20 Tips To Help Prevent Medical Errors

One in seven Medicare patients in hospitals experience a medical error. But medical errors can occur anywhere in the health care system: In hospitals, clinics, surgery centers, doctors' offices, nursing homes, pharmacies, and patients' homes. Errors can involve medicines, surgery, diagnosis, equipment, or lab reports. They can happen during even the most routine tasks, such as when a hospital patient on a salt-free diet is given a high-salt meal.

Most errors result from problems created by today's complex health care system. But errors also happen when doctors* and patients have problems communicating. These tips tell what you can do to get safer care.

What You Can Do to Stay Safe

The best way you can help to prevent errors is to be an active member of your health care team. That means taking part in every decision about your health care. Research shows that patients who are more involved with their care tend to get better results.

Medicines

1 Make sure that all of your doctors know about every medicine you are taking. This includes prescription and over-the-counter medicines and dietary supplements, such as vitamins and herbs.

2 Bring all of your medicines and supplements to your doctor visits. "Brown bagging" your medicines can help you and your doctor talk about them and find out if there are any problems. It can also help your doctor keep your records up to date and help you get better quality care.

3 Make sure your doctor knows about any allergies and adverse reactions you have had to medicines. This can help you to avoid getting a medicine that could harm you.

4 When your doctor writes a prescription for you, make sure you can read it. If you cannot read your doctor's handwriting, your pharmacist might not be able to either.

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*The term "doctor" is used in this flier to refer to the person who helps you manage your health care.

5 Ask for information about your medicines in terms you can understand—both when your medicines are prescribed and when you get them:

- What is the medicine for?
- How am I supposed to take it and for how long?
- What side effects are likely? What do I do if they occur?
- Is this medicine safe to take with other medicines or dietary supplements I am taking?
- What food, drink, or activities should I avoid while taking this medicine?

6 When you pick up your medicine from the pharmacy, ask: Is this the medicine that my doctor prescribed?

7 If you have any questions about the directions on your medicine labels, ask. Medicine labels can be hard to understand. For example, ask if "four times daily" means taking a dose every 6 hours around the clock or just during regular waking hours.

8 Ask your pharmacist for the best device to measure your liquid medicine. For example, many people use household teaspoons, which often do not hold a true teaspoon of liquid.

Special devices, like marked syringes, help people measure the right dose.

9 Ask for written information about the side effects your medicine could cause. If you know what might happen, you will be better prepared if it does or if something unexpected happens.

Hospital Stays

10 If you are in a hospital, consider asking all health care workers who will touch you whether they have washed their hands. Handwashing can prevent the spread of infections in hospitals.

11 When you are being discharged from the hospital, ask your doctor to explain the treatment plan you will follow at home. This includes learning about your new medicines, making sure you know when to schedule follow-up appointments, and finding out when you can get back to your regular activities.

It is important to know whether or not you should keep taking the medicines you were taking before your hospital stay. Getting clear instructions may help prevent an unexpected return trip to the hospital.

Surgery

12 If you are having surgery, make sure that you, your doctor, and your surgeon all agree on exactly what will be done.

Having surgery at the wrong site (for example, operating on the left knee instead of the right) is rare. But even once is too often. The good news is that wrong-site surgery is 100 percent preventable. Surgeons are expected to sign their initials directly on the site to be operated on before the surgery.

13 If you have a choice, choose a hospital where many patients have had the procedure or surgery you need. Research shows that patients tend to have better results when they are treated in hospitals that have a great deal of experience with their condition.

Other Steps

14 Speak up if you have questions or concerns. You have a right to question anyone who is involved with your care.

15 Make sure that someone, such as your primary care doctor, coordinates your care. This is especially important if you have many health problems or are in the hospital.

16 Make sure that all your doctors have your important health information. Do not assume that everyone has all the information they need.

17 Ask a family member or friend to go to appointments with you. Even if you do not need help now, you might need it later.

18 Know that "more" is not always better. It is a good idea to find out why a test or treatment is needed and how it can help you. You could be better off without it.

19 If you have a test, do not assume that no news is good news. Ask how and when you will get the results.

20 Learn about your condition and treatments by asking your doctor and nurse and by using other reliable sources. For example, treatment options based on the latest scientific evidence are available from the Effective Health Care Web site (effectivehealthcare.ahrq.gov/options). Ask your doctor if your treatment is based on the latest evidence.

