

5. Medication errors (8.1%)
6. Patient falls (6.4%)

Upwards of 70% of these sentinel events resulted in death or loss of function , and close to 75% occurred in general or psychiatric hospital settings (JCAHO 2009 data).

These events are more likely to occur in error-prone situations and in healthcare facilities providing care to special populations,(i.e. the elderly, those with diminished cognitive function, developmental or learning disabilities, psychiatric patients, infants and young children). It has been determined as well that a better informed, educated public is more likely to become more involved in its own health care as relates especially to **medication use** and **events impacting on surgery** (peri-operative, pre-operative, operative, and postoperative). The Joint Commission (www.jointcommission.org) provides public education through their “**Speak UpTM**” program.

In the sections which follow, interventions will be discussed which may prevent the common medical errors detailed earlier which account for close to 2/3rds of reported sentinel events.

1. Wrong-site surgery

This important common error has been the subject of a Joint Commission sentinel event alert. This error is most common during orthopedic procedures, followed in incidence by urological and then neurosurgical procedures. A generic set of risk factors includes: (1) more than one surgeon involved because of multiple procedures or transfer to the care of another surgeon; (2) the performance of multiple procedures on the same patient during a single operation; (3) pressures imposed by time constraints; and (4) circumstances peculiar to the patient which altered usual, preferred positioning during a given surgical procedure.

The American Academy of Orthopedic Surgery has issued a set of corrective measures to reduce the risk of errors which include marking the

correct surgical site with indelible pen along with the surgeon's initials; writing "NO" on the side not to be operated on; and the use of radioopaque markers and intraoperative radiographs to determine the exact vertebral level during spinal surgery. As mentioned earlier, root cause analysis should focus on systems and processes and not exclusively on individual performance. All personnel involved in the operating room setting should monitor procedures to verify compliance, especially during high-risk surgical procedures [11,12].

Because of the high prevalence of wrong-site, wrong-procedure, and wrong-person surgeries, the Joint Commission, along with 50 healthcare professional organizations, convened two summits, one in 2003 and the second in 2007. A Universal Protocol was developed during the first summit, and included the following recommendations:

1. a pre-procedure verification process;
2. marking the operative/procedure site with an indelible marker;
3. taking a "time out" with all perioperative/periprocedure personnel immediately preceding the performance of the operation/procedure;
4. adapting these requirements to all procedure settings, including bedside

Despite this protocol, the incidence rose for wrong-site surgeries, and the second summit (2007) was convened. Failure to consistently follow the 2003 recommendations led to the adoption of a "zero tolerance" policy along with a clarification that the Universal Protocol policy applied to all types of procedures, often including those many would not have considered a procedure, per se, i.e. the administration of regional anesthetics and radiological interventions. An updated version of the Universal Protocol became effective January 1, 2009 (<http://www.jointcommission.org/PatientSafety/UniversalProtocol/>).

2. Patient Suicide

The majority of inpatient suicides take place in psychiatric hospitals (JCAHO 1998) followed in decreasing incidence in general hospitals and residential facilities. Root causes identified by reporting facilities included [13]:

1. The environment (inadequate security, the presence of non-breakaway bars, rods, safety rails, inadequate testing of breakaway hardware);

2. Inadequate or incomplete suicide assessment on admission;
3. Incomplete reassessment at regular intervals to identify the presence of contraband;
4. Factors related to staff (inadequate numbers, insufficient training or orientation, incomplete competency reassessments);
5. Too infrequent or incomplete patient observation; and
6. Lack of effective communication among caregivers and unavailability of information when needed.

Risk-reduction strategies were directed to remedy the identified root causes. In addition, these strategies included engaging family and friends regarding the process of detecting contraband and educating them regarding the identification of suicide risk factors [13,14].

