery system that can lead to or contribute to error include:

- Reliance on automated systems to prevents errors
- Cost-cutting measures in response to funding cutbacks
- Unsafe design and construction of healthcare facilities
- Infrastructure failures

It is important to recognize that a focus on systems errors should not overshadow the need for personal accountability, particularly in safety measures such as hand hygiene.

THE SCOPE OF THE PROBLEM

A decade and a half has passed since the IOM published To Err Is Human: Building a Safer Health System. This landmark report revealed an epidemic of medical errors in the United States, with an estimate of up to 98,000 people dying each year due to mistakes made in hospitals (IOM, 1999). In 2010, the Office of Inspector General for the Department of Health and Human Services reported that more than 180,000 patients enrolled in Medicare alone die in a given year because of poor hospital care (U.S. DHHS, 2010).
In 2013, the *Journal of Patient Safety* reported that between 210,000 and 440,000 patients each year who enter a hospital experience some type of preventable harm that contributes eventually to their death, making medical errors the **third-leading cause of death** in America behind heart disease (the first) and cancer (the second). This outstanding number is equivalent to the entire population of a city such as Miami, Oakland, or Minneapolis dying each year. The study also reported that tens of thousands also die from preventable mistakes made outside hospitals in outpatient settings and the community, including deaths from missed diagnoses or injuries from medication (James, 2013).

Although most healthcare is delivered in outpatient or ambulatory care settings, efforts to improve safety mainly focus on the inpatient setting. Recent research has begun to emerge over the past few years to identify and characterize factors that influence safety in office practice, the types of errors commonly encountered in ambulatory care, and the potential strategies for improving safety (U.S. DHHS, 2014).

A recent study of medical malpractice claims showed that slightly more than half (52.5%) of the paid claims related to outpatient care. Most malpractice claims for hospital care are related to surgical errors, whereas most claims for outpatient care are related to missed or late diagnosis. Medication errors are also common in outpatient malpractice claims, particularly those related to transition from hospital to community-based care (Bishop et al., 2011). Paid malpractice claims show only a fraction of the actual number of medical errors, because most patients who suffer the effects of medical errors do not sue for damages and many who do sue are denied payment.

In some states, reporting systems are voluntary, and ambulatory surgery centers may fail to report adverse events. For example, although 56 of Oregon’s 58 hospitals participate in the voluntary reporting system established by the Oregon Patient Safety Commission, less than two thirds of the licensed surgery centers reported any details on adverse events in 2010 (Rojas-Burke, 2011).

**The High Price of Medical Errors**

Medical errors add substantially to the direct costs of healthcare and to the loss of income. “More than 400,000 Medicare ‘never events’ occurred in the United States in 2008, with an estimated total cost of $3.7 billion. The cost of these events constitutes 22% of the total cost for medical errors” (van den Bos et al., 2011).

The ten most expensive medical errors are:

**Medical errors leading to severe brain injury due to:**

1. Birth trauma
2. Ventriculo-peritoneal (VP) shunt malfunction
3. Asphyxiation in the recovery room
4. Untreated post-concussive hemorrhage
5. Warfarin toxicity leading to hemorrhagic stroke
6. Undiagnosed/untreated transient ischemic attack (TIA)
7. Falls

Medical errors leading to quadriplegia due to:

8. Missed cervical spine fracture
9. Missed spinal epidural abscess

Medical errors leading to death due to:

10. Myocardial infarction after unstable angina
    (Bialek, 2013)

It is not uncommon for healthcare facilities to take cost-containment measures that reduce staffing, particularly RN staffing. When this occurs there is an increase in medical errors and poor outcomes. An analysis of data from nearly 200,000 hospital admissions and 176,000 nursing shifts of eight hours each showed that staffing of RNs below target levels was associated with increased mortality (Needleman et al., 2011).

Most Commonly Occurring Medical Errors

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).

SURGICAL ERRORS

Surgical errors (or surgical adverse events) account for a high percentage of all adverse events. According to a study by the Johns Hopkins University School of Medicine reported in 2012, at least 4,000 surgical errors occur in the United States each year. National data was analyzed and it was estimated that 80,000 “never events” occurred in U.S. hospitals between 1990 and 2010 and that the figure may be on the low side. The study showed that U.S. surgeons leave a foreign object inside a patient’s body after an operation 39 times a week, perform the wrong procedure on a patient 20 times a week, and operate on the wrong side of the body 20 times a week. All estimated events were found to be totally preventable (Johns Hopkins Medicine, 2012).

A review by the Joint Commission found that wrong-site surgery was most common in orthopedic procedures. Risk factors contributing to the error included: more than one surgeon involved in the case, multiple procedures performed during a single operating room visit, and unusual time pressures—particularly pressure to speed up preoperative procedures.

The Joint Commission found that robotic surgery, a relatively new technological procedure, resulted in an increase in surgery-related sentinel events from 2006 to 2013. During that period there were 34 reports of sentinel events—27 related to unintended retention of foreign objects and 7 operative or postoperative complications. Of the seven operative or postoperative reports,
two resulted in death from excessive blood loss and one was related to a delay in treatment. Complications were usually due to hemorrhage caused by lacerations and injury to surrounding tissues (JC, 2014a).

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**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.

Prior to induction of general anesthesia, a “time out” was performed in the operating room, with the involvement of the surgeon, anesthesia provider, scrub, and circulating nurse. Among the items verified were the name and site of the procedure. This process and the names of the personnel participating were documented on the surgical safety checklist, which was part of the facility’s perioperative chart.

After 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, as the surgeon was new to the facility, having just completed a fellowship in hand surgery, and had already performed several 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 contracture 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, scrub, and circulating nurse 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. After Cheryl was transported to the post-anesthesia 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, 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.
A root cause analysis was done that day by the Quality Assurance/Performance Improvement (QAPI) coordinator, with the following findings:

- **Root cause:** the surgeon was momentarily distracted immediately prior to making the incision.

- **Contributing factors:**
  - The surgeon had performed one procedure at another facility early that morning and two others at the facility in question prior to Cheryl’s. Despite the completion of the time-out, he momentarily forgot which procedure he was due to perform on Cheryl.
  - The scrub failed to question the unusual incision due to unfamiliarity with that surgeon’s techniques.
  - The circulating nurse and anesthesia provider were involved in duties that did not allow them to watch what was going on in the surgical field.

- **Corrective action:** since considerable time may elapse between the time-out and the actual incision (up to 30 minutes for a case involving complex positioning, draping, and equipment positioning), the facility instituted a final verification of the intended procedure at the time the scalpel was made available to the surgeon.

**DIAGNOSTIC INACCURACIES AND DELAYS**

Diagnostic inaccuracies most commonly are related to process breakdowns in the clinical encounter and typically occur when taking medical histories, performing physical examinations, and ordering tests. Often the practitioner is under pressure to do more in less time and is pressed for time to make decisions. An accurate diagnosis is the first requirement for correct and effective treatment.

The Joint Commission estimates that the death toll from diagnostic errors is an estimated 40,000 to 80,000 per year, with 40,500 preventable deaths arising in the ICU alone. One patient in every six has personally been affected or has had a family member or friend affected. Almost half of pediatricians come upon one or more diagnostic errors every month, and 1 in every 1,000 primary care encounters will cause preventable harm from diagnostic error (JC, 2014b).

Although delayed or inaccurate diagnoses are often attributed to physician error, members of the healthcare team can and do contribute to delayed or inaccurate diagnoses due to information gaps and communication problems. Staffing can also play a significant role in delayed and improperly diagnosed conditions. Overworked healthcare workers could miss important details. For instance, subtle symptoms may be overlooked and treatment may be delayed because a nurse does not have sufficient time to comprehend the patient’s condition.
Most diagnostic errors occur in primary care settings and most frequently in the testing phase (failure to order, faulty interpretation of results, missed follow-up and tracking).

The most commonly missed diagnoses are:

- Pneumonia
- Decompensated congestive heart failure
- Acute renal failure
- Cancer (primary)
- Urinary tract infection

(Joszt, 2013)

Other errors were attributed to failure to make referrals and patient-related issues such as inaccurate medical histories (Wood, 2014).

Misdiagnosis occurs in diagnostic radiology when the radiologist or interpreting physician fails to see an abnormality that is present on the image due to what has been called an unexplainable “psycho-visual phenomenon.” Many other radiologic errors are cognitive: the abnormality is plainly visible but is not appreciated because of lack of understanding or poor judgment (Berlin, 2011).

The most common cognitive error that clinicians make is the premature closure of the diagnostic process, where common benign diagnoses are made for patients with uncommon serious disease, signaling a need to broaden differential diagnosis. It is to be noted that a lot of symptoms patients present with are vague, such as fatigue, resulting in a vague differential diagnosis.

Sentinel event statistics compiled by the Joint Commission from 2004 to 2013 show that one of the most frequently reported events is delay in treatment. In 2013 delay in treatment was the third most documented reviewable sentinel event. This includes delays in medication, lab testing, physical therapy, or any other kind of treatment. Delays have contributing factors including misdiagnoses, failure to treat, failure to communicate an important lab result, delay in diagnosis, or misunderstanding the underlying disease process. The most common causes of delayed treatment are:

- Failures of communication
- Failed hand-offs and care transitions
- Inadequate staff orientation and training
- Inadequate staffing levels
- Unavailability of the clinician
- Failures in the patient assessment process

(Wyatt, 2014)

Diagnostic errors are costly for healthcare organizations. The costs may include the defending and resolving of malpractice claims as well as the costs related to diagnostic inefficiency. These
include over- and under-testing or ordering tests that are inappropriate or of low value. Diagnostic errors increase costs due to the need for hospital readmission that could have been avoided if the correct diagnosis had been made. Another source of unnecessary costs is unwarranted treatments given due to a wrong diagnosis (Wood, 2014).

**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, and 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 nurses who administer medications, practitioners who prescribe medications, and pharmacists who dispense them. Medication errors are considered preventable adverse drug events (ADEs).

The National Coordinating Council for Medication Error Reporting and Prevention (2014) 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.

In a study conducted by the Economic Cycle Research Institute (ECRI) patient safety organization, it was found that the phase of the medication process in which the highest number of medication errors occurred was during the administration phase, and more than a third involved intravenous errors (Oh, 2012a).