INTRODUCTION: BACKGROUND AND SCOPE OF THE PROBLEM

In 2001, the Florida Legislature passed a law mandating that all licensed health professionals complete and repeat every three years a 2-hour course on the topic of prevention of medical errors.   Several years previous to this decision, the Institute of Medicine (IOM) published a document entitled To Err is Human: Building a Safer Health System [1]. The authors reviewed the prevalence of medical errors in the United States which revealed that somewhere between 44,000 and, quite possibly, upwards of 90,000 deaths attributed to medical errors occurred annually in hospitals. A recently published (2004) HealthGrades report stated that annual deaths attributable to medical errors may be as high as 195,000 [2]. This number compared to other causes of death in 2001 (http://www.cdc.gov/nchs/fastats/deaths.htm) is exceeded only by heart disease (700,142) and cancer (553,768). A recent study (2010) from the Department of Health and Human Services found that one in seven Medicare recipients is harmed by hospital acquired infections, poorly administered medication and faulty bedside care during in-hospital medical care (New York Times) in total accountable for an estimated 180,000 patients deaths annually. While the figures of 180,000-195,000 deaths attributable to medical errors when compared to annual hospital admissions in excess of 33 million represents only 0.58%, it sends an important message to healthcare professionals to accept the responsibility to understand the increasingly broad definition of medical errors,

their root causes, and to assist in building systems designed to reduce the incidence of medical errors, i.e. adverse events. "Hospitals and doctors and nurses are focused on preventing harm", says Nancy Foster of the American Hospital Association, "but as the report (HHS) suggests, we do have a ways to go before we are where we want our performance to be" [3].

The course you are taking is designed to satisfy the requirements of the Florida law and to better inform you about the necessity for and wherewithal to effect a

reduction in medical errors and to become knowledgeable regarding existing preventative measures.

WHAT IS CONSIDERED A MEDICAL ERROR?

As defined by the IOM, "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim": medical errors which result in harm to the patient are not routinely or automatically considered examples of medical malpractice or negligence. They can occur anywhere in the trajectory of providing medical care, i.e. from diagnosis to treatment, including even when attempting to provide preventative care, i.e. an overlooked allergy when administering a vaccine or the occurrence of C. difficile toxin-mediated diarrhea following the administration of antibiotic prophylaxis. The failure of a planned action falls into two categories: "error of execution" or "error of planning", the former defined when a correct action plan did not proceed as anticipated; the latter defined when the action intended originally was incorrect [1]. Medical errors, "adverse events" which, in retrospect, are considered preventable are labeled *sentinel events,* those which signal a need for immediate investigation [4]. A sentinel event is defined further as "an unexpected occurrence involving death or serious physical (loss of limb or function) or psychological injury, or **the risk thereof**, the latter phrase including the recognition of a variation in process when an unanticipated recurrence carries the risk of a serious adverse outcome (Joint Commission on Accreditation of Healthcare Organizations: *Root Cause Analysis in Health Care: Tools and Techniques, 2000*). An excellent example (CME Resource, 136:(1) 1-12, 2011 Course # 9133) would be the death of a patient who underwent a successful surgical procedure but died from pneumonia acquired during the postoperative period, an adverse event. Was this event **preventable,** i.e. failure to utilize proper hand-washing techniques?; allowing visitation by relatives with URIs?; or **unpreventable,** i.e. the result of age and comorbidities? The careful examination i.e. **root cause analysis,** of adverse events sets the stage for the discovery of underlying causes of preventable

medical errors. The Joint Commission has established guidelines to facilitate both the recognition and analysis of these events [5]. A thorough and credible **root cause analysis** provides the opportunity to identify the need for improvements in processes or systems; justify requests to hospital administrators to modify hospital staffing patterns and/or to upgrade technical supporting systems; and to develop onsite education for healthcare professionals and ancillary support personnel.

ROOT CAUSE ANALYSIS: Definition and Utilization

Applying the "Golden Rule", those with the gold make the rules. Accreditation status is accorded healthcare facilities by the Joint Commission which holds accredited facilities responsible for establishing and maintaining a safe environment for patients. To that end, the Joint Commission has identified a subset of sentinel events subject to their review [4]:

1. When the event has resulted in death or permanent loss of function and does not seem related to natural course of the patient's or underlying condition **or**
2. The event is one of the following:
    a. The suicide of the patient being cared for in a staffed around-the clock setting or within 72 h of discharge;
    b. Surgery on the wrong patient or wrong body part;
    c. The unintended retention of a foreign object in a patient who has undergone surgery or another procedure;
    d. A hemolytic transfusion reaction involving the administration of blood or blood products having major group blood incompatibilities;
    e. The unanticipated death of a full-term infant;
    f. The occurrence of severe neonatal hyperbilirubinemia (bilirubin > 30mg%);
    g. The discharge of an infant to the wrong family;
    h. Abduction of a patient receiving care, treatment, and services;
    i. The rape of a patient;
    j. Prolonged fluoroscopy with excessive rads delivered to a single field or the administration of radiotherapy to the wrong body region or > 25% above the planned dose.

The Joint Commission further requires that accredited healthcare organizations have in place processes to recognize these events, conduct thorough and credible root cause analyses which focus on process and systems factors, and are able to provide a risk-reduction strategy and internal corrective plan with built in methods for assessing the effectiveness of these strategies and plans in actually reducing further risks and the incidence of adverse events [4]. Of interest is that the Joint Commission considers a root cause analysis to be acceptable if it focuses on **systems** and **processes**, and **not exclusively on individual performance** and is both **thorough** and **credible** [6]. Furthermore, it should think of sentinel or adverse events as the result of **special causes** in clinical processes as well as **common causes** in organizational processes. The suggested framework for a root cause analysis and action plan initiated in response to a sentinel event is designed to address the following questions: **What happened? Why did it happen? What were the most proximate factors? What systems and processes underlie the proximate factors?** The provision of answers for which correctable actions can be undertaken depend on a **level of analysis** which focuses on the following:

1. The sentinel event
2. The process or activity in which it occurred
3. Human factors
4. Equipment factors
5. Controllable environmental (factors which directly affected outcome)
6. Uncontrollable external factors (outside the control of the organization)
7. Human resource issues (staff qualifications, competence, actual performance, numbers, ideal v actual levels, adequacy of orientation and continuing education procedures)
8. Information management issues (availability, completeness, unambiguousness, accuracy)
9. Environmental management issues (appropriateness for processes being conducted, systems to identify environmental risks, testing and planning of emergency and failure-mode responses)
10. Leadership issues: Corporate culture
11. Encouragement of communication
12. Clear communication of priorities

A credible and thorough analysis of each of the levels of analysis enumerated above gives way to findings, the identification of root causes, an answer to the question "Why?", and whether action needs to be taken. The actions taken should state clearly the **risk reduction strategy** being employed; and for each, **measures of effectiveness** must be included along with dates of implementation, planned follow up, and the associated measure of effectiveness. To be considered credible, the root cause analysis process must (1) involve the organization's leadership and include the participation of individuals involved directly or indirectly in the process and/or systems under review; (2) the analysis must be internally consistent, not contradict itself or leave important questions incompletely addressed; (3) findings of "not applicable" or "no problem" must be accompanied by an explanation; and, finally, (4) should include reference to relevant literature. This process is to be completed within 45 days from the date the organization involved becomes aware of the sentinel event [4,6].

DIVISION OF PRACTITIONER DATA BANKS (DPDB)

The National Practitioner Data Bank (NPDB) and the Healthcare Integrity and Protection Data Bank (HIPDB) are components of the Division of Practitioner Data Banks (DPDB), the organization responsible for their implementation. They exist as flagging systems created to facilitate a comprehensive review of the professional credentials of health care practitioners, providers, and suppliers. The National Practitioner Data Bank, established in 1986 through Title IV Public Law 99-660, the Healthcare Quality and Improvement Act, began its operations in 1990. "The intent of the NPDB was to enhance the quality of health care, encourage greater efforts in professional peer review and restrict the ability of incompetent health care practitioners to move from State to State without discovery of previous substandard performance or unprofessional conduct" (U.S. Department of Health and Human Services). The NPDB collects and discloses certain information related to the professional competence and conduct of physicians, dentists, and other health care practitioners and includes information

of the following actions against them: (1) adverse licensure actions; (2) actions related to clinical privileges; (3) actions of professional societies; (4) paid medical malpractice judgments and settlements; (5) exclusions from participation in Medicare/Medicaid programs; and (6) registration actions taken by the U.S. Drug Enforcement Administration (DEA). While the data in the NPDB is available to hospitals, health care entities and professional societies with peer review, State licensing authorities, health care practitioners (self-inquiry), researchers (statistics only), and, in infrequent and limited circumstances, plaintiffs' attorneys, they are prohibited from disclosing specific information to the general public.

The Healthcare Integrity and Protection Data Bank was established in 1996 as an addition to the Social Security Act and a component of the Health Insurance Portability and Accountability Act; it became fully operational in March of 2000. "The intent of the HIPDB is to combat fraud and abuse in health insurance and health care delivery" (U.S. Department of Health and Human Services). This data bank contains the following information, and, similar to the NPDB, is prohibited from disclosing specific information to the public related to a practitioner, provider, or supplier: (1) civil judgments against health care providers, suppliers, or practitioners related to the delivery of a service or health care item; (2) Federal or State criminal convictions (see (1) above; (3) actions by Federal or State agencies against organizations responsible for licensing and/or certifying health care providers, suppliers or practitioners; (4) exclusion of providers, practitioners, or suppliers of health care from participation in Federal or State health care programs; and (5) any other adjudicated action taken against providers, suppliers, or practitioners of health care.

Through May 23, 2009, the NPDB for Florida listed more than 18,000 medical malpractice reports for physicians (MD and DO) and more than 500 Medicare/Medicaid exclusion reports.

FLORIDA LAW

In addition to what has already been discussed regarding the reporting of adverse incidents (sentinel events) to the Joint Commission, Florida law mandates the reporting to its Agency for Health Care Administration (AHCA) within 15 calendar days from their occurrence a set of serious adverse events associated with and occurring possibly as a result of medical intervention and which have resulted in an adverse outcome.   To assure that this occurs, the JCAHO accredited facility must have in place a well developed risk management program which includes an incident reporting system requiring all healthcare providers and employees to report adverse incidents to the risk manager or his or her designee within 3 business days of the incident. Florida law defines an adverse incident as: ***An event over which healthcare personnel could exercise control and which is associated in whole or in part with medical intervention rather than the condition for which such intervention occurred*** [7]. The following injuries resulting from an adverse event must be reported to the Florida AHCA:

1. Death
2. Brain or spinal damage
3. Permanent disfigurement
4. Fracture or dislocation of bones or joints
5. A resulting limitation of neurological, physical, or sensory function which continues following discharge from the facility
6. When informed consent was not obtained for a non-emergent medical intervention which required specialized medical attention or surgical intervention;
7. Any condition requiring transfer of the patient to a facility providing a more acute level of care, the result of the adverse event and not the pre-existing condition;
8. Regarding a surgical procedure, was it:

   a. performed on the wrong patient?
   b. the wrong surgical procedure?
   c. performed on the wrong site?
   d. unrelated to the patient's diagnosis or condition?
   e. a surgical repair of damage resulting from a planned surgical procedure?
   f. performed to remove a foreign object remaining from a prior procedure?

Each reported incident is reviewed by the AHCA which determines the penalty to be imposed on the party held responsible for the adverse event. The organization feels that all healthcare professionals who practice in licensed facilities share the responsibility to ensure that risk management systems are in place to detect and report adverse incidents in an accurate an expedient manner [7].

During 2008, the Florida AHCA received reports of 579 adverse incidents of which 193 deaths were included, 1/3rd of which were considered the result of hospital error. The next most common injuries related to surgical procedures: unrelated to the patient's primary diagnosis or medical needs (24.01%); to remove a foreign object from a previously performed procedure (18.65%); and for surgical repair or damage resulting from a prior surgical procedure (10.02%) [8]. Based on sentinel events reported, the Joint Commission has compiled **Sentinel Event Alerts** which it sends to all accredited organizations. These reports emphasize areas of potential concern so that a facility providing health care can review constantly its internal processes as a means of reducing risks to patients, the number of adverse events, and to have in place preventative measures. The goals of the Joint Commission and Florida's AHCA are in concert to keep healthcare professionals aware constantly of and to be sensitive to circumstances in which adverse events can be anticipated and, thereby, prevented [9].

REDUCING AND PREVENTING ERRORS

An analysis of sentinel events reported to the Joint Commission from 1995 to March 31, 2010 indicated that 6782 events impacting 6920 patients resulted in 4642 deaths [10]. The six most common categories were:

1. Wrong-site surgery (13.4%)
2. Patient suicide (11.9%)
3. Operative and postoperative complications (10.8%)
4. Delay in treatment (8.6%)

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 Up^(TM)***" 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. Regretfully, 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 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.

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