Preventing Medical Errors
For Allied Health Professionals

2011-2014
Preventing Medical Errors for Allied Health Professionals 2011-2012 - R: 01/01/2011 E: 12/31/2014

Needs Statement: The 1999 Institute of Medicine report To Err is Human: Building a Safer Health System brought prominence to the issue of medical error in the US. Since that time multiple activities at various levels of private and regulatory arenas have targeted identification and resolution of medical error. The process is dynamic and health professionals need education of error reduction techniques so as to improve safety in their professional activities and work setting. Some regulatory agencies require specific medical error education for licensure/relicensure of health professionals.

Intended Audience: This course is designed for all health professionals in all settings in the healthcare industry.

Course Goal: This educational monograph addresses the identification, reporting, monitoring and reduction of medical error. It is intended to make participants aware of the magnitude of the problem, of the many-leveled activities needed to resolve it, and the importance of each person’s role in the national effort to reduce medical errors.

Objectives: At the completion of this course the participant will be able to:

1. Recognize the magnitude and far reaching effects of medical error.
2. Categorize factors contributing to the occurrence of medical error.
3. Describe the healthcare professional’s role in identifying error prone situations.
4. Explain the importance of reporting medical error.
5. Specify at least two recommended practice modifications to promote safety and reduce the incidence of medical error.
6. Review the processes of root cause analysis and failure mode and effects analysis when analyzing error.

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Introduction

For those of us in healthcare, medical errors are nothing new. The possibility of their existence and their consequences were likely introduced to us early in our professional education and long before our licensure, certification or registration. Their reality became clear to us from the outset of professional practice. We know that errors can and do occur at various levels and with diverse significance and outcomes. The key is prevention. While our genuine desire to avoid errors is consistent, our response to them at the many levels of the healthcare industry is not. Too often nothing really changes. Mistakes are superficially addressed with contributing procedures and systems left unaltered thus leaving the stage set for the next incident. Often, individuals contributing to an error may not even be aware of their role in it. Other times, individuals are unjustly singled out to receive blame for matters beyond their control. A cycle of inaction, or nonproductive action, prevails.

In November, 1999, the landmark report of the Institute of Medicine (IOM) To Err is Human: Building a Safer Health System initiated an unprecedented effort to break this cycle. Sobering statistics justified its recommendations and declaration that it is simply unacceptable for patients to be harmed by the same system one expects to heal and comfort. Effects of the report were widespread, evoking reaction from the public, from regulatory and governmental agencies, as well as from all segments of the healthcare industry. In the period following initiatives to reduce errors continue; some high-risk activities have been identified; processes have been researched and modified; monitoring and reporting is evolving; automation and technologic advances have been increasingly incorporated into distribution and decision making. Certainly awareness of errors by the many stakeholders in healthcare has been heightened. While some improvements have been made the process continues.

Why is it important?

Statistics

The occurrence of medical errors and their associated costs are poorly understood by most. The reasons are many. They include an environment of secrecy characterized by absent reporting and documentation, as well as by a diluted perception of the problem. A disaster involving an aircraft that immediately claims many lives has a more emphatic impact on the public and safety officials than does a similar number of deaths attributable to medical errors that occur over a greater geographical area and longer period of time; knowledge of the latter are slow to emerge and difficult to discover.

Clearer definition of the problem surfaced with the 1999 IOM report which estimates that 44,000 to 98,000 people die in hospitals each year as the result of medical errors. Even using the lower estimate, medical errors are the eighth leading cause of death in this country – higher than motor vehicle accidents, breast cancer or AIDS.

While these numbers are impressive, they are likely to be a significant underestimation of the problem. First, the two studies from which the statistics are extracted are believed to offer conservative figures. They were limited to injuries of a specified level of harm, required a high threshold to determine whether an adverse event was preventable or negligent, and included only those errors documented in patient records. Additionally, these statistics represent errors in hospitals only. More recently, Barker and colleagues observed a persistence of the problem in defining 19% of medication doses administered in healthcare facilities to be in error and 7% rated as potentially harmful. While much of the early data on medical errors focused on the hospital setting, a source of more readily available information, it is important to understand that errors can occur in any healthcare settings, such as physician offices, outpatient surgical settings, urgent care settings, nursing homes, hospices and community pharmacies.

Impact

The incidence of medical error has a substantial impact on the health and well-being of Americans. It is linked with estimations of significant cost to individuals, families, organizations and society as a whole. Affected individuals encounter needless pain and countless losses related to functional health status and financial stability. They may endure duplicate testing, repeated procedures, prolonged treatment and extended recovery time. Because of medical error, they may also experience lost productivity, disability, and increased costs of personal care. Unacceptably, thousands will die each year. Countless others, along with their family and friends, will have lost their trust in our healthcare system. The potential for experiencing harm while receiving healthcare threatens every American and as the IOM report noted, Americans shouldn’t be harmed by the very people that are trying to care for them. Public perception, reflected by recent polls, is not favorable. Forty-two percent of respondents to a National Patient Safety Foundation poll indicated that they or a friend or relative had been affected by a medical error. Thirty-two
percent noted the error had a permanent negative effect on
the patient’s health. These respondents rated the healthcare
system as a 4.9 on a 1 to 7 scale (1 = not safe; 7 = very safe).²

In an American Society of Health-System Pharmacists
survey, 61% indicated they are "very concerned" about
being given the wrong medicine (61%), receiving multiple
medicines that might interact adversely (58%), and
experiencing complications from a medical procedure
(56%).²