The Healthcare Cost and Utilization Project tracked medication-related adverse outcomes and found that these outcomes occurred in nearly 1.9 million hospital stays and 838,000 treat-and-release emergency department (ED) visits. These adverse outcomes included adverse drug reactions (harm caused by a drug at normal doses), adverse drug events (harm caused by use of a drug), and medication errors (inappropriate use of a drug) (Lucado et al., 2011).

A large international study found that poor coordination of care is a key risk factor for medication errors in all seven countries studied. Cost-related barriers also increased the likelihood of errors. Researchers cited the expressed need for “better communication among multiple healthcare providers and more structured organization of care across healthcare settings” (Lu & Roughead, 2011).

Between 2004 and 2008, medication-related adverse outcomes increased 52%. More than half of this increase was due to corticosteroids, anticoagulants, sedatives, and hypnotics. In the inpatient setting, corticosteroids caused more than 13% of all medication-related adverse outcomes (AHRQ, 2011a).

Analgesics, antipyretics, and antirheumatics were the second most common general cause of adverse outcomes for both inpatient and ED events. Within this category, opiates were the most common specific cause of all inpatient and ED events (AHRQ, 2011a). Opiate prescriptions for chronic noncancer pain have increased dramatically in the last decade, and prescriptions for non-steroidal anti-inflammatory medications have decreased. Two highly addictive opiates, hydrocodone and oxycodone, account for nearly 85% of all opioid prescriptions (Volkow et al., 2011).

The Institute for Safe Medication Practices (2007) received multiple reports of mix-ups between insulin and heparin. In two cases where insulin was added to infant TPN solutions, death resulted. These mix-ups were most commonly associated with mental slips (confusion) because both drugs are dosed in 10 ml vials and packaged similarly. In addition, insulin and heparin vials are often placed next to each other on a counter or drug cart or under a pharmacy IV admixture hood (ISMP, 2007).

Drugs with similar names can also cause medication errors. According to the FDA (2011), hundreds of drug mix-ups have occurred with risperidone (Risperdal) and ropinirole (Requip).
Risperidone is an antipsychotic medication prescribed for the treatment of schizophrenia, mania, and bipolar disorder. Ropinirole is a dopamine agonist used to treat the symptoms of Parkinson’s disease and restless leg syndrome. Serious adverse reactions were reported, including the need for hospitalization and one death. The FDA has asked manufacturers of these two drugs to change the labeling and packaging to prevent future medication errors.

### 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. 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, 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. 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 and hung it. 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 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, and 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.

### TUBING MISCONNECTIONS

According to the Joint Commission (2014c), tubing and catheter misconnections are “a persistent and potentially deadly occurrence.” Although misconnections are often caught and corrected before the patient is injured, these AEs can have life-threatening consequences. This is a complex issue involving medication errors and equipment design problems. Medications are being delivered via the wrong route, and equipment design leads to making such misconnections.

### TYPES OF TUBING MISCONNECTIONS

- Enteral feeding tube connected to an IV
- Blood pressure cuff connected to an IV
- 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
• IV infusion connected to an indwelling (Foley) catheter
• IV infusion connected to a nasogastric tube
• Primary IV tube connected to a blood product meant for transfusion

Luer connectors were implicated in many of the misconnections. These universal connectors have a “female” and a “male” component designed to lock together. Unfortunately, this universal design allows tubes or catheters with dissimilar function to be connected, with potentially disastrous results. Other factors contributing to misconnections include the routine use of tubes or catheters for unintended purposes, such as using IV extension tubing for epidurals, irrigation, drains, and central lines.

In addition, movement of a patient from one setting to another and staff fatigue related to working consecutive shifts contribute to these adverse events (JC, 2014c).

Patient’s feeding tube was inadvertently connected to the instillation port on the ventilator in-line suction catheter, delivering tube feeding into the patient’s lungs, causing death. (Source: FDA, 2013.)
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 cardiac pacemakers, defibrillators, and deep brain stimulation neurotransmitters to control tremors in people with Parkinson’s disease. Any malfunction of such devices can be serious and even life threatening.

An FDA report showed a 97% increase in recalls of medical devices between 2003 and 2012 as a result of increased public safety efforts by both regulators and industry. Recalls of medical devices totaled 604 in 2003 and 1,190 in 2012. The most common reason for recall was software-related, making up about 15% of all devices recalled between 2010 and 2012. Other common recall causes included change and process control issues, material component problems, and problems with packaging or labeling of devices. The most common software-related recalls were for radiological devices. Other types of recalls for software problems included chemistry, cardiovascular, and general hospital equipment (Eisenhart, 2014).

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 considered a systems failure. According to the CDC, 1 of every 20 hospitalized patients will experience a healthcare-acquired infection. These infections lengthen hospital stays, cost
U.S. hospitals an estimated $33 billion annually, increase patients’ pain and suffering, and can prove fatal. Types of HAIs include the following:

- Catheter-associated urinary tract infections (CAUTIs)
- Surgical-site infections (SSIs)
- Central line–associated bloodstream infections (CLABSIs)
- IV catheter–related bloodstream infections (CRBSIs)
- *Clostridium difficile* (*C. diff*) infections (CDIs)
- MDRO (multiple drug-resistant organism) infections
- Ventilator-associated pneumonia (VAP)

The CDC released new data in 2014 showing healthcare-associated infections are decreasing in the nation’s hospitals, and dropping the fastest are CLABSIs. These infections dropped 44% from 2008 to 2012 as a result of utilizing checklists and bundling of supplies as recommended by studies funded by AHRQ (Blumenthal, 2014).

ICU patients on ventilators are prone to bacterial pneumonia, which develops 48 hours or longer after mechanical ventilation is given via endotracheal tube or tracheostomy. Intubation compromises the integrity of the oropharynx and trachea, allowing oral and gastric secretions to enter the lower airways. The Institute for Healthcare Improvement (IHI, 2014a) notes that ventilator-associated pneumonia in a critically ill patient significantly increases the risk of mortality and increases ventilator time, length of stay, and cost of care. VAP is a complex condition to diagnose and treat, making prevention extremely important.

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 have shown that hospital workers wash their hands as little as 30% of the time that they interact with patients and that physicians tend to be the most resistant to hand hygiene (Hartocollis, 2013).

**FALLS**

Falls are also considered a systems failure. Falls are a commonly reported sentinel event in 24-hour care facilities and can be fatal. Each year, one third of people over 65 suffer a fall, and one third of these falls cause both fatal and nonfatal injuries. In 2013 the Joint Commission reviewed 82 fall-related events resulting in death or permanent loss of function (JC, 2013b).

Fractures of the hip, arm, leg, and ankle bones are the most common injuries sustained in falls, but some falls result in traumatic brain injury (TBI). In 2005, half of all unintentional fall deaths were caused by TBIs. A sudden bump or jolt to the head of an older person can easily tear cerebral blood vessels and lead to long-term cognitive, emotional, and/or functional impairments. Any person taking blood-thinning medication (warfarin/Coumadin) should be seen immediately by a healthcare provider if they have a bump or blow to the head, even if they do not have any of the symptoms of TBI (Wacker et al., 2013).
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.

Risk factors associated with falling are clinically identified as either intrinsic or extrinsic. Intrinsic factors include the characteristics or conditions of a person, which can include vision, gait, and health history. Intrinsic factors may or may not be modifiable. Extrinsic factors involve conditions outside the person, such as environmental hazards and medications. Extrinsic factors are modifiable.

**Intrinsic Risk Factors**

- Lower extremity weakness
- Previous falls
- Gait and balance disorders
- Impaired vision
- Depression
- Function and cognitive impairment
- Dizziness
- Low body weight
- Urinary incontinence
- Diarrhea
- Orthostatic/postural hypotension
- Female gender (more nonfatal falls then men)
- Being over the age of 80 years

**Extrinsic Risk Factors**

- Medications, especially polypharmacy
- Psychotropic medications
- Poor lighting
- Loose rugs or carpets
- Lack of bathroom safety equipment
- Improper foot wear
- Improper use of or failure to use assistive devices

(Slattum & Ansello, 2013)
PRACTICE AREAS IN REHABILITATION THERAPY

Practice errors are not limited to medication, diagnostic, or equipment errors, nor are they limited to nurses, pharmacists, and physicians. They also occur in 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. Of those studies that have been done, most errors in these 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
- Overload or time constraints
- Insufficient or mis-communication
- Inexperience or lack of knowledge
- Issues related to the patient
- Inadequate preparation

PROBLEMS WITH HEALTH INFORMATION TECHNOLOGY (IT)

The Institute of Medicine (IOM) has evaluated safety concerns and identified actions that can be taken to lessen safety risks linked with health IT. The literature about health IT and patient safety is inconclusive, yet it shows substantial potential hazards for patient safety (IOM, 2012).

**Electronic Health Records (EHRs)**

While adoption of EHR systems offers to provide substantial benefits, there are serious unintended consequences that have emerged from their implementation. Currently, there is no regulatory framework to monitor EHR system safety and no agreed-upon design standards.

Although the original intent of EHRs was to improve the accuracy of documentation, they are overwhelmed with incorrect data input, which impacts information integrity. In addition, clinicians complain that the computer comes between them and the patient and that such information technology fosters distractions (Campbell, 2012).
A recent survey of nearly 14,000 licensed registered nurses from forty states found that 92% are dissatisfied with their inpatient EHR system. Eighty-four percent of those polled reported that disruptions in productivity and workflow negatively influenced their job satisfaction. Eighty-eight percent blame nonclinical administrators and CIOs for selecting inferior systems based on price and government incentives, and most said the selection did not take nursing workflow into account. Sixty-nine percent working in for-profit inpatient settings say their IT department is incompetent. Most significantly, however, 9 out of 10 nurses report negative impacts upon their communication with patients, and 94% report no improvement in communication between providers (Perna, 2014).

Many providers find that EHRs decrease efficiency and add hours to their workday due to non-user-friendly interfaces and difficult navigation. They report many EHR systems are awkward and time consuming.

**Computerized Prescriber Order Entry (CPOE)**

A CPOE system, at a minimum, ensures standardized, legible, and complete orders and thus has the potential to greatly reduce errors at the ordering and transcribing stages. CPOE is recommended by the AHRQ and the National Quality Forum as one of the “Safe Practices for Better Healthcare” (AHRQ, 2011b).