3. Operative and Postoperative Complications

Interesting and surprisingly, studies by the Joint Commission revealed that most of these complications occur in nonemergent procedures [14, 15]:

1. interventional imaging and/or endoscopy →perforation of a viscus
2. tube or catheter insertion (NG tube→lung; central venous catheter→artery)
3. open abdominal surgery (fluid overload, respiratory failure)
4. head and neck, orthopedic, and thoracic surgery

Miscommunication (insufficient, inaccurate, infrequent) among and between physician and non-physician support personnel in the pre-operative, intra-operative, and post-operative arenas, whether in the operating room, endoscopy suite, radiology department, or at the bedside, has been targeted as the major root cause of complications. Other identified risk factors include [14]:

1. Inadequate supervision of house staff (when applicable),
2. deficiencies in conferring privileges and credentialing,
3. incomplete preoperative assessment,
4. failure to follow established procedures,
5. inconsistent postoperative monitoring procedures, appropriate to the needs of the patient,
6. failure to question “inappropriate” orders, and
7. inadequate support staff orientation, training, and continuing education.

4. Delays in Treatment

According to the Joint Commission, more than half of all sentinel event cases that resulted in patient death or permanent injury were due to delays in treatment in the emergency room setting, attributed most commonly to misdiagnosis in addition to delayed test results, physician availability, delays in following orders regarding patient care, incomplete treatment, and, strangely enough, difficulty in locating the entrance to the emergency department [16]. Once again, a breakdown in communication usually with or between physicians, was identified as a root cause; included were insufficient or inadequately trained staff, overcrowding of the ER facility, and lack of specialists when required. To remedy the remediable, Joint Commission recommended (1) implementing processes and procedures that improved timeliness, completeness, and accuracy of communication; (2) implementing face-to-face interdisciplinary change-of-shift debriefings; (3) taking steps to reduce reliance on verbal orders; and (4) requiring a procedure of “read back” or verification when verbal orders are utilized [16].

5. Medication Errors

Common and unavoidable, they seem to occur at three critical points in the care of the patient: when ordered by the physician (or authorized healthcare professional), dispensed by the pharmacist, or administered by a nurse . Medication error has been defined by the National Coordinating Council for Medication Error Reporting and Prevention as: *“any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in 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; monitoring; and use”* [17].

The majority of medical errors are related to the administration of the **wrong medication**, the correct medication in the **wrong dose**, or the correct medication administered at the **wrong time** [18].

Factors related to prescribing of the **wrong medication** include

1. drug interactions
2. duplicate therapy
3. incorrect indication
4. failing to recognize contraindications

Factors related to the **wrong dosage** include:

1. misplacement of decimal points
2. incorrect calculations
3. incorrect units of measure
4. miscopying of doses
5. not adjusting to the patient's altered physiologic status, i.e. alertness, unstable vital signs, dehydration, impaired renal function, etc.

Factors related to **errors of dosing frequency** include:

1. incorrect frequency for a dose form
2. misinterpretation of abbreviations (QD read as QID)

The use of dangerous abbreviations and dose expressions contributes to the number of medication errors. The Joint Commission has addressed this in their **Sentinel Event Alert, Issue 23: Medication Errors Related to Potentially Dangerous Abbreviations**

(http://www.jointcommission.org/SentinelEvents/SentinelEventsAlert/sea_23.htm).

They recommended that prescribers take the following precautionary steps:

- Avoid the use of the symbol “u”; when ordering drugs administered in unit dosages such as insulin, spell out “units”.
- Spell out medication names completely rather than using abbreviations or acronyms.
- Avoid using abbreviations such as QD for “daily”; QOD for “every other day”, and QID for “four times daily” which are easily confused. Write out the word “discharge” or “discontinue” rather than using the abbreviation “D/C”.
- Precede a decimal point with a 0 (e.g. 0.2mg rather than .2mg) and avoid the use of “trailing” zeros (e.g. 2mg instead of 2.0 mg to avoid confusing 2.0mg with 20mg).