An Agency for Healthcare Research and Quality (AHRQ)
report indicates that most people believe that medical
errors result from failures of individual providers. Seventy-
five percent of respondents to a survey on medical errors
respondents felt effective resolution could be achieved by
preventing professionals with bad track records from
providing care; 69% thought better training of health
professionals was necessary. Five years following the IOM
report the Kaiser Family Foundation conducted as survey
which indicated the concern of the US public has not
changed. Of those responding, 48% indicated that they are
concerned about the safety of medical care they or their
loved ones receive and 55% rate the quality of healthcare in
this country as unsatisfactory.⁵

What are the errors?
Most of us think of medical error in terms of medication
mistakes or mishaps in surgery. Indeed, the 1999 IOM report
estimated that medication errors alone led to as many as
7,000 deaths annually. Findings from a 2003 study published
in JAMA documented 32,000, mostly surgery-related, deaths
costing $9 billion and accounting for 2.4 million extra days in
the hospital during 2000.¹ However, many types of medical
errors exist. They penetrate every process and system and
affect every healthcare professional. Medical errors
threaten every healthcare consumer and can occur even
with the most routine task.

Categorizing types of medical error can be accomplished by
using several frameworks. Some methods might look at legal
definitions while others might consider severity of injuries or
types of healthcare services, settings, or providers. Leape
categorized medical errors as diagnostic, treatment,
preventative and other.⁶ These categories are still widely
used but others could also apply.

**Diagnostic oriented** – Mistakes within this category include
inaccurate or delayed diagnosis, failure to employ
appropriate tests, use of outmoded tests or therapies, and
failure to act on the results of monitoring or testing.
According to the 1999 IOM report, diagnostic error is the
major factor contributing to costly delays in treatment.¹

An example would be the failure to diagnose breast cancer.
According to the CDC,⁷ “aside from non-melanoma skin
cancer, breast cancer is the most common form of cancer in
women.” Despite this fact, delayed follow-up by
practitioners still exists when women complain of a mass.⁸
The Physician Insurers Association of America (PIAA) did a
series of studies on breast cancer claims. It was revealed
that the younger women (40-49 years) had the highest rate
of misdiagnosis error.⁹ Factors for the error were attributed
to misinterpretation of mammography, inadequate medical
record documentation, failures that occurred in office
systems, and the all inclusive communication failures.

Currently, the Board of Medicine in Florida identifies the 5
most misdiagnosed conditions as: cancer, cardiac, acute
abdomen, timely diagnosis of surgical complications, and
failing to identify pregnancy or stage of pregnancy before
treatment or surgery.¹⁰

**Treatment oriented** – Mistakes within this category include
error in the performance of an operation, procedure, or test;
error in administering the treatment; error in the dose or
method of using a drug; avoidable delay in treatment or in
responding to an abnormal test; inappropriate or not
indicated care. Surgical errors comprise a high percentage of
these errors.

A post-operative patient with slow, insidious bleeding at the
surgical site that goes untreated as the monitoring is
interpreted as “insignificant” might be considered treatment
oriented. An example of a treatment oriented error could
also be those associated with acute myocardial infarction
(MI). A delay in treatment that originates from admission
delays can be labeled as this type of error. A
misinterpretation of an ECG (diagnostic related) can lead to
failure in treatment as some infarctions may be missed.¹¹
Nationally, up to 40,000 acute Mls are missed each year.¹²

**Performance oriented** – Error of this type refer to those that
occur while “performing” a wrong procedure or treatment.
A primary example of this would be “wrong site surgery”.
System breakdowns occur allowing the patient to be
vulnerable to “the system” that can be busy, confusing, with
numerous distractions or levels of possible failure.

**Medication oriented** – These are errors that arise
specifically from prescribing, dispensing, administering, or
monitoring patient medications. A patient that is prescribed
a drug that is specifically contraindicated due to a pre-
existant condition or allergy can be considered a medication
oriented error.

**Preventative** – Errors within this category include failure to
provide preventative treatment, or inadequate monitoring
or follow-up of treatment. These are the kinds of errors that
occur when information “gets lost in the system” or
someone “falls through the cracks”. These types of error tend to occur whenever there is a high volume workload. In the fast paced emergency department, the patient that is discharged for follow-up with a general practitioner could fall under this type of error if they are not provided appropriate access for that evaluative care.

Other – Errors within this category include failures in communications, equipment function, and other types of system failure. Even when these failures do not directly cause medical error, they are often linked to the circumstances surrounding error.

Healthcare professionals will acknowledge the above categories, but may have difficulty applying these concepts to their own practice setting. Unique circumstances and workplace scenarios contributing to error are embedded into each professional discipline’s activities. Many will recognize some of these common examples.

Physicians, physician assistants and nurse practitioners report that the potential for diagnostic or treatment error is present during virtually every patient encounter. Patients can be poor historians, records may be incomplete, and relevant information may be missed, omitted, misinterpreted, or discounted. Cost and time constraints also contribute to preventable error, and any combination of factors can set the stage for adopting a “most likely” diagnosis, prescribing the “usually works” treatment plan, or failing to pursue routine screening guidelines.

Clinical laboratory professionals explain that the potential for diagnostic error is always present while collecting, labeling and processing specimens. Equipment failure and miscommunications are also common contributors to error. Clinical laboratory professionals typically work in fast paced, high volume environments that will quickly fail if patient and specimen identification is inaccurate or incomplete.