CPOE automates the medication ordering process. Basic clinical decision-support software (CDSS) may include suggestions or default values for drug doses, routes, and frequencies. More sophisticated software can perform drug allergy checks, drug laboratory value checks, and drug-drug interaction checks, in addition to providing reminders to the clinician about drug guidelines or corollary orders at the time of ordering. Powerful CDSS software can incorporate patient-specific information or pathogen-specific information, such as suggesting appropriate anti-infective regimens.

Only 8% of U.S. hospitals have fully implemented CPOE systems. One obstacle is the upfront cost, which is approximately $1.9 million, with $500,000 per year for maintenance. Another obstacle is resistance by physicians to utilize such tools, instead preferring to rely on practice experience (Leapfrog, 2014).

Physicians may choose to override warnings from the CPOE system. Alerts have often been found to become excessive so that physicians simply override them so as not to disrupt workflow. This is known as “alert fatigue” and is a significant issue in hospitals that have implemented these systems. In a study on safety alerts generated, 98% were drug-drug interaction, of which more than 90% were overridden. Clinicians overrode more than 77% of the allergy alerts as well (Perna, 2012).

CPOE can help hospitals reduce ADEs, but only about one third of hospitals have a CPOE system and less than half use barcode medicine administration (BCMA) (Halvorson, 2011). Research shows that BCMA can reduce the rate of potential ADEs as much as 50%, but errors can still occur (Poon et al., 2010).
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. Healthcare providers need to recognize the special needs of these patients and act accordingly.

Older Adults

People age 65 years and older consume more prescription and over-the-counter (OTC) medications than any other age group. Although medications may improve the quality of life and health, they also hold the potential for misuse, overuse, and life-threatening complications.

Polypharmacy, the inappropriate use of multiple drugs, creates a significant risk for adverse drug events. The older adult population (ages 65 and older) receives more than 50% of all prescription medication, and most who engage in the healthcare system take 6 to 8 medications. The prevalence of older adults taking five or more medications is close to 7%. In addition to prescription medications, older adults purchase 40% of over-the-counter medications, use OTCs three times more, and use herbals twice as much as the younger population.

Patients who see several physicians for different ailments are at higher risk for adverse drug events related to drug interaction, as are those who use multiple pharmacies to fill their prescriptions or who order their prescriptions by mail. Ideally, each patient’s complete medication profile would be monitored by a single health professional such as a clinical pharmacist.

The risk for an adverse drug event is 15% with two medications, 58% with five, and 82% with seven or more medications. Nearly 17% of hospital admissions are due to an adverse drug event, and the rate increases to 33% in patients 75 years of age and older. Additionally, while in hospital, 17% of older adults experience an adverse drug event (Bland, 2013).

Visual, hearing, or cognitive problems may lead to misunderstanding of instructions or failure to question an incorrect or unfamiliar drug. When caring for older patients, communication with a responsible family member or other patient advocate is essential.

Older adult patients are also at high risk of falling, and medications increase that risk. Researchers in Sweden studied changes in fall risk—increasing drugs (FRIDs) and bone density—related medication in study participants with hip fracture before and after the fracture. They found that two thirds of patients with hip fracture were prescribed FRIDs before fracture, and the number increased after fracture (Kragh et al., 2011).

Prescribing physicians need to consider the slowed metabolism and excretion of drugs in older adult patients—not only the choice of drugs but also the dosage and timing of administration.
Because older adults experience a decrease in total body water and a relative increase in body fat, water-soluble drugs become more concentrated and fat-soluble drugs have a longer half-life.

**Infants and Children**

The potential for *adverse drug events* is higher in the pediatric population than in hospitalized adult patients. The factors that place them at higher risk include:

- Changing pharmacokinetic parameters between patients at various ages and stages in development
- Need for calculation of individualized doses based on the patient’s age, weight, body surface area, and clinical condition
- Need for precise dosage measurement and appropriate delivery systems

Medication dosing errors occur in up to 17.8% of hospitalized children (Wesley & Washick, 2013).

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.

**Intensive Care Patients**

Intensive care units (ICUs) host the sickest patients whose conditions require extraordinarily complex care. These patients are more vulnerable to medical errors and more prone to injury. Errors associated with drugs can be particularly common in the ICU. Critically ill patients receive nearly twice as many medications as patients in general care units, and most medications involve calculations for bolus administration or continuous infusion. The most common *medication error* types in ICU are administering the wrong dose, omission of a dose, wrong administration rate, and wrong administration time (Blumenthal, 2014).

The *complexity of care* in the ICU can cause highly skilled clinicians to overlook the basics, leading to life-threatening, sometimes fatal, misconnections, infections, and other complications. Patients in the ICU often have feeding tubes, chest drainage tubes, and central venous catheters, all of which require invasive procedures for placement. The most common types of adverse events in the ICU involve these lines, tubes, and drains.

**Patients with Limited English and/or Health Literacy**

The National Institutes of Health (2014) reports that less than 60% of the U.S. population has English as a first language, and 10 million Americans speak no English at all. Meeting the healthcare needs of a culturally and ethnically diverse population may require bilingual care providers, translators, interpreters, or other communication experts. Without these experts
available, communication of vital information between patient and provider can lead to misunderstanding and errors.

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 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. According to an AHRQ report, low health literacy is linked to a higher risk of death and more emergency room visits and hospitalizations.

The National Network of Libraries of Medicine (NNLM) reports that 71% of adults older than 60 have difficulty using print material, 80% have difficulty using documents such as forms and charts, and 68% have problems with interpretation of numbers and performance of calculations. It has been estimated that two thirds of older people do not understand information given to them concerning prescription medications (NNLM, 2014).

According to the Literacy Project Foundation (2014), 45 million adults in the United States are functionally illiterate and read below a 5th-grade level, while health information is usually written at a higher reading level. In addition, fear, vulnerability, shock concerning a diagnosis, family stresses, and multiple health problems can interfere with patients’ abilities to understand medical information. The National Patient Safety Foundation’s Ask Me 3 initiative (2011) promotes three basic questions that patients should ask their providers in every healthcare interaction:

1. What is my main problem?
2. What do I need to do?
3. Why is it important for me to do this?

When caring for patients whose verbal abilities are limited either by education, development, or neurologic impairment, assistive devices such as an alphabet board, a picture board, or a magic slate may prove helpful. Patients who are unable to speak because of a tracheostomy or other surgical procedure should also have these devices available, along with pencil and paper.

**EVOLUTION OF THE PATIENT SAFETY MOVEMENT**

When *To Err Is Human* made headlines across the country, 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.
AGENCIES AND ORGANIZATIONS IN THE PATIENT SAFETY MOVEMENT

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, equitable, and affordable. Works 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.

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 Medicine 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.

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

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

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

WHO - World Alliance for Patient Safety
Serves as the directing and coordinating authority for health within the United Nations system.
## Milestones in the First Decade of the Patient Safety Movement

<table>
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<tr>
<th>Year</th>
<th>Milestone</th>
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<tr>
<td>1999</td>
<td>Release of the IOM report <em>To Err is Human</em> launches the modern patient safety movement.</td>
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<td>2001</td>
<td>IOM releases its Quality Chasm report.</td>
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<td>2002</td>
<td>Joint Commission releases its first National Patient Safety Goals, followed by dozens more over the next seven years.</td>
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<td>2002</td>
<td>NQF releases its initial list of serious adverse events, commonly called the “never events” list, most recently updated in 2011.</td>
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<td>2003</td>
<td>Accreditation Council for Graduate Medical Education (ACGME) institutes duty-hours regulations, limiting residents to 80 hours per week.</td>
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<td>2003</td>
<td>Minnesota becomes the first U.S. state to create a statewide error-reporting system based on NQF list of serious adverse events; 26 states follow suit over the next 6 years.</td>
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<td>2004</td>
<td>U.S. government creates the Office of the National Coordinator for Health IT (ONC), the first federal initiative to computerize healthcare.</td>
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<td>2005</td>
<td>Institute for Healthcare Improvement (IHI) launches its first national campaign (100,000 Lives) to promote the use of patient safety interventions.</td>
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<td>2005</td>
<td>President Bush signs into law S.544, the Patient Safety and Quality Improvement Act, which establishes a voluntary confidential reporting system to create a national database of medical errors for analysis and development of evidence-based patient safety measures.</td>
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<td>2008</td>
<td>Patient Safety Organizations (PSOs), authorized by the U.S. Congress, voluntarily report errors and share learning.</td>
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<td>2008</td>
<td>Medicare launches its “no pay for errors” initiative, the first use of the payment system to promote patient safety.</td>
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<td>2009</td>
<td>U.S. Congress appropriates $19 billion to promote the implementation of electronic health records and health IT, partly to promote patient safety.</td>
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Source: Copyrighted and published by Project HOPE/Health Affairs as exhibit 2 in Wachter, 2010. The published article is archived and available online at healthaffairs.org.
Despite a decade and more, patient safety has improved slowly, in part due to the limited base of evidence for the development and widespread dissemination of effective patient safety practices.

The science of patient safety has generated a new lexicon. For example, “pockets of excellence” in healthcare are hospitals where the best practices—such as implementing checklists in ICUs to reduce or eliminate catheter-related bloodstream infections (CRBIs)—have improved patient safety and are now common practice at that institution. Although isolated pockets of excellence in patient safety are encouraging, the science of patient safety—the research that shows how safety interventions affect patient outcomes—lags far behind the science of disease. This means the science of patient safety needs to mature.

A primary goal of the patient safety movement is to close the gap between the best-known practice and common practice and disseminate the existing science from pockets of excellence throughout the healthcare system. Reporting medical errors and analyzing why they happen and what needs to change to prevent errors are at the heart of the science of patient safety.

**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, 2007).

As of 2011, 21 states had a similar nonpayment policy for Medicaid funds. In June 2011, CMS issued a new rule that expanded that policy nationwide. The new rule prohibits use of federal Medicaid funds to pay doctors and hospitals for treatment services related to “never events” (see box below). It also stipulates that hospitals cannot pass these charges along to the beneficiary.

The new Medicaid policy also allows states the option of expanding the nonpayment policy to healthcare settings other than hospitals, such as nursing homes, and to add other types of “never events.” It is expected to improve patient care and to save an estimated $35 billion between 2011 and 2016 (CMS, 2011).
PREVENTABLE COMPLICATIONS (“NEVER EVENTS”) NO LONGER COVERED BY MEDICARE AND MEDICAID

The following preventable complications are no longer 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
- Crushing injuries
- Burns
- Electric shock
- Catheter-associated urinary tract infection
- Vascular catheter–associated infection
- Manifestations of poor glycemic control:
  - Diabetic ketoacidosis
  - Nonketoacidosis
  - Hyperosmolar coma
  - Hypoglycemic coma
  - Secondary diabetes with ketoacidosis
  - Secondary diabetes with hyperosmolarity
- Surgical site infection following:
  - Coronary artery bypass graft (CABG); mediastinitis
  - Bariatric surgery
  - Laparoscopic gastric bypass
  - Gastroenterostomy
  - Laparoscopic gastric restrictive surgery
- Surgical site infection following certain orthopedic procedures:
  - Spine
  - Neck
  - Shoulder
  - Elbow
- Deep vein thrombosis (DVT)/pulmonary embolism (PE) following total knee or hip replacement, with pediatric and obstetric exceptions
- Surgery on the wrong patient, wrong surgery on a patient, and wrong-site surgery

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 (EBP)**

Planning, implementing, and measuring the effects of change (e.g., safety interventions) and establishing whether and at what cost an intervention improved patient outcomes is the process that identifies best practices, which is the foundation of evidence-based practice.

AHRQ (2014a) defines evidence-based practice as “applying the best available research results (evidence) when making decisions about healthcare. Healthcare professionals who perform evidence-based practice use research evidence along with clinical expertise and patient preferences. Systemic reviews (summaries of healthcare research results) provide information that aids in the process of evidence-based practice.”

The need for EBP throughout healthcare is endorsed by physicians, nurses, and other health professionals. EBP was initially developed as evidence-based medicine (EBM), formulated to answer a physician’s one-on-one clinical question on the best treatment for a specific patient.

In medicine, the primary source of evidence comes from randomized control studies resulting in qualitative evidence. Nursing, physical therapy, and occupational therapy, however, do not necessarily rely on these studies as their primary source of research data. In these fields, approaches include quantitative, qualitative, and quasi-experimental methodologies.

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**EVIDENCE-BASED PRACTICE (EBP) and PRACTICE-BASED EVIDENCE (PBE)**

- **EBP** is the assimilation of external quantitative scientific evidence, clinical proficiency or expert opinion, and client/patient/caregiver values to provide services that coincide with the interests, values, needs, and choices of the individuals being cared for.

- **PBE** utilizes qualitative research conducted in the environment of real-world practice through research and practice partnerships, and to innovations that arise from practice. Generally it includes evidence relating to the contexts, experiences, and practice of healthcare providers working in real-world practice settings.

The combining of EBP and PBE can overcome gaps in dissemination that prevent translation of knowledge gained in research to practicing healthcare providers.

FIVE STEPS TO IMPLEMENT EVIDENCE-BASED PRACTICE

1. Ask: Recognizing a need for new information, formulate a well-written clinical question.

2. Acquire: Identify relevant resources, including background and quantitative and qualitative research findings, and chose the right evidence.

3. Appraise: Critically appraise the evidence to determine its validity and potential usefulness.

4. Act: Once determined that the evidence is sound, decide whether it should be incorporated into clinical 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.


CASE

James, 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, he 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.

James 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, James 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.

James brought his findings to the director of nursing and the medical director, and together they enacted 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 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.


Attitudes towards EBP are mostly positive within the nursing, occupational, and physical therapy fields. However, there remain barriers to the use of evidence to support clinical decision-making. It has been noted that widespread culture change in healthcare settings and education are necessary that emphasize research methods and critique of existing research as well as the implementation of findings in the delivery of patient care.

To accomplish this, leaders and management must be supportive in finding ways to make EBP efficient, easy to access, and relevant to clinical practice. Research evidence must be coupled with workflow in a way that does not negatively affect productivity and the flow of patient care.

Improvement in utilization of evidence-based safety practices is occurring. As of the end of April 2013, more than 291,000 eligible professionals and more than 3,800 eligible hospitals have received payments from Medicare and Medicaid Electronic Health Record Incentive Programs. Approximately 80% of all eligible hospitals and critical access hospitals in the United States and more than half of physicians and other eligible professionals have received an incentive payment for adopting, implementing, upgrading, or meaningfully using electronic health records, which are considered an evidence-based safety practice (McCann, 2013).

Experts have identified five core competencies that healthcare professionals need to function within an evidence-based environment:

1. Providing patient-centered care
2. Working in interdisciplinary teams
3. Employing evidence-based practice
4. Applying quality assurance/performance improvement (QAPI)
5. Using informatics (the intersection of information science, computer science, and healthcare)
QAPI is the merger of two approaches to quality—Quality Assurance (QA) and Performance Improvement (PI). QA is the process of meeting quality standards and assuring that care reaches an acceptable level. PI is the continuous analysis of performance and the development of systematic efforts to improve it.

These quality-associated concepts have been in place in the healthcare arena for several decades and have been known by a variety of names and acronyms/initialisms. It is crucial for all healthcare providers in any facility to be familiar with both elements of QAPI, for two reasons:

- This dual concept is a more comprehensive way of looking at systems, policies, and procedures both as they currently exist and how they could be improved.
- QAPI is the term most commonly used by both regulatory and voluntary surveying bodies. Using current terminology in a manner that indicates that these concepts are truly a part of the organization may prompt surveyors to view both the organization being surveyed and the individuals representing that organization in a more favorable light.

ACCREDITING AGENCY STANDARDS AND GOALS

Accreditation is a deliberate and thorough process of meeting standards developed by impartial professionals, stakeholders, consumers, and regional or national organizations. An accredited organization means it has achieved a certain level of proficiency and has reliable mechanisms in place for continual improvement in the quality of services it provides.

Accreditation recognizes a certain level of competence that is comparable to other organizations accredited by the same body. It discovers areas in need of improvement and offers suggestions to help make improvements. Accreditation also requires an organization to have management controls in place related to accountability and the efficient and effective use of available resources.

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. Prior to 2002, the Joint Commission scheduled on-site surveys of hospitals and other healthcare organizations to evaluate the safety and quality of care. In 2002, that policy changed to one of random unannounced surveys and, as appropriate, for-cause surveys.

During an accreditation survey, the Joint Commission evaluates the hospital’s compliance with the applicable standards, National Patient Safety Goals, and Accreditation Participation Requirements. The Joint Commission may also assess a hospital’s performance improvement practices and procedures, such as root cause analyses and proactive risk assessment (assessing possible risks of systems and processes that could potentially cause sentinel events).
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 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 (JC, 2013c) 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 in the accreditation process

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 track national trends and develop strategies for improving patient safety.

JOINT COMMISSION NATIONAL SAFETY GOALS

The Joint Commission has issued mandatory goals and recommendations to improve patient safety. Hospitals and other organizations will be evaluated by accreditation representatives to see whether these recommendations or acceptable alternative measures are being implemented. Failure to implement the recommendations could result in loss of accreditation and federal funding.

Hospital
- Identify patients/residents correctly
- Improve staff communication
• Use medicines safely
• Prevent infection
• Organizational identification of risk inherent to the patient population
• Universal protocol

**Long-Term Care**
• Identify patients/residents correctly
• Use medicines safely
• Prevent infection
• Reduce risk of falls
• Prevent pressure ulcers

**Home Care**
• Identify patients/residents correctly
• Use medicines safely
• Prevent infection
• Reduce risk of falls

**Ambulatory**
• Identify patients/residents correctly
• Use medicines safely
• Prevent infection
• Reduce risk of falls
• Organizational identification of risk inherent to the patient population
• Universal protocol
  (Joint Commission, 2014d)

**JOINT COMMISSION “DO NOT USE” ABBREVIATIONS**

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.

**JOINT COMMISSION “DO NOT USE” LIST**
Applies to all orders and all medication-related documentation that is handwritten (including free-text computer entry) or on pre-printed forms.

<table>
<thead>
<tr>
<th>Do Not Use</th>
<th>Use Instead</th>
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| U, u (unit) | • Write “unit”  
• Potential Problem: Mistaken for “0” (zero), the number “4” (four), or “cc” |
| IU (International Unit) | • Write “International Unit”  
• Potential Problem: Mistaken for IV (intravenous) or the number 10 (ten) |
Prevention of Medical Errors

Q.D., QD, q.d., qd (daily)
- Write “daily”
- Potential Problem: Mistaken for each other

Q.O.D., QOD, q.o.d, qod (every other day)
- Write “every other day”
- Potential Problem: Period after the Q mistaken for “I” and the “O” mistaken for “I”

Lack of leading zero (.X mg)
- Write 0.X mg
- Potential Problem: Decimal point is missed

MS
- Write “morphine sulfate” or “magnesium sulfate”
- Potential Problem: Can mean morphine sulfate or magnesium sulfate

MSO₄ and MgSO₄
- Write “magnesium sulfate”
- Potential Problem: Confused for one another

Trailing zero (X.0 mg)*
- Write X mg
- Potential Problem: Decimal point is missed

* 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: Joint Commission, 2014e.

Root Cause Analysis (RCA)

The Joint Commission 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 (JC, 2013c). (See also “Root Causes of Medical Errors” earlier in this course.)

Root cause analysis is a tool for identifying prevention strategies. It is a process that is part of the effort to build a culture of safety and move beyond the culture of blame. In RCA, basic and/or contributing causes are discovered in a focused review process similar to diagnosis of disease—with the goal always in mind of preventing recurrence. The goal of a root cause analysis is to find out:

- Who was involved
- When it happened
- What happened
- Why it happened
- What to do to prevent it from happening again
Root cause analysis is:

- Interdisciplinary, involving experts from the frontline services
- Involving those who are the most familiar with the situation
- Continually digging deeper by asking “why, why, why” at each level of cause and effect
- A process that identifies changes that need to be made to systems
- A process that is as impartial as possible

To be credible, a RCA must:

- Include participation by the leadership of the organization and those most closely involved in the processes and systems
- Be internally consistent
- Include consideration of relevant literature

**CASE**
*(continued from “Classification of Medical Errors” earlier in this course)*

**St. Vincent Hospital**
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 CO₂ are color-coded the same (grey).

- When an OR logistics technician allowed a logistics technician from the cath lab to store an extra CO₂/O₂ tank in the OR tank room, no one in the OR, anesthesia, or logistics chain of command was informed.

- The circulating nurse mistakenly replaced an empty CO₂ tank with a blended CO₂/O₂ tank, not noticing the difference because they were both grey and there was no history of anything but pure CO₂ being stored in the OR tank room.

- There is no pin-indexing at the connection point between the cylinder and the gas delivery system that differentiates between pure CO₂ and CO₂ blends. Any cylinder containing any percentage of CO₂ fits to any yoke designed to accept CO₂.
Corrective actions included:

- 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:
  - Only tanks containing gases also used in the OR are to be stored temporarily in the OR tank room.
  - If no alternative storage is available, storage in the OR tank room may be approved by the senior professional and technical personnel in the OR and the anesthesia service.
  - Any such tanks are to be tagged with orange fluorescent tags reading “Not for use in the OR” and placed in the most remote storage tubes in the tank room.
  - This information 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 a 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 team 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.

**ROOT CAUSE ANALYSIS AND ACTION PLAN TEMPLATE**

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.

1. What was the planned flow of the procedure?
2. What steps in the procedure did not occur as planned?
3. What human factors were pertinent to the outcome?
4. How did performance of equipment affect outcome?
5. What controllable environmental factors directly affected the outcome?
6. What external controllable factors affected the outcome?
7. Were there any other factors that directly affected the outcome?
8. In what other areas of the organization could this happen?
9. Was the staff properly qualified and currently competent at the time of the event?
10. How did real staffing compare with ideal levels?
11. What is the plan for dealing with unforeseen staffing problems?
12. Were such problems a factor in this event?
13. Did staff perform to expectations during the event?
14. Was all the necessary information available when needed? Was it accurate, complete, and explicit?
15. Was communication among participants sufficient for this situation?
16. Was this the appropriate physical environment for the situation?
17. What systems are in place to recognize environmental risks?
18. What planned and tested emergency and failure-mode responses are in place?
19. How does the culture support risk reduction?
20. What barriers exist to the communication of potential risk factors?
21. What methods are utilized to communicate the high priority of prevention of adverse outcomes?
22. What orientation and in-service training revisions are necessary to reduce risk of events in the future?
23. Was available technology used as intended?
24. What technology or redesign of technology might reduce risk in the future?

Source: JC, 2013b.

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 bi-weekly skin assessment and finds a small open crater with visible subcutaneous tissue on the heel of her right foot, a stage III pressure ulcer.

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 III pressure ulcer (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 ulcers in the future.

• Reposition patients at risk every 2 hours and document the action.
• Apply devices that relieve pressure such as heel and elbow (heelbo) protectors.
• 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 following measures are instituted:

• 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 (AAAHC)**

The Accreditation Association for Ambulatory Health Care 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. The studies conducted by the institute are designed specifically for ambulatory care environments (AAAHC, 2014).

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.
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Environment
- Are all state and local building codes and regulations followed?
- Are there necessary personnel, equipment, and procedures to handle emergencies that arise?
- Is space allotment adequate and suitable for a particular function?

Anesthesia services
- Are anesthesia services adequately supervised by qualified personnel?
- Is informed consent obtained for planned anesthesia?
- Is there appropriate resuscitative equipment available?

Professional improvement
- Are employees encouraged to attend relevant educational activities?
- Is there continual monitoring of the maintenance of professional personnel licensure/certification?

Surgical and related services
- Are procedures limited to those approved by the governing body?
- Are procedures performed by licensed healthcare professionals with privileges granted by the governing body?
- Is the environment safe for treating surgical patients, including adequate cross-infection prevention safeguards?

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 reinforced by fear of punishment when they fail. This “culture of blame” bypasses the opportunity for analysis and corrective measures to prevent recurrence.

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. In fact, research shows that when the fear of punishment is removed, reporting of errors actually increases. One reported study showed that over a period of 30 months after the introduction of a blame-free system in a North Carolina clinic, 216 medical errors were reported, compared with 5 reports in the year before (Neuspiel et al., 2011).

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. A culture of safety includes:

- Acknowledgment of the high-risk, error-prone nature of an organization’s activities and the determination to achieve consistently safe operations
- A blame-free environment where individuals are able to report errors or near misses without fear of reprimand or punishment
- Encouragement of collaboration across ranks and disciplines to seek solutions to patient safety problems
- Organizational commitment of resources to address safety concerns (AHRQ, 2014b)

MEDICAL ERRORS AND LAWSUITS

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, disclosing medical errors can lower liability litigation expenses.

A report from the international insurance broker Lockton states that “disclosure programs make the best financial sense for healthcare organizations, along with being ‘the right thing to do’” (Gallegos, 2011). After the University of Michigan Health System adapted a medical disclosure policy, about 20 fewer lawsuits were filed each year, resolution time was reduced significantly, and the average cost per lawsuit decreased by almost half (Kachalia et al., 2010). Estimates are that only 2% to 3% of patients injured by negligence file claims and only half of them recover money (Kachalia & Mello, 2011).

“JUST CULTURE” MODEL

The culture of healthcare traditionally has been one of blame and punishment; yet, this type of culture does not promote open reporting of adverse events and risky situations. A challenge exists in distinguishing between a system that might cause errors, human error that might result in a bad outcome, and reckless behavior that intentionally puts lives or organizations at risk.

One popular approach is the Just Culture model developed by David Marx and colleagues (2005), which helps differentiate human error (inadvertent mistakes by experienced professionals, which deserve “no blame” and call for systems analysis) from blameworthy errors (conscious disregard of unreasonable risks, which deserve remedial or punitive action). Marx describes the model:

On one side of the coin, it is about creating a reporting environment where staff can raise their hand when they have seen a risk or made a mistake. It is a culture that rewards reporting and puts a high value on open communication—where risks are openly discussed between managers and staff. It is a culture hungry for knowledge.
On the other side of the coin, it is about having a well-established system of accountability. A Just Culture must realize that while we as humans are fallible, we do generally have control of our behavioral choices, whether we are an executive, a manager, or a staff member. Just Culture flourishes in an organization that understands the concept of shared accountability—that good system design and good behavioral choices of staff together produce good results. It has to be both.

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.

**Leadership**

The National Quality Forum (2010) lists “Leadership Structures and Systems” as the first of 34 safe practices for better healthcare, stating: “Leadership structures and systems must be established to ensure that there is organization-wide awareness of patient safety performance gaps, direct accountability of leaders for those gaps, and adequate investment in performance improvement abilities, and that actions are taken to ensure safe care of every patient served.” The overarching goal should be to create and sustain a culture of safety rather than a culture of blame.

Hospital boards can also affect quality and safety of care. However, according to Harvard researchers, the majority of hospital board chairs surveyed was not aware of what the quality of care was at their hospitals. Asked to rank several issues—including financial performance, organizational strategy, and quality of care—less than half named quality of care as one of their two top priorities. Yet they believed the care at their hospitals was above average, even those who chaired the boards of hospitals that Medicare data rated as having the worst care in the country (Jha & Epstein, 2010).

Healthcare is a high-risk industry, but only in the last two decades have leaders in the industry adopted the strategies and models, including systems thinking, long used by other industries. One reason for the delay is that “medical schools and teaching hospitals have not trained physicians to follow safe practices, analyze bad outcomes, and work collaboratively in teams to redesign care processes to make them safer. … Most teaching hospitals have hierarchical cultures that are inimical both to safety education and safety improvement. … The unquestioning deference to physician authority inhibits adherence to safe practices and team-building across disciplines” (National Patient Safety Foundation, 2010a).

While the above references specifically mention hospital-delivered care, the same thoughts apply to care delivered in any facility: inpatient or outpatient, public or private, for-profit or not-for-profit. And deference to authority figures is not limited to physicians.

**Technology**

Health 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 to make 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.

**INTERVENTIONS TO PREVENT MEDICAL ERRORS**

Many approaches to the reduction of medical errors have been found and are being utilized in the healthcare system. The following have been shown to be of great benefit in the promotion of patient safety.

**Surgical Error Interventions**

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 developed a Universal Protocol (UP) in 2004 requiring compliance by all accredited hospitals, ambulatory care, and office-based surgery facilities (JC, 2014f).

In 2010, the Joint Commission revised the UP and posted an online survey to evaluate implementation efforts and other responses. More than 2,100 individuals responded. Nearly 90% of respondents agreed or strongly agreed that their organizations were able to fully implement the revised 2010 Universal Protocol. The majority of respondents agreed or strongly agreed that the focus of the requirements in the UP are appropriate, including the pre-procedure verification, site marking, and a time-out (JC, 2014f).

**DEVELOPMENT OF SURGICAL SAFETY CHECKLISTS**

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.

An international team of researchers working with the WHO Safe Surgery Saves Lives program in 2009 developed and tested a surgical safety checklist in eight hospitals in eight countries. The test involved nearly 4,000 patients in diverse populations and a variety of economic circumstances. The study found an overall decrease of 4.0% in surgery-related complications and a reduction of 0.7% for total in-hospital deaths when a checklist was used for each surgical
procedure (McConnell, et al., 2012). Final results showed that mortality rates were reduced by half and complications by one third after implementation of the checklist.

**ELEMENTS OF THE SURGICAL SAFETY CHECKLIST**

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

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 non-routine steps?
     - How long will the case take?
     - What is the anticipated blood loss?
   - Anesthetist
     - Are there any patient-specific concerns?
• Nursing team
  o Has sterility (including indicator results) been confirmed?
  o 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, anesthetist, 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?


Checklists have been responsible for some of the greatest successes of the patient safety era, particularly in improving safety for surgical patients. A systematic review of 33 studies found broad evidence that surgical safety checklists are effective in detecting potential safety hazards, decreasing surgical complications, and improving communication among operating room staff (Treadwell et al., 2014).

Medication Error Interventions

AHRQ (2012b) has identified four pathways between a healthcare provider’s prescribing decision and the patient who will receive the medication:

• Prescribing
• Transcribing
• Dispensing
• Administering

For each of the pathways, there are strategies recommended to prevent adverse drug reactions.

When prescribing:

• Order the appropriate medication, dose, and frequency.
• Avoid unnecessary medications (polypharmacy).
• Use computerized prescriber order entry (CPOE).
• Perform medication reconciliation at times of transition of care.

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 creating the most accurate list possible of all the medications a patient is taking—including the drug name, dosage, frequency, and route—and comparing that list against the physician’s admission, transfer, and/or discharge order. The goal is to ensure the correct medication is provided to a patient at all points of transition within the facility.

Medication reconciliation review tools are available that provide step-by-step instructions for the process. These tools can also create a baseline measurement of errors from unreconciled medications, which can help build a case for the importance of instituting this process in the healthcare setting (IHI, 2014b).

When transcribing:

• In non-computerized systems, read and interpret the prescription correctly.
• Implement computerized prescriber order entry to eliminate errors due to handwriting.

When dispensing:

• Check for drug-to-drug interactions and allergies.
• Dispense the correct quantity of medication in the correct form.
• Supervise the process of dispensing medications by assistants.
• 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 upper case, e.g. chlorproMAZINE and chlorproPAMIDE.)

When administering:

• Adhere to the “eight rights” of medication administration safety:
  1. Right patient
  2. Right medication
  3. Right dose
  4. Right route
  5. Right time
  6. Right documentation
  7. Right reason
  8. Right response
• Utilize barcode medication administration to guarantee accuracy.
• Use smart infusion pumps when administering intravenous fluids/medications to catch errors at the point of care.
• Provide patients with education to enhance comprehension of instructions for taking medications.

### RIGHTS OF MEDICATION ADMINISTRATION

1. **Right patient**
   - Check the name on the order and the patient.
   - Use two identifiers.
   - Ask the patient to identify himself/herself.
   - When available, use technology (for example, barcode system).

2. **Right medication**
   - Check the medication label.
   - Check the order.

3. **Right dose**
   - Check the order.
   - Confirm the appropriateness of the dose using a current drug reference.
   - If necessary, calculate the dose and have another nurse calculate the dose as well.

4. **Right route**
   - Again, check the order and appropriateness of the route ordered.
   - Confirm that the patient can take or receive the medication by the ordered route.

5. **Right time**
   - Check the frequency of the ordered medication.
   - Double-check that you are giving the ordered dose at the correct time.
   - Confirm when the last dose was given.

6. **Right documentation**
   - Document administration AFTER giving the ordered medication.
   - Chart the time, route, and any other specific information as necessary (e.g., the site of an injection or any laboratory value or vital sign that needed to be checked before giving the drug).

7. **Right reason**
   - Confirm the rationale for the ordered medication. What is the patient’s history? Why is he/she taking this medication?
   - Revisit the reasons for long-term medication use.
8. Right response

- Make sure that the drug led to the desired effect. If an antihypertensive was given, has the patient’s blood pressure improved? Does the patient verbalize improvement in depression while on an antidepressant?
- Be sure to document the monitoring of the patient and any other nursing interventions that are applicable.


**HIGH-RISK AND HIGH-ALERT MEDICATIONS**

Published studies of ADEs have consistently identified certain classes of medications as particularly serious threats to patient safety. The Joint Commission and the Institute for Safe Medication Practices (ISMP) have published lists of high-alert medications. These “high-risk” medications include:

- Concentrated electrolyte solutions such as potassium chloride
- Intravenous insulin
- Chemotherapeutic agents
- Intravenous opiate analgesics
- Anticoagulants such as heparin and warfarin

**Safe System Design**

In 2012 the Institute for Healthcare Improvement created 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.

**FDAWarnings**

High-alert (high-risk/high-hazard) drugs such as neuromuscular blocking agents, chemotherapy agents (some of which are carcinogens), and opioid analgesics require special precautions to prevent catastrophic errors. Although many of these drugs carry a black box warning (BBW), the FDA’s strongest labeling requirement, one study indicated that some physicians and pharmacists might ignore BBWs in prescribing and dispensing drugs.

According to AHRQ (2011c), “Although medications with black box warnings often enjoy widespread use and, with cautious use, typically do not result in harm, these warnings remain important sources of safety information for patients and healthcare providers. They also emphasize the importance of continued, post-market surveillance for adverse drug reactions for all medications, especially relatively new ones.”

**PATIENT-CONTROLLED ANALGESIA**

The Physician-Patient Alliance for Health & Safety (PPAHS) reported that there is 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.
PCA CHECKLIST

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
  - Pre-existing 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:

- Assess patient for level of pain, alertness, and adequacy of ventilation
- Verify PCA pump settings
- Verify electronic monitoring
- Document patient assessment and condition, PCA dosing, and monitoring

Source: Wong et al., 2013.
MEDICATIONS IN NON-HEALTHCARE SETTINGS

Many health professionals work or consult in non-healthcare 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’s recommendations for the handling of medications (including OTC medications) in these settings include proper storage, written policies and procedures, limitations on the type of medications stored by the organization, training programs, safeguards to prevent theft of controlled medications, and reporting and evaluation of medical errors.

PATIENT TIPS FOR PREVENTION OF MEDICATION ERRORS

It is important that patients understand their role in the medication administration process, and the Joint Commission recommends patients:

- Give doctors, pharmacists, and other caregivers a list of all medications.
- Make certain the handwriting on the prescription is legible. If not, ask for a printed one.
- Read the label. Make sure it has your name and the right medication name on it.
- Make certain all instructions for taking medications are understood.

Patients who are in hospital or a clinic should:

- Make certain doctors and nurses verify their name and check their wristband.
- Speak up if about to get the wrong medications.
- Know what time medicine should be given and speak up if not on time.
- Inform caregivers if feeling unwell after taking a medication.
- Read the label on IV fluids to see what it contains. Ask the nurse how long it will take to run out. Notify the nurse if it’s dripping too fast or slow.
- Get a list of medications, including new ones, at time of discharge, and read it carefully to ensure it is accurate. If unable to do this, enlist the help of a friend or relative.

Patients can ask the following questions before accepting prescription drugs in order to reduce the potential for taking a medication that was not prescribed for them or cannot be safely taken by them:

- Is this the drug my doctor (or other healthcare provider) ordered? What are the trade and generic names of the medication?
- What is the drug for? What is it supposed to do?
- How and when am I supposed to take it and for how long?
• What are the likely side effects? What do I do if they occur?
• Is this medication safe to take with other over-the-counter or prescription medications or dietary supplements that I am already taking? What food, drink, activities, dietary supplements, or other medications should be avoided while taking this medication?

Interventions to Prevent Tubing Misconnections

An analysis of research and recommendations for preventing misconnections suggests that equipment redesign to make enteral and IV systems incompatible is the most effective way to reduce misconnection errors (Simmons et al., 2011). The International Organization for Standardization (ISO) has adopted new standards intended to address connector cross-compatibility issues between products for a variety of medical applications (e.g., enteral, parenteral, IV, epidural, etc.) and identifies specific designs for each application to eliminate the possibility of misconnections (JC, 2014g).

Connectors manufactured according to the new specifications are entering the workplace, and temporary adaptors are being introduced to connect the old tubing with the new tubing. However, old connectors will remain in use and the potential for misconnections will still exist until existing supplies are depleted (JC, 2014g).

RECOMMENDATIONS TO REDUCE TUBE MISCONNECTIONS

Until tubing has been redesigned to meet safer standards, the Joint Commission recommends the steps outlined below:

1. Review currently used systems to assess practices with the potential for misconnection, including nonstandard, rigged work-arounds (for example, Luer adapters).
2. Instruct nonclinical staff and visitors not to reconnect lines but to seek clinical assistance instead. Only clinicians or users knowledgeable about the use of the device should make a reconnection.
3. Do not modify or adapt IV or feeding devices. Doing so may compromise the safety features incorporated in the design.
4. When making a reconnection, routinely trace lines back to their origins and ensure that they are secure.
5. On arriving at a new setting or as part of a hand-off process, recheck connections and trace all tubes.
6. 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).
7. Package together all parts needed for enteral feeding and reduce availability of additional adapters and connectors to minimize availability of dissimilar tubes or...
catheters that might be improperly connected.

8. Label or color-code feeding tubes and connectors. Educate staff about the labeling or color-coding process in the institution’s enteral feeding system.

9. Identify and confirm the solution’s label because a three-in-one parenteral nutrition solution can appear similar to an enteral nutrition formulation bag. Label the bags with large, bold statements such as “WARNING! For Enteral Use Only—NOT for IV Use.”

10. Identify and minimize conditions and practices that may contribute to healthcare worker fatigue and take appropriate action.

Source: Source: JC, 2014h.

Medical Device and Equipment Problem Interventions

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.

Health professionals should familiarize themselves with their institution’s procedures for reporting adverse events to the FDA (FDA, 2009a & b). 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

The medical device and equipment user (physician, nurse, therapist, technologist, patient, and other service personnel) is the human factor that must be taken into consideration when a new device is being designed in order for it to be operated correctly and safely. This means the design must consider the perceptual abilities associated with sight, hearing, and touch.

Healthcare-Associated Infection (HAI) Interventions

The CDC (2012) provides recommendations for prevention of these infections. A summary of the top recommendations for preventing each type of infection follows.

PREVENTING CATHETER-ASSOCIATED URINARY TRACT INFECTIONS (CAUTIs)

- Insert catheters only for appropriate indications.
- Leave catheters in place only as long as needed.
• Ensure that only properly trained persons insert and maintain catheters.
• Insert catheters using aseptic technique and sterile equipment (acute care setting).
• Follow aseptic insertion; maintain a closed drainage system.
• Maintain unobstructed urine flow.
• Comply with CDC hand hygiene recommendations and Standard Precautions.

Also consider:

• Alternatives to indwelling urinary catheterization
• 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 (SSIs)

Before surgery:

• Administer antimicrobial prophylaxis in accordance with evidence-based standards and guidelines.
• Treat remote infections whenever possible before elective operations.
• Avoid hair removal at the operative site unless it will interfere with the operation; do not use razors.
• Use appropriate antiseptic agent and technique for skin preparation in the period prior to surgery and immediately before the placement of surgical drapes.

Also consider:

• Nasal screening and decolonization for *Staphylococcus aureus* carriers for select procedures (i.e., cardiac, orthopedic, neurosurgery procedures with implants)
• Screening preoperative blood glucose levels and maintaining tight glucose control

**During surgery:**

• Keep OR doors closed during surgery except as needed for passage of equipment, personnel, and the patient.
• Re-dose antibiotic at the 3-hour interval in procedures with a duration greater than 3 hours.
• Adjust antimicrobial prophylaxis dose for obese patients (body mass index >30).
• Use at least a 50% fraction of inspired oxygen intraoperatively and immediately postoperatively in select procedure(s).

**After surgery:**

• Maintain immediate postoperative normothermia.
• Protect primary closure incisions with sterile dressing.
• Control blood glucose level during the immediate post-operative period (cardiac).
• Discontinue antibiotics according to evidence-based standards and guidelines.

**PREVENTING CENTRAL LINE–ASSOCIATED BLOODSTREAM INFECTIONS (CLABSIs)**

The CDC (2014a) estimates that 41,000 CLABSIs occur in U.S. hospitals each year. These infections typically cause a prolonged hospital stay with increased cost and mortality risk. Preventing these dangerous oversights may have a low-cost, high-yield solution such as a simple checklist of evidence-based practices in infection control, like handwashing and other fundamental procedures.

CDC guidelines for prevention of CLABSIs include a checklist that covers the following:

**For clinicians:**

• Promptly remove unnecessary central lines.
  o Perform daily audits to assess if each central line is still needed.
• Follow proper insertion practices.
  o Perform hand hygiene before insertion.
  o Adhere to septic technique.
  o Use maximal sterile barrier precautions (mask, cap, gown, sterile gloves, and sterile full body drape).
  o Perform skin antisepsis with >0.5% chlorhexidine with alcohol.
  o Choose the best site to minimize infections and mechanical complications.
  o Avoid femoral site in adult patients.
  o Cover the site with sterile gauze or sterile, transparent, semipermeable dressings.

• Handle and maintain central lines appropriately.
  o Comply with hand hygiene requirements.
  o Scrub the access port or hub immediately prior to each use with an appropriate antiseptic (chlorhexidine, povidone iodine, an iodophor, or 70% alcohol).
  o Access catheters only with sterile devices.
  o Replace dressings that are wet, soiled, or dislodged.
  o Perform dressing changes under aseptic technique using clean or sterile gloves.

For facilities:

• Empower staff to stop non-emergent 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.
• Use antimicrobial/antiseptic-impregnated catheters.
• Use chlorhexidine-impregnated dressings.

PREVENTING IV CATHETER-RELATED BLOODSTREAM INFECTIONS (CRBSIs)

• 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.
• If the duration of intravascular therapy is likely to be more than six days, a midline catheter or PICC is preferred to a short peripheral catheter.

• Evaluate the catheter insertion site daily and remove peripheral venous catheters if signs of phlebitis develop.

• For patients with chronic renal failure, a fistula or graft instead of a CVC for permanent access for dialysis should be used.

• Any intravascular catheter that is no longer essential should be promptly removed.

• When adherence to aseptic technique cannot be ensured, such as during a medical emergency, the catheter should be replaced as soon as possible (within 48 hours).

• Systemic antimicrobial prophylaxis before insertion or during use of an intravascular catheter is not routinely recommended to prevent catheter colonization or CRBSI.

PREVENTING CLOSTRIDIUM DIFFICILE INFECTIONS (CDI)

• Use Contact Precautions for duration of diarrhea.

• Comply with CDC hand hygiene recommendations.

• Adequately clean and disinfect equipment and environment.

• Implement a laboratory-based alert system for immediate notification of positive test results.

• Educate about CDI: healthcare personnel, housekeeping, administration, patients, and families.

Also consider:

• Extending use of Contact Precautions beyond duration of diarrhea (e.g., 48 hours)

• Presumptive isolation for symptomatic patients pending confirmation of CDI

• Evaluating and optimizing testing for CDI

• Using soap and water for hand hygiene before exiting room of a patient with CDI

• Implementing universal glove use on units with high CDI rates

• Using EPA-registered disinfectants with sporicidal claim (e.g., bleach) or sterilants for environmental disinfection

• Implementing an antimicrobial stewardship program

PREVENTING MULTI DRUG-RESISTANT ORGANISM (MDRO) INFECTIONS

• Comply with hand hygiene as recommended by the CDC.

• Implement Contact Precautions when working with patients with MDRO infection.
• Use antibiotics only when needed and for the shortest time possible.
• Place patients with a MDRO infection in a private room or share a room with others who have the same infection.
• Clean and disinfect all patient care items, equipment, and room surfaces every day; utilize a checklist to ensure compliance.
• Recommend vaccination against *Streptococcus pneumoniae*.
• Monitor the spread of MDROs and educate caregivers.

**PREVENTING VENTILATOR-ACQUIRED LUNG INFECTIONS**

Many hospitals are reporting significant reductions in ventilator-acquired pneumonia (VAP) in critical care units. Some have reached zero cases by taking an approach that involves a checklist that includes a “bundle” of evidence-based care processes that reduces the incidence of pneumonias in ventilator patients by one fourth and reduces length of stay in ICU by one half. The bundle includes four processes: peptic ulcer disease prophylaxis, deep vein thrombosis prophylaxis, elevation of the head of the bed, and a “sedation vacation.”

**Fall Prevention Interventions**

**PATIENT ASSESSMENT**

Preventing falls begins with assessment of the patient. It is recommended that assessment for fall risk should be done for every patient on admission. Reassessment should be done upon transfer of a patient from one unit to another, with any status change, following a fall, at regular intervals, and with changes in caregivers. Post-fall assessment should include a history of the fall from the patient and/or witnesses; the circumstances (e.g., time, location, activity); review of underlying illness, medications, and environmental conditions; and functional, sensory, and psychological status.

Assessing mobility, strength, and gait is essential in determining the older patient’s risk for falling. There are several tools that can be used to assess and predict a patient’s risk for falls.

**Inpatient assessment tools for adults:**
• Morse Fall Scale
• Hendrich I & II
• STRATIFY
• Johns Hopkins
• Conley
• Innes
• Downton
• Tinetti
• Schmid
Pediatric assessment tools:
- Schmid “Little Schmidy”
- CHAMPS
- GRAF PIF (General Risk Assessment for Pediatric Inpatient Falls)
- Humpty Dumpty
- I’M SAFE

Outpatient risk assessment tools:
- History of Falls
- Get Up and Go
- Timed Get Up and Go

MORSE FALL SCALE (MFS)
The MFS is used widely by nurses 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:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Score</th>
</tr>
</thead>
</table>
| 1. History of falling; immediate or within 3 months | No = 0  
Yes = 25 |
| 2. Secondary diagnosis | No = 0  
Yes = 15 |
| 3. Ambulatory aid | None, bed rest, wheelchair, nurse = 0  
Crutches, cane, walker = 15  
Furniture = 30 |
| 4. IV/heparin lock | No = 0  
Yes = 20 |
| 5. Gait/transferring | Normal, bed rest, immobile = 0  
Weak = 10  
Impaired = 20 |
| 6. Mental status | Oriented to own ability = 0  
Forgets limitations = 15 |

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>MFS Score</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Risk</td>
<td>0–24</td>
<td>None</td>
</tr>
<tr>
<td>Low Risk</td>
<td>25–50</td>
<td>Standard fall prevention interventions</td>
</tr>
<tr>
<td>High Risk</td>
<td>51+</td>
<td>High-risk fall prevention interventions</td>
</tr>
</tbody>
</table>

Source: Oh, 2012b.
PREVENTION INTERVENTIONS

Fall prevention interventions include both standard and high-risk categories.

**Standard fall prevention strategies:**

- Orient the patient to the environment.
- Place the call light (bell) within reach and have the patient demonstrate its use.
- Ensure that necessary items are within the patient’s reach.
- Keep the hospital bed in low position and the brakes locked.
- Make certain the patient is wearing non-slip, well-fitting footwear.
- Provide a night light or other lighting.
- Keep floors clean and dry.
- Clean up spills immediately.
- Provide handrails in patient bathrooms, room, and hallway.
- Keep patient care areas free of clutter.

**High-risk prevention strategies:**

- Provide visual cues to communicate risk of falls.
  - Post a sign outside the patient’s door and in the room.
  - Apply a coded wristband.
  - Use designated color socks or blankets.
  - Post an alert in the medical record.
- Cue the patient for toileting at least every two hours while awake.
- Do not leave the patient unattended when assisted to the bathroom or commode.
- Use safe transfer and handling techniques, utilizing gait belt or assistive devices if needed.
- Use low beds and floor mats, if appropriate.
- Apply bed and chair alarms.
- Observe frequently or continuously, if necessary.
  (Gardner & Feil, 2013)

**OCCUPATIONAL AND PHYSICAL THERAPY INTERVENTIONS**

Both occupational and physical therapists have a significant impact in preventing falls. Physical therapists assess risk factors, measure strength, assess balance and mobility, and then design specific exercise and training programs to improve these functions.
Occupational therapists consider how the person functions in their day-to-day environment. They offer education in safety to patients and/or caregivers during activities of daily living. Structuring the environment and education can include:

- Removing environmental hazards
- Using proper body mechanics
- Wearing proper footwear
- Utilizing grab bars and tub-shower seats
- Increasing proximity of objects to avoid reaching


### 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 Score. 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.

### DOCUMENTATION AND COMMUNICATION

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. Meticulous medical documentation helps to prevent practice errors and provides a shield against errors arising from miscommunication.

#### Good Documentation

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

**DOCUMENTATION CHECKLIST**

- Document in the correct chart.
- Document any prevention measures, including patient education.
- Write legibly, using agency-approved abbreviations.
- Be objective, state the facts, and avoid personal opinions.
- If a problem is identified, document the actions taken to address the problem.
- Document all communication with colleagues.
- Document errors and how they were dealt with.
- Document referrals to other health practitioners or services.
- Follow agency procedures for correcting a charting error.
- Document in a timely manner throughout the shift.
- Never document what someone else saw or heard unless the information is critical.

**DOCUMENTATION AND LIABILITY**

It is necessary to consider the possibility of malpractice lawsuits and how best to avoid potential legal liability. Documentation must be complete, correct, and timely. To avoid liability, it is important to be able to explain and justify (based on EBP) the care given by each person if one is subpoenaed.

- Do not chart a symptom without also charting what action was taken in response.
- Do not alter a patient’s record (a criminal offense).
- Do not use abbreviations that are not facility approved and widely accepted.
- Do not write inexact descriptions such as “a large amount.”
- Do not chart excuses for omissions such as “dressing not changed because supply not available.”
- Do not document what someone else said, heard, felt, or smelled unless it is pertinent, and if so, place it in quotation marks.
- Do not chart ahead of time. Charting care a clinician hasn’t done is considered fraud. (NSO, 2013)

**Communication Tools**

Research indicates that poor communication is a root cause in more than half 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.

- **Situation:** What’s happening right now?
- **Background:** What are the circumstances that led up to this situation?
- **Assessment:** What do I think the problem is with this patient?
- **Recommendation:** What should be done to correct the situation?

Source: IHI, 2014c.

**CONCLUSION**

For over a decade, patient safety has become a topic of national 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 and quality have not been a traditional part of the education of most healthcare workers, but today this is no longer an acceptable reason for not taking an active role in the prevention of negative outcomes for those we care for. It is essential that we all understand the journey every patient makes through the system, recognizing how the system can fail and what can be done to prevent those failures.

To counter errors and safeguard patients, changes must continue to be made in how the workforce is deployed, how work processes are designed, and to leadership, management, and the culture of healthcare organizations. Physicians, nurses, therapists, and other healthcare personnel are members of a team, and it is crucial that these team members work together and communicate effectively. Collaborative teamwork is essential for optimizing quality and safety in healthcare.
RESOURCES

AHRQ Patient Safety Network
http://psnet.ahrq.gov

Health Care at the Crossroads: Strategies for Improving the Medical Liability System and Preventing Client Injury (Joint Commission)
http://www.jointcommission.org/assets/1/18/Medical_Liability.pdf

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

Institute for Healthcare Improvement
http://www.ihi.org

Joint Commission
http://www.jointcommission.org

List of High-Alert Medications (Institute for Safe Medication Practices)

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

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

Your Medicine: Be Smart, Be Safe (AHRQ)

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TEST

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1. 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 injury caused by medical management rather than the underlying condition of the patient.

2. According to the Joint Commission, a sentinel event is defined as any:
   a. Unexpected occurrence involving death or serious physical or psychological injury.
   b. Error in system design, faulty installation or maintenance of equipment, or ineffective organizational infrastructure.
   c. Meeting to reduce health risks and brainstorm a corrective action plan.
   d. Error that could have caused harm but did not because someone intervened.

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.
   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. The National Quality Forum’s Serious Reportable Events (SREs) in healthcare are also known as:
   a. Sentinel events.
   b. Never events.
   c. Adverse events.
   d. Latent events.
5. 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. An unexpected and patient-related error causing an adverse event.
   b. A sentinel error causing an adverse event.
   c. A near miss causing an adverse event.
   d. A latent and active error causing an adverse event.

6. In the field of systems analysis, environmental factors that contribute to medical errors include:
   a. Leadership and culture.
   b. Workload and training.
   c. Sequence of activity.
   d. Steps to perform a task.

7. The most common root cause of medical errors is:
   a. Inadequate staff or supervision.
   b. Technical failures of equipment.
   c. Problems involving communication.
   d. Deficiencies in education and training.

8. What is the more common cause of patient deaths?
   a. COPD
   b. Motor vehicle accidents
   c. Medical errors
   d. Stroke

9. Patients undergoing orthopedic surgical procedures are most at risk for which medical error?
   a. A hospital-acquired infection
   b. A foreign object left in the body
   c. A wrong-site surgery
   d. A handoff error
10. The most common cognitive (reasoning) error that practitioners make is:
   a. Failure to make referrals.
   b. Premature closure of the diagnostic process.
   d. Inadequately staffing the healthcare facility.

11. Most medication errors occur when drugs are:
   a. Administered.
   b. Prescribed.
   c. Dispensed.
   d. Discontinued.

12. Which groups of drugs are most likely to be involved in adverse drug events?
   a. Antibiotics and antihistamines
   b. Anticoagulants and corticosteroids
   c. Cytotoxic chemotherapy drugs and antacids
   d. Antiemetics and anticholinergics

13. Which is a correct statement concerning tubing misconnections?
   a. IV tubing cannot be connected to a nasogastric tube.
   b. Staff fatigue is not a factor related to misconnections.
   c. Enteral feeding tube connections have unique connectors.
   d. Luer locks are a major contributor to errors.

14. The Food and Drug Administration reports the most common reason for recalling a medical device is:
   a. Problems with packaging or labeling.
   b. Software issues.
   c. Process control issues.
   d. General hospital equipment design flaws.

15. A female patient who is taking Coumadin slips and hits her head on the tile wall while showering, leaving a large bump on the back of her head. The clinician is concerned about the patient’s risk for:
   a. Hypoglycemia.
   b. Postural hypotension.
   c. Decreased visual acuity.
   d. Traumatic brain injury.
16. Which is an intrinsic risk factor for falling?
   a. The improper use of a cane
   b. An inability to remember prescribed medications
   c. The failure to wear appropriate footwear
   d. A history of previous falls

17. Which is a true statement regarding practice errors in rehabilitation therapy?
   a. Communication with other professionals is not a cause for errors.
   b. Most errors occur in the planning phase of treatment.
   c. Errors have been attributed to inexperience.
   d. Time constraints are not a cause for errors.

18. Which is a true statement about computerized prescriber order entry (CPOE)?
   a. Most hospitals now use CPOE.
   b. CPOE generally eliminates more than half of potential adverse drug events.
   c. Physicians may choose to override CPOE-generated drug alerts without clinical justification.
   d. CPOE has not been shown to reduce medication errors.

19. An 85-year-old retired physician is scheduled for a hernia repair. Which characteristic unique to the patient could potentially contribute to a medication error?
   a. Limited health literacy
   b. Anxiety about surgery
   c. Slowed metabolism
   d. Alcoholism

20. Which characteristic of children puts them at risk for adverse medical events?
   a. Cognitive impairment
   b. Changing pharmacokinetic parameters
   c. Frequent falling
   d. Hyperactivity

21. When communicating with a patient who has a neurological impairment, the clinician knows it is helpful to:
   a. Provide the patient with a pencil and paper.
   b. Utilize a translator.
   c. Use a picture board.
   d. Provide the patient with reading material at a first-grade level.
22. A primary goal of the patient safety movement is to:
   a. Implement checklists to reduce or eliminate medical errors.
   b. Close the gap between best practice and common practice.
   c. Determine pockets of excellence.
   d. Accredit nursing education programs.

23. Medicare and Medicaid no longer reimburse for which preventable complication arising during an inpatient stay?
   a. Viral pneumonia
   b. Secondary diabetes with ketoacidosis
   c. Tenosynovitis
   d. Any stage pressure ulcer

24. Which is a true statement about evidence-based practice (EBP)?
   a. There are no barriers to EBP in hospital settings.
   b. EBP is widely used by all professionals throughout the U.S. healthcare system.
   c. EBP involves integrating the best research evidence with clinical judgment and patient values.
   d. EBP in nursing answers questions about the best treatment for a specific patient.

25. What is an essential competence for a health professional to function in an evidence-based practice environment?
   a. A baccalaureate or higher degree
   b. Effective interdisciplinary team skills
   c. Certification as a primary care provider
   d. Advanced computer skills

26. What is the appropriate documentation of a medication according to the Joint Commission’s “Do Not Use” list of abbreviations?
   a. Regular insulin 2 units QD
   b. MS 10.0 mg
   c. Regular insulin 2 U daily
   d. Morphine sulfate 10 mg
27. Root cause analysis is:
   a. A process for discovering basic and contributing causes of error with the continuing
      goal of preventing recurrence.
   c. An exploration of all adverse incidents and malpractice actions at a facility.
   d. A way of distinguishing injuries caused by medical management from all other
      injuries to patients.

28. A thorough root cause analysis must contain:
   a. A final determination of who was at fault and a corrective action plan.
   b. A report to the practitioner’s licensing board with recommendations.
   c. An examination of underlying cause-and-effect systems through a series of “why”
      questions.
   d. The identification of others who may have contributed to the error and a corrective
      action plan.

29. A practice that promotes a culture of safety is:
   a. Creating a blame-free environment.
   b. Clearly spelling out the penalties for reporting safety violations.
   c. Filing incident reports at the end of every month.
   d. Establishing staff and patient error committees.

30. According to the WHO surgical checklist, sterilization indicators are confirmed by the scrub
    and circulating nurse:
   a. In the holding area.
   b. Before induction of anesthesia.
   c. Before skin incision.
   d. Upon the patient leaving the OR.

31. Which statement is in support of an organization adopting a surgical safety checklist?
   a. Checklists improve communication among operating room staff.
   b. Checklists have had no impact on postoperative complications.
   c. Checklists do not require extensive staff interaction.
   d. Checklists are not effective in detecting potential safety hazards.
32. A 12-year-old male patient is to undergo repair and pinning of a compound ankle fracture. After discussing pain medication options with the patient’s nurse, the surgeon orders patient-controlled analgesia (PCA) for the patient’s post-operative pain. This decision was based on the clinicians’ joint assessment of the patient’s:
   a. Risk for respiratory distress.
   b. Level of expected post-op pain.
   c. Current medication that could potentiate sedative effects.
   d. Cognitive ability to participate in pain management.

33. The most effective way to reduce the incidence of line and tubing misconnections is to:
   a. Require that all Luer locks be discontinued.
   b. Design equipment to make IV and enteral systems incompatible.
   c. Eliminate tubing that contains phthalates.
   d. Color-code tubing connectors.

34. Which is a correct action for avoiding central line–associated bloodstream infections?
   a. Performing audits every 48 hours to assess the need for each central line
   b. Bundling needed supplies into a kit
   c. Avoiding the femoral artery site in children
   d. Providing a yearly in-service to new healthcare staff

35. One of the most important, but sometimes overlooked, procedures common to practitioners in preventing all types of healthcare-related infections is:
   a. Staying at home when you have a cold.
   b. Always wearing a mask when caring for patients.
   c. Complying with CDC hand hygiene recommendations.
   d. Avoiding the use of urinary catheterization.

36. An older adult female patient is admitted to the hospital with a right arm fracture following a fall while rising 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. Applying bed and chair alarms
   b. Keeping the head of the bed slightly elevated
   c. Toileting every four hours while awake
   d. Providing a night light for ambulation
37. Credible, timely, and accurate patient documentation should include:
   a. The clinician’s sense of the patient’s emotional state.
   b. The communication between clinicians about the patient’s care.
   c. A justification for why the proper care was not provided.
   d. The charting of patient symptoms without reference to a response by the clinician.