Other factors contributing to prescriber errors include [19]:

1. Illegible or confusing handwriting
2. Overuse of verbal orders, especially when there is no procedure or system in place to assure verification
3. Failure to restrict the use of verbal orders for certain medications such as chemotherapy.
4. Failure to involve the facility's Pharmacy and Therapeutics Committee to interact with the prescriber staff to limit, where appropriate, the number of therapeutically and generically equivalent products.

A national observational study (2003) which focused on prescription dispensing accuracy estimated that between 0.2% and 10% of prescriptions are dispensed incorrectly [20]. Based on this report and many other related publications, a number of risk reduction strategies have been suggested to assure safe dispensing practices in order to reduce the incidence of errors that may harm patients [19,21]:

1. Assure that current drug reference texts are immediately available to prescribing professionals.
2. Be certain that the dispensing pharmacist has available essential patient information (e.g. vital statistics, current medication regimen, current diagnosis, etc).
3. Have in place a process for clarification of any questionable order and resolution of differences of opinion.
4. Whenever possible, dispense dosage units in a ready-to-administer form.
5. Rely more on single-dose vials and ampoules rather than multidose vials.
6. Assure that the pharmacist re-check all mathematical calculations for neonatal and pediatric solutions and other compounded pharmaceutical products.
7. Involve a second pharmacist to verify that a prescribing order is correct, especially when involving high-risk drugs and antineoplastic agents.
8. Enhance an awareness of look alike and sound alike medications and have in place preventative steps to avoid dispensing errors.

Very often, especially in inpatient settings, a prescribed medication is administered by a nurse who often employs the five "rights" before doing so: the **right** patient, the **right** medication, in the **right** dose, by the **right** route, and at the **right** time [22]. It has been determined that medication errors fall

into four categories which, can be shown to be related to the five “rights” detailed above: (1) failure to follow procedural safeguards related to the patient (e.g. weight, allergies, current medications); (2) unfamiliarity with the medication being dispensed; (3) failure to use the correct mode of administration (e.g. oral, IV, etc); and (4) failure to clarify a confusing order (e.g. incomplete, illegible, or questionable for other reasons). Nurses can be held legally responsible by virtue of a shared responsibility in administering a medication ordered by a physician and dispensed by a pharmacist [22]. A system in place that emphasizes reviewing the five “rights” prior to administering a medication and the four categories in which medical errors can be compartmentalized goes a long way toward assuring that the incidence of medical errors leading to the occurrence of adverse events which cause patient harm will be reduced substantially.

In a preceding section of this manuscript, **Reducing and Preventing Errors**, reference is made to special populations at greater risk of sustaining medical errors. It is worthwhile to list these representative samples again, including some not detailed in the earlier section:

1. elderly patients
2. psychiatric patients
3. patients with diminished cognitive function, developmental or learning disabilities
4. infants and young children
5. individuals with hearing or visual difficulties
6. comatose patients
7. heavily sedated members of the general population

The pediatric population is at high risk for sustaining injury from medication errors. Pediatric-specific calculations are required to adjust medication dosage according to weight. Healthcare professionals trained to care for pediatric patients must be on site in the facility where health care is

delivered. Intolerance to medications is common due to physiologic immaturity. Furthermore, it is difficult for a child to communicate symptoms attributable to adverse drug reactions. Risk reduction strategies must be in place targeted at identified root causes [23].

6. Patient Falls

They provide a constant challenge to health care facilities. The elderly, those with altered mental status on the basis of intoxication or chronic mental illness, and a history of prior falls are red flags for identifying patients at high risk. Identified root causes of these sentinel events include the processes of care, the care givers, the environment where care is provided, and the entire organizational culture. The Florida Hospital Association has recommended that facilities establish a comprehensive, interdisciplinary program to prevent falls; such a program should have the following components: (1) have in place fall prevention protocols applied to patients screened and determined to be at greatest risk; (2) reporting falls and measuring fall rates; and (3) use gathered information to modify fall prevention protocols [24]. As the population ages with more Americans living well beyond age 65, hospital facilities should have in place programs to guard against falls and to introduce activities designed to enhance mobility in a safe environment while the elderly patient and others at high risk are hospitalized [25].

COMMON MISDIAGNOSES

Misdiagnosis is an obvious contributor to the occurrence of medical errors. Recognizing this, the Florida Board of Medicine (2010) has determined that continuing medical education is a requirement especially for the five most misdiagnosed conditions as determined in the last licensing biennium [26]:

- Cancer
- Coronary artery disease
- Acute abdomen
- Timely diagnosis of surgical complications
- Stroke and related cranial conditions

1) Cancer

It is well recognized and accepted that early diagnosis is essential to assure an appropriate treatment approach and a better outcome. Regrettably, an estimated 12% of cancer is misdiagnosed, and the missed or delayed diagnoses account for a large number of medical malpractice claims [27]. There are many reasons underlying misdiagnoses: (1) atypical or ambiguous presentations; (2) not considered because of the patient's young age; (3) a low index of suspicion; and (4) diagnosis considered unlikely because of the absence of risk factors.

2) Coronary Artery Disease

There are many explanations for the occurrence of the acute onset of chest pain, ranging from the **benign** (e.g. panic/anxiety, peptic ulcer, costochondritis, esophageal spasm, gastroesophageal reflux disease, pericarditis) to the **life-threatening** (e.g. acute coronary syndromes (ACS), pulmonary embolism, pneumothorax, aortic dissection). A careful history and physical examination is essential to direct the selection of additional diagnostic tests. The remainder of this section will focus on the more prevalent potentially life-threatening diagnosis of ACS which can present to the ER setting or occur in a patient hospitalized for unexplained chest pain or for even an unrelated disproportionate to the amount of exertion raises the index of suspicion that the patient has underlying coronary artery disease. The existence of several risk factors (e.g. male sex, smoking, hypertension, diabetes, obesity, hyperlipidemia, and family history) should heighten the suspicion of the diagnosis when an individual presents with oppressive anterior chest wall pain, uncharacteristic heart burn with radiation to the neck, shoulder, or left arm, acute onset of dyspnea, unexplained syncope, or a transient ischemic attack. Cocaine use may provoke spasm of the coronary arteries. Aortic stenosis increases myocardial oxygen demand and may present with angina, syncope, or both. Atypical descriptions of chest pain occur especially in the elderly and women and

include descriptive terms as burning, numbness, tingling, stabbing or pricking. The location may not be classic as described and can occur in the back, interscapular, upper abdomen, shoulders, left axilla, and jaws. An electrocardiogram should be performed on acute presentation; if normal or revealing of non-specific ST-T wave changes, perform an exercise stress test with or without thallium, or an angiogram if index of suspicion is high, especially when associated with several risk factors. Serial cardiac enzymes (e.g. creatine kinase, cardiac troponins) assays repeated over 6 to 12 hours may aid in the diagnosis [28,29].

3) Acute Abdomen

This complaint accounts for approximately 5% of visits to ERs and 1.5% of visits to primary care physicians [30]. There are numerous causes to consider. A careful history and physical examination are essential to determine the need for immediate hospitalization, a surgical consultation, and the ordering of an EKG as baseline or to exclude an atypical presentation of ACS. The mode of onset, antecedent symptoms suggesting biliary tract or peptic ulcer disease, the radiation pattern, the character of the pain (e.g. colicky or constant), the appearance of the patient are all factors that facilitate a rational differential diagnosis and the selection of appropriate confirmatory tests. Special consideration has to be paid to this condition in children, the elderly and pregnant women [30].

4) Surgical Complications

Zahn and Miller (2003) presented data indicating that postoperative complications accounted for up to 22% of “preventable” deaths [31]. Not all of these are avoidable. Surgery undertaken for the right reasons, performed by a credentialed, experienced surgeon who knows when to call for assistance in the operating room, and which reveals what was suspected and is appropriately remedied reduces the likelihood of postoperative complications. Baseline (pre-

operative) and serial examinations performed in the recovery room by personnel trained to know what to look for as the patient becomes arousable are likely to detect early complications and facilitate appropriate diagnostic evaluations. The same can be said for follow up on a daily or more frequent basis in the in-hospital; premature discharge should be avoided when in doubt about the explanation for unexpected findings.

5) Stroke and Related Conditions

Effective treatment requires rapid recognition and diagnosis of the third leading cause of death in the United States and an important cause of disability. Most are ischemic, caused by thrombosis, embolus, or hypertensive vasospasm. Each may produce a transient ischemic attack (TIA), the result of a temporary disruption of cerebral blood flow, presenting with focal neurologic symptoms including speech slurring of a duration usually less than 30 minutes. Attacks lasting longer than 1 hour are indicative of brain infarction. Treatment undertaken within 3-4 hours of onset increase the likelihood of successful clot dissolution (thrombolytic agent rt-PA {alteplase}) once brain imaging is negative for hemorrhage, and prevention of infarct; this fact underlines the importance of a high index of suspicion and rapid transportation to an emergency room setting equipped to handle such a problem [32]. The American Heart Association recommends that all such patients receive a battery of standard tests and undergo a baseline set of procedures [33]. All such tests should be available to a community and in a hospital setting 24 hours a day, seven days a week.

THE ROLE OF PATIENTS AS THEIR OWN SAFETY ADVOCATES

Guidelines have been developed by a number of organizations to encourage patients to share in the responsibility toward insuring their own safety. The Agency for Healthcare Research and Quality has developed a "Patient Fact Sheet" which includes 20 tips for patients to help reduce the incidence of medical errors [34]. These are guidelines only, not intended to shift the responsibility to

patients for reducing medical errors. The informed patient who is able to become involved in his or her own care with the assistance of loved ones and friends and who asks the right questions and accepts only those answers which make sense increases the likelihood of a better outcome.

USE OF AN INTERPRETER

From time to time the services of a skilled interpreter may become both necessary and desirable to assure that effective communication is occurring between healthcare professionals providing care and the patient receiving that care. It is essential to be confident that instructions and information conveyed to the patient are understood. It is important for the physician “in charge” to respect the interpreter as a professional, a member of an interdisciplinary team providing care, who has been trained to negotiate cultural differences and be able to do so ethically, accurately, and with impartiality, able to translate and transmit important information expeditiously when required. The role of the interpreter is critical in circumstances when there is high risk for the occurrence of medical errors (e.g. obtaining informed consent for procedures, making decisions about treatment options, understanding the purpose of recommended therapies, etc).

CONCLUSIONS

Medical errors, adverse events, contribute significantly to morbidity and mortality. They are usually unanticipated and, more often than not, preventable. A careful study of the circumstances surrounding the care of the patient is undertaken when it is felt that the error was preventable, i.e. a sentinel event. A carefully performed root cause analysis is undertaken to identify factors which contributed to the occurrence of the event. The findings generated by the analysis provide information useful to improve systems and processes in the health care facility providing care. The major objectives of the root cause analysis are to identify and correct problem areas and not to assign blame. The Joint Commission has

and continues to play an important role in the establishment of reporting guidelines and the publication of sentinel alerts. The Florida legislature has mandated additional reporting requirements for a specific set of medical errors. All healthcare professionals should be increasingly sensitive to the issue of medical errors, alert to circumstances which increase the risk for their occurrence, and work as a team to reduce the risks when identified. We should strive to encourage our patients to assume some responsibility for their own safety as well; education systems are available to make our patients better informed. We must work together so that the public we serve know of our concerns for their safety and trust the system in which healthcare is delivered.





“This course was developed from the public domain document: 20 Tips To Help Prevent Medical Errors – Agency for Healthcare Research and Quality (AHRQ).”