Nurses indicate that the potential for diagnostic and treatment error most frequently involves one of two scenarios: 1) inadequate or inaccurate assessments, and 2) problematic medication administration. Because nurses monitor their patients’ responses to illness and treatment, ongoing assessments with timely communication of findings become critical to patient safety. Nurses also devote much of their time to medication administration and multiple medications set the stage for potential error.

Psychologists, Clinical social workers, mental health therapists and marriage and family therapists reveal that their potential for treatment error essentially revolves around the limited resources for behavioral health and the unpredictability of clients in crisis. Most community healthcare systems are simply unable to accommodate everyone’s mental health needs – and so the required prioritization of available resources inevitably leads to error when violent, homicidal or suicidal tendencies are missed.

Physical therapists suggest that their potential for error is primarily related to unrecognized medical instability. Recommended or standard treatments may be contraindicated for those with unresolved cardiopulmonary problems, but a therapist relies on documentation to recognize these circumstances. Failed communications become primary contributors to error. The majority of events involving fainting, “falling out”, respiratory distress or cardiac arrest develop when underlying medical problems are unknown, unresolved, or not adequately appreciated.

Pharmacists and pharmacy technicians report that medication errors may be viewed as an infraction of one of the “five rights”: right patient, right drug, right dose, right route and right time. The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) 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.” It is important to note that this definition encompasses “near misses”, a feature that can help identify processes and events before they affect an actual patient. A “near miss” is defined as an event that could have resulted in an accident, injury or illness, but did not, either by chance or through timely intervention.

Depending on work setting, various personnel other than pharmacists are involved with the handling of medications. Technicians and support personnel can be involved in one or more of the various activities associated with medication use such as ordering, storage, packaging, labeling, delivery, administration and even monitoring.

All of the above examples have been reported by healthcare professionals responding to our invitation to comment on their own experiences with medical error.

Why do they occur?

“Human” Error

Have you ever made a mistake? It happens, despite attempts to carefully “double-check” or review what has been done. Collectively, healthcare professionals all share a genuine desire to avoid error. Yet health professionals, being human, make mistakes. These mistakes occur despite how much we care, how hard we work, and how much we know. Consequently, systems that rely solely on error-free performance by humans are likely to fail.
Reasons why people make errors have been studied for many years. While there is no single answer, it is generally recognized that no one intentionally makes a mistake. However, it is generally agreed that humans tend to perform best when they stay focused and alert, concentrating on the required tasks or decisions. Anything that decreases one’s attention or creates a distraction will predictably increase the chance of error. Typical distractions come from physiological, psychological, or environmental sources.

- **Physiological factors** include fatigue, illness, loss of sleep, alcohol, and drugs.

- **Psychological factors** include various emotional states and distraction from other activities. These can be triggered by external factors such as overwork, interpersonal relations, or other forms of stress.

- **Environmental factors** such as temperature, noise level, lighting, and visual activity can also cause distraction.

**“Invisibility” of Error**

Have you ever been advised to “forget” an error or keep error-related information “quiet”? Medical errors are often surrounded by secrecy and shame allowing others to remain unaware of their existence. Embarrassment, fear of retribution and the potential of career-ending litigation keep many from revealing their mistakes. When errors are silenced and covered they also remain undocumented and unreported, and this keeps them “invisible”. A perceived lack of time also keeps many from reporting error. Comprehensive reporting requires added time that is simply not available and doing so may result in a missed lunch break, added time at the end of a busy shift, or an unwelcome shifting of priorities. This relative “invisibility” of error is dangerous because it prevents us from recognizing what went wrong and it keeps us from working towards resolution or improving conditions to prevent recurrence. “Invisible” errors also have a high probability of being repeated, and are likely to trigger a cascade of additional mistakes and inaccuracies that only compound the original error.

The “invisibility” of error also leads to a generalized under-appreciation of its incidence and encourages a diluted perception of the medical error problem. No one wants to talk openly about iatrogenic mistakes; therefore, errors outside the scope of personal involvement are rarely noted. Limited access to the aggregate data on medical error is unnecessarily protective and blunts our comprehension of “the bigger picture”. This silent accumulation of error keeps us from fully appreciating its larger impact and even larger solution. Consider the unrelated example of a disaster involving an aircraft that immediately claims the lives of 200 persons. This one disaster is so visible it will elicit a more emphatic impact than the nearly invisible 200 deaths attributable to medical error. Because our knowledge of isolated errors and “near misses” accumulates over time and occurs over a large geographical area, we tend to respond more passively than we do when there is a single publicized disaster.

**“System” Error**

Whenever error does occur, have you ever been asked to isolate a human “cause” and then assign blame? This kind of response is common, yet extensive analyses reveal that most errors occur as a result of “a chain of events set in motion by faulty system design that either induces errors or makes them difficult to detect.” In other words, mistakes usually happen with system contribution - not just because of the people! Focusing on the unfortunate individual closest to the mistake does not address the system flaws or the complex organizational processes that allowed the error in the first place. In fact, neglecting system-wide influences sets the stage for repetition.

Charles Perrow, in his analysis of the Three Mile Island nuclear accident, elaborated on how systems can cause or prevent accidents. He characterized organizations and systems according to their complexity and whether they are coupled loosely or tightly.

**Complex systems** have multiple components that interact in a variety of unexpected and invisible ways, setting the stage for mistakes and accidents. Our current healthcare system qualifies as a complex system. The combination of system variability, professional specialization, continually evolving technology and layered governmental regulation produces a complexity that is often difficult to navigate.

**Coupling** refers to the slack or buffer between steps in a process. Tightly coupled systems have more time-dependent processes and sequences; they accommodate less flexibility in how things can be accomplished. Tight coupling characterizes most of the quick paced events in healthcare. Here activities may happen so quickly that detection of error and intervention may be difficult.

Recognizing that our healthcare systems are both complex and tightly coupled suggests that we should focus attention on organizational infrastructure and system re-design when addressing medical error.

**How do we respond?**

After categorizing and analyzing the multiple dimensions of medical error, it has become apparent that no single solution can be universally effective. Still, a unified approach to evaluation and response can guide appropriate action.

**How should we begin?**

Should we focus on the individual? Traditional responses focusing on individual error have relied upon “naming,
These errors are most often attributed to human error and identified and a more effective response to error. Identifying human failure.
safeguards and redundancies to protect against inevitable and oriented strategies, proactive system and not just the individual.
to error prevention an allow for wide variations a situations continually arise?
How effective are these reactionary “band aids” when new situations continually arise? Restrictive guidelines can never address every potential problem and broad-based policies allow for wide variations in interpretation. Instead, the Quality Interagency Coordination Task Force (QuIC) suggests system-wide solutions such as allocating adequate resources to error prevention and nurturing solutions that foster professional responsibility and accountability.

Ultimately, we must focus appropriate attention on the system and not just the individual. Once we appreciate that error reduction and performance improvement requires proactive system-wide changes rather than reactive person-oriented strategies, we can begin to embrace what is now called a “culture of safety”. We must begin to appreciate the importance of developing a non-punitive workplace culture and promote a healthcare system with built in checks, safeguards and redundancies to protect against inevitable human failure. Initial steps in this process include differentiating error types and identifying those “pre-conditions” that are most likely to contribute towards error.

Identifying Active vs. Latent Error
Differentiating between active and latent errors helps guide a more effective response to error. Active errors are easily identified and occur at the level of the frontline worker. These errors are most often attributed to human error and their effects are felt almost immediately. Common active errors include administering the wrong medication or documenting on the wrong medical record. Latent errors tend to be removed from the direct control of the worker. These errors are less obvious, occur “behind the scenes”, and often remain undetected unless someone is actively investigating all the factors contributing to an active error. Typical latent errors are attributed to faulty systems and include things such as poor design, incorrect installation, faulty maintenance, bad management decisions, and poorly structured organizations.

Latent errors and active errors are inevitably linked, supporting the assumption that no one sets out to intentionally make an error. A less threatening response to any active error involves focusing on the contributory latent errors. The following examples use different groups of healthcare professionals to illuminate some of the connections between active and latent error.

Among physicians, physician assistants and nurse practitioners, well-publicized examples of active error incidents involve wrong site surgery. Wrong site surgeries are most common among orthopedic procedures and associated risk factors include multiple surgeons involved in the case, multiple procedures performed during a single operating room visit, and unusual time pressures. Wrong site surgery represents the kind of mistake that provokes outrage, assigns blame to the operating surgeon, and results in costly litigation. Yet several latent errors contribute to the end result. For example, all operating room staff as well as the patient themselves have a role in verifying the correct surgical site. The patient’s initial interview and verification in pre-op, surgical prep and draping of the wrong extremity, repeated failure to correctly verify the affected extremity, and inaccurate or inadequate preoperative documentation are all system errors that contribute to wrong site surgery.

Among clinical laboratory professionals, an active error might involve the conscious decision to override scheduled, routine calibration checks. Routine calibration checks are required to assure test result accuracy, yet busy clinical laboratory workers may repeatedly prioritize the high volume of specimens over the performance of scheduled calibration checks on equipment. The latent errors in this example might include the timing of scheduled calibration checks, a lack of duplicate/back-up instruments, or instrument programming that allow over-ride functions.

A nursing example of an active error is the erroneously free-flowing IV caused by incorrect loading of tubing into an infusion pump. When the free flow of fluid overloads the system or delivers toxic amounts of medication, the outcome can be particularly dangerous to the patient. The latent errors in this example might include the pump design that allowed the improper loading of the tubing, or the
absence of technology that could prevent free-flow from occurring.

Among psychologists, clinical social workers, mental health therapists and marriage and family therapists, a common example of an active error is the failure to adequately communicate a worsening symptom that could compromise safety. Counselors and therapists rely on communication alerts when suicidal and/or homicidal ideation is expressed, and discounting these indicators can endanger the lives of others. The latent errors in this example could include delays in transcription or inadequacies in procedure for communicating messages.

A physical therapist example of an active error is the inappropriate choice of minimal documentation to describe a client’s response to therapy. Detailed communication of any untoward client response is absolutely vital to successful rehabilitation; failure to adequately document client response sets the stage for potential harm during subsequent therapeutic sessions. The latent errors in this example might include time constraints because of a busy schedule, or documentation forms that discourage added therapy comments.

Among pharmacists and pharmacy technicians, an example of an active error is the inaccurate filling of a medication order by dispensing a wrong medication or an incorrect dose. Pharmacists report that they carefully check filled prescriptions to avoid these types of error and yet they still occur. The latent errors contributing to this example might include drugs that look or sound alike, or a written prescription that is difficult to decipher.

Identifying Pre-Conditions

Another effective response to error involves identifying those factors or influences that “set the stage” for error. These pre-conditions could be the “root causes” of error or they might serve as stimuli that foster or encourage error. Once these pre-conditions are recognized and their links to error identified, specific remedies can be implemented. In a study examining preventable adverse events in a primary care outpatient setting, pre-conditions to error came from four distinct sources. Each source category was then labeled and described.

Clinician factors, those pre-conditions directly attributable to the healthcare professional, include individual errors in judgment, procedural skills errors, failure to recognize signs/symptoms, forgetfulness, and execution related errors (“stupid mistakes”). Unfortunately, healthcare professionals in any setting will recognize these person-oriented contributions to medical error. Anticipated responses most appropriately focus on the individual, but every analysis should also look for system-wide problems that encourage human failures or fail to detect/prevent human error.

Communication factors contributing to error include failure to understand, cultural and language difficulties, conflicting information, and delayed exchange of information. Since accurate and timely communication is essential within any healthcare organization, it is easy to understand how these pre-conditions influence and encourage medical error. When communication-oriented errors are identified, a diverse team representing all levels of personnel may be needed to adequately develop an improved communication process.

Administrative factors contributing to error include a large number of system-wide problems that may or may not have already been known. Rushed personnel, missing charts and broken or unavailable equipment were most often identified in the study focusing on a family practice clinic. In other practice settings, administrative contributions to error might include scarce supplies, unresponsive management or unscheduled computer downtime. Think about how often a worker identifies a situation as “a mistake waiting to happen”, and then consider how and when the situation was remedied. Appropriate responses to these identified contributions will typically involve both short term and long term action plans in an attempt to limit their influence on error.

Blunt end factors contributing to error include those influences that are outside the affected system’s span of control. Examples might include physical size and location of the healthcare setting, or corporate level decisions affecting an individual facility or organization. An unusual example might include the occurrence of any community-wide disaster that limits access to usual resources, such as hurricane or flood. For many healthcare systems, it is the complexity of multi-layered interactions with outside insurance and government agencies that contribute to error. When identified contributions to error are external to the affected healthcare system, necessary internal adaptations are advised.

What is being done?

Actions to define and correct medication errors existed prior to the IOM report. In 1995, the United States Pharmacopoeia (USP) advocated the formation of the National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP), an independent body comprised of 25 national and international organizations, to address medication error reporting and prevention. The 1998 report of the President’s Advisory Commission on Consumer Protection and Quality in the Healthcare Industry identified medical errors as one of the four major challenges facing the nation to improve healthcare quality. As recommended by this report, the Quality Interagency Coordination Task Force (QuIC) was established to coordinate quality activities in federal healthcare programs, the largest purchaser and provider of
healthcare services in the country. The QuIC includes the Departments of Health and Human Services, Labor, Veterans Affairs, Commerce, and Defense; the Coast Guard; the Bureau of Prisons; the Office of Management and Budget; the Federal Trade Commission; and the Office of Personnel Management. The QuIC is charged with coordinating the overall federal response to the IOM’s report on medical errors.

Federal government activities extended to the private sector with President Clinton’s December 1999 memorandum requiring the more than 300 private health plans participating in the Federal Employee Health Benefits program to institute patient safety initiatives. Additionally, federal agencies administering health plans were to evaluate and, where feasible, implement the latest error reduction techniques.23

Health providers are experiencing greater scrutiny and demand for safety improvement by the many oversight organizations, group purchasers, and professional groups. This responds to one of the recommendations by the IOM in its To Err Is Human report as a means to increase external pressure on providers to improve patient safety.1

Government officials at the state level are also interested. Twenty states require some form of medical error reporting. As an example, Florida requires reporting of mistakes that lead to serious patient injuries, such as life-threatening situations and epidemic outbreaks. Another class of reports involves serious adverse events, such as wrongful deaths, brain injuries, wrong limb removals, and incorrect surgeries.24 Additionally, the 2000 Florida Legislature created the Commission on Excellence in Healthcare to facilitate the development of a comprehensive statewide strategy for improving healthcare delivery systems through meaningful reporting standards, data collection and review, and quality measurement. As a further demonstration of their intent to advance this process, legislation (456.013) was passed in 2001 requiring 2 hours of continuing education study on medical errors by all healthcare professionals to qualify for initial Florida licensure and biennial renewal.

1999 IOM Recommendations

The 1999 IOM recommendations for initiating the move to improve patient safety addressed the following four general areas:

- create a national center to oversee and direct medical safety efforts
- mandatory and voluntary error reporting
- safety performance standards for healthcare professionals
- safe practices at the delivery level

Currently, the Center for Quality Improvement and Patient Safety (CQuIPS) is the primary group within the Agency for Healthcare Research and Quality (AHRQ) serving as a sustainable national driving force for patient safety. The Center is charged with conducting and supporting research on patient safety and healthcare quality issues, developing and disseminating reports and information, and collaborating with stakeholders to implement evidence-based practice.25 The call, initiated by the 1999 IOM recommendations and continued today, was for current knowledge on how to prevent errors to be identified and acted upon, and efforts to improve our understanding and develop other solutions to be intensified.

The expectation of increased reporting is to identify errors and learn from them. This sounds simple, but in reality it is a complex and highly emotional subject that continues to be the focus of significant discussion. Because of reporting deficiencies we probably don’t have an accurate grasp of the magnitude of the problem of patient safety. Nevertheless, for some errors we do know about we have failed to consistently bring about an effective resolution because of the way we evaluate and react to them. Through its recommendations the committee attempted to create an environment that encourages error identification, evaluation of their causes, and, finally, action to prevent future occurrences. To accomplish this task a national standardized method of reporting certain errors is to be mandated, and related information (type of errors, analysis, and resolution) is to be shared with the states. The IOM has provided a report describing a detailed plan to facilitate the development of data standards applicable to the collection, coding, and classification of patient safety information.26 It has also recommended legislation to protect peer review data related to patient safety and quality improvement. With less serious situations it advocates control of legal discoverability to make the environment more conducive for organizations to identify, analyze, and report errors.

Early IOM recommendations included establishing performance standards and safety expectations for healthcare organizations and professionals. Many groups, including regulators, accreditors, public and private purchasers, and professional societies were solicited to encourage this. Perhaps the most obvious response to this recommendation for many of us, are activities within our specific organizations to comply with safety related Joint Commission (JC) standards.

In an attempt to extend the emphasis on safety to the delivery level, IOM recommendations called for implementation of specific programs in healthcare organizations and specified clearly defined executive responsibility. To health professionals, particularly those affiliated with hospitals, this recommendation is the most apparent because it spells out comprehensive safety related activities for organizations and the professionals affiliated with them. Its requirements include patient safety programs, non-punitive systems for reporting and analyzing
errors, incorporation of well-understood safety principles, and the establishment of interdisciplinary team training programs for providers utilizing proven methods. Additionally, it states that healthcare organizations should implement proven medication safety practices. The JC has adopted standards that mirror these requirements. These, coupled with the Commission’s Sentinel Event Policy, have stimulated patient safety activity within healthcare organizations so as not to jeopardize their accreditation.

In 2003, the IOM was mandated by Congress to “carry out a comprehensive study of drug safety and quality issues in order to provide a blueprint for system-wide change.” Project meetings were conducted in 2005 and 2006, all culminating in the 2007 publication titled “Preventing Medical Errors: Quality Chasm Series”. The publication identified six (6) aims for improvement in healthcare. They are:

- **Safety**: avoiding injuries to patients from care designed to help them,
- **Efficacy**: providing evidence-based services to all who could benefit, and refraining from providing services to those unlikely to benefit (avoiding underuse and overuse).
- **Patient centered**: providing care that is respectful of and responsive to individual patient preferences, needs and values and ensuring that patient values guide clinical decisions.
- **Timely**: reducing waits and sometimes harmful delays for both those who receive and give care
- **Efficiency**: avoiding waste, such as waste of equipment, supplies, ideas and energy
- **Equitable**: providing uniform care regardless of personal characteristics such as gender, ethnicity, geographic location, and socioeconomic status

**What can you do?**

There is no single or best way to prevent medical error and improve patient safety, but it clearly becomes each healthcare professional’s responsibility to actively work towards error reduction and error prevention. Major emphasis at the individual level relies on 1) willing participation in comprehensive and timely reporting of error, 2) collaborative analysis of individual and system practices designed to reduce error, 3) routine recognition of error prone situations and 4) voluntary adoption of recommended practice changes designed to minimize error. When each healthcare professional fully participates in these activities, the ultimate goal of improved patient safety can be realized.

**Reporting**

Each healthcare professional can substantially contribute to error reduction by consistently identifying and reporting actual errors, “near misses”, and flawed systems that can contribute to error. Reports can be submitted within an organization (internal) or to an outside agency (external) using either mandatory or voluntary reporting strategies. Mandatory reporting typically focuses on serious faults in performance, promotes provider accountability, and addresses public issues of safety and the public’s “right to know” by disclosing serious inadequacies. Voluntary reporting is generally done in response to errors that result in minor or no injury, and the information generated is used to alter processes and systems to improve safety.

Voluntary reporting is one of the largest safety related functions that delivery-level health professionals will encounter. It is the initial step in learning from past mistakes, and is vital to identifying system designs that can contribute to error. As previously mentioned, system problems that contribute to error are particularly harmful because they are difficult to recognize, and because they can combine with a multitude of events to cause more errors.

As a delivery-level health professional, ask yourself the following questions:

- Do you feel your organization’s error rate (medication variance, etc.) is accurate?
- When you discover an error, do you document all, some, or only those errors a supervisor tells you to report?
- When you identify and report an error do you feel it will result in: a) an improvement to a system or process that will make the error less likely to be repeated, or b) someone getting into trouble?

Usual answers to these questions quickly identify the common barriers to reporting. We tend to “name, blame and shame”, and are often irregular about preparing reports. Authorities are aware of these obstacles. They acknowledge that our current “culture of blame” needs to be replaced by a “culture of safety”; they recognize that reporting needs to be non-punitive; they agree that documentation needs to be more streamlined. Working towards these goals will take time, yet many caution that more exhaustive reporting at the delivery-level will be required until there is a complete understanding of error.

**Error Analysis**

Practicing healthcare professionals need to actively participate in error analysis because one of the most effective ways to learn from past mistakes is to analyze all its contributing factors. Contributing factors may arise from faulty communication, other factors may come from the person, the system, or influences outside the system. The importance of analyzing all the contributing factors is underscored by the The JC’s mandate for organizations to complete a thorough and credible root cause analysis (RCA) whenever a sentinel event occurs and whenever a “critical effect” is identified. Critical effects are defined as possible serious effects on the patient from failure or undesirable variation in a process. Critical effects are usually identified
when conducting the Failure Mode and Effects Analysis (FMEA) process.

Root Cause Analysis: Healthcare professionals routinely conduct intensive analyses of physical disease by exploring the condition at a cellular and/or chemical level to understand the root cause of the condition. Similarly, the RCA process allows us to explore and understand the reasons contributing to medical error. Through this “cellular level” scrutiny, system and practice modifications are made so that reoccurrence can be prevented. It is based on the premise and philosophy of the National Patient Safety Foundation that most errors result from faulty systems rather than human error and that people are in essence set up by them to make errors for which they are not fully responsible. Using RCA, events are dissected to discover: (1) the main reason an accident occurs (its proximate cause); (2) systematic problems that might lead to other mistakes (common causes); (3) contributors that could not have been foreseen or prevented (special causes); and (4) areas where the accident could have been avoided had things been done differently (risk points).

Most Common Root Causes of Medical Error: The Agency for Healthcare Quality and Research recently categorized findings from multiple root cause analysis findings. They identified a diverse group of factors that cause medical error, and then developed the following categories: communication problems, inadequate flow of information, human problems, patient-related issues, organizational transfer of knowledge, staffing patterns or work flow, technical failures, and inadequate policies and procedures.

1. Communication problems, the most common cause of medical errors, results in many different types of errors and involve all members of a healthcare team. These failures include both verbal and written communication amongst the many users of health related information and involve all types of medical information including physician orders, prescriptions, and laboratory results. These may exist between individuals in different agencies, facilities, departments or disciplines and can involve illegible, unintelligible, misspoken, misunderstood, lost, incomplete, or other failed communication.

2. Inadequate information flow problems are those that prevent critical information from being available when prescribing decisions are made; delay or diminish reliability of critical test results; or fail to coordinate medication orders at points of interface or transfer of care.

3. Human problems relate to how standards of care, policies, or procedures are followed. Examples include failure in following policies, guidelines, protocols, and processes. Such failures also include sub-optimal documentation and inadequate labeling of specimens. These human problems may be a related to lack of knowledge, but they are more often related to distraction and just “not thinking”.

4. Patient-related issues can include improper patient identification, incomplete patient assessment, failure to obtain consent, and inadequate patient education. While patient related issues are listed as a separate cause by some reporting systems, they are often nested within other human and organizational failures of the system.

5. Organizational transfer of knowledge can include deficiencies in orientation, education, or training for those providing care. This is of particular concern in areas where new employees or temporary help is often used and in academic medical centers where physicians in training often rotate through numerous centers of care.

6. Staffing patterns/work flow can cause errors when work conditions become stressful due to insufficient staffing, high patient acuity, excessive volume, or when supervision is inadequate.

7. Technical failures include device/equipment failure and complications or failures of implants or grafts. These events can cause great harm to patients. Instructions may be difficult to understand or even missing; device design may be poor. Frequently the fault of the device or equipment is not obvious, with blame focused on the operator, until a more thorough evaluation, such as RCA, is undertaken.

8. Inadequate policies and procedures guiding the delivery of care can contribute to many medical errors when they are poorly designed, inadequate or adhered to variably.

RCA has been used successfully for over twenty years in other settings, such as the nuclear and aviation industries. Justification to this labor-intensive process is improved outcomes and the avoidance of costly (and deadly) mistakes. Difficulties encountered when applying RCA to healthcare include inadequate staff, insufficient time, fear of retribution, and stopping the analysis too soon. Both people and time are scarce in contemporary healthcare settings, and everyone shares a wariness of discussing and documenting mistakes because they fear possible legal action. The JC sentinel event policy has been described as a “lawsuit kit for attorneys”. The JC offers advice on how to minimize discoverability of these activities but admits that none are foolproof. Legislative protection has been suggested and recommended by the IOM but is currently not a reality. One method for avoiding or diminishing the fear of retribution is a thorough evaluation of near misses, errors that have the potential to cause patient harm, or errors that have occurred outside of one’s organization.

Failure Mode and Effects Analysis (FMEA): This bottom-up analysis is used in an organization’s ongoing, proactive program to identify risks to patients’ safety and reduce error. It is different from the RCA process because instead of focusing on what went wrong, the FMEA process focuses on what could go wrong. The FMEA process is outlined as follows:
1. A team examines a process in detail, identifying all the "functions" that are supposed to occur.
2. The team then identifies the ways in which those functions might go awry, i.e., the "failure modes."
3. Next, the consequences ("effects") of each failure mode are identified
4. Then the underlying causes ("contributory factors") are elucidated. Sometimes an RCA is required for this.
5. Each effect is rated in terms of its severity, and,
6. Each contributory factor and/or failure mode is rated in terms of its frequency or likelihood of occurrence.
7. Any existing "controls" (detection systems, mitigation systems, etc.) are then identified, and their impact is assessed, again via ratings.
8. The three foregoing ratings yield criticality and/or other values from which the team decides which contributory for failure modes are the most critical for improvement efforts. Typically the team utilizes Pareto methodology to identify the classic 20% of "issues" that cause 80% of the process variability. This 20% can be considered to represent "significant risk" issues, e.g., the issues most important to address via improvement actions.
9. It identifies courses of actions and establishes how those actions will be assessed for impact upon the process under analysis.

FMEA is meant to be proactive so that processes, system designs, and performance can be analyzed using a sequential review process before error occurs. For example, FMEA can be used to analyze the error potential of a new drug being considered for formulary addition in the pharmacy. Does the drug under consideration have ambiguous or difficult to read labeling? Is the packaging potentially error-prone? Do product names have sound-alike or look-alike problems? Could there be any dosing confusion? Is there any special patient monitoring needs? How will the drug appear on a computer screen while performing varied processing functions?

**Recognizing Potential Error**

Individual healthcare professionals are advised to recognize error prone populations and error prone situations. Continuously evaluating risk and probability of error heightens awareness and reduces overall occurrence of medical error.

1. **Vulnerable populations:** When asked, most healthcare professionals immediately identify the very old and the very young as being particularly vulnerable to error. Individuals at these extreme ends of the age continuum are not as physically stable, their bodies are more significantly impacted by concomitant medical conditions, they metabolize their medications differently than the general adult population, and they often use alternative forms of communication to alert clinicians about impending problems.

Additionally, each profession has defined unique sub-populations that are particularly prone to error.

- **Clinical laboratory professionals** focus much of their attention on obtaining adequate specimens for subsequent analysis. They indicate that their most problematic patients are subject to collection errors. These patients include the very obese, the very frail, those who are immune-compromised, and anyone who is in an emergently unstable life-threatened situation.

- **Retail pharmacists** have identified tourists (those having no available drug profile) and patients with multiple (and sometimes conflicting) drug files as those who are more likely to be involved with a pharmaceutical error. Pharmacists and pharmacy technicians also report a higher potential of error when working with anyone who cannot adequately communicate because of illiteracy or language barrier (cannot communicate in English) because it becomes difficult to verify and clarify relevant information.

- **Psychologists, clinical social workers, mental health therapists and marriage and family therapists** explain that their suicidal, homicidal and psychotic patients are most unpredictable and thus lead their list of those most vulnerable to errors in assessment and/or treatment. Aggressive or violent individuals pose the greatest threat to overall safety, but errors are also common when individuals conceal relevant information or offer conflicting information. Examples include persons with HIV disease, the chronically mentally ill, gay/lesbian persons, the uninsured and the homeless.

- **Physical therapists** are most concerned about error when working with depressed persons and those with impaired judgment (left sided CVA affecting frontal lobe). These individuals do not always respond appropriately during a therapeutic session, and so a therapist cannot rely on the patient to verify information or correct therapist assumptions. PT professionals also realize that clients receiving oxygen during therapy or those utilizing medicated topical ointments are at a higher risk for the development of untoward reactions.

- **Nurses** consistently indicate that their highest safety risk populations include those who are combative and/or confused, those who are critically ill (and thus subject to hundreds of medical interventions each day), and those who have no desire to survive (patient lacks incentive to participate in care).

2. **Error-prone practice settings.** Healthcare professionals also identify special situations and circumstances that are more likely to contribute to error. Human factors such as stress or fatigue can interfere with cognition. System inadequacies such as insufficient staffing, computer
downtime or other technology failure can inject variability into “routine” processes or diminish anticipated capabilities. These and similar situations should clearly signal potential for mistakes and alert practitioners to take special measures. These might include seeking a second opinion from a co-worker, avoiding fatigue by delegating tasks, prioritizing activities, or utilizing additional reference materials.

Of interest, healthcare professionals working in different practice settings all identify additional, unique practice situations that pose the highest risk for error.

- **Physicians** comment that their highest potential for error arises whenever they are asked to emergently consult an unstable patient, primarily because “everyone” is expecting the impossible: a quick response offering definitive treatment that will immediately resolve a complex medical situation.

- **Clinical laboratory professionals** report that the majority of their errors involve situations with improper or inadequate patient identification.

- **Nurses** report that most of their high risk situations are related to inadequate staffing and emergent patient circumstances, but they consistently identify medication administration errors as a primary situational risk, particularly among those with multiple medications.

- **Psychologists, Clinical social workers, mental health therapists and marriage and family therapists** explain that their potential for error is highest when they are asked to strategize a minimal solution that has few or any backup contingencies. Regarding personal safety, they are most concerned when practicing alone during evening or “off” hours because they are dealing with unstable patients and/or unstable family members.

- **Physical therapists** report that the highest risk situations involve patients with underlying conditions that are undetected, and patients receiving pharmacologic products that can precipitate untoward responses (hypotension, vertigo, nausea, impaired judgment).

- **Pharmacy personnel** indicate that some of their riskiest situations occur when there are computer failures, because they rely so heavily on computerized patient profiling and the automated identification of potential drug interactions.

  In addition, pharmacy personnel have identified the following contributing causes of medication errors independent of setting include:

  - Telephone interruptions
  - General interruptions
  - Prescriber’s handwriting
  - Look alike/sound alike drug names
  - Prescription volume
  - Fatigue

- Verbal orders
- Product labeling and packaging
- Abbreviations

**Recommendations for Change**

*Individual healthcare professionals are asked to embrace the recommended practice changes* that are designed to minimize error and enhance patient safety. America’s nationally based safety initiatives are evidence driven, using both voluntary and mandatory reporting data that were collected by centralized agencies like the JC, the National Patient Safety Foundation (NPSF), the U.S. Pharmacopeia (USP) and AHRQ. Recommendations may not always seem necessary to every healthcare professional, but these reflect a genuine desire to change practices that have been repeatedly implicated in medical error. Primary opportunities for patient safety are identified within the broad categories of medication administration, patient practice, technology applications, and education (both professional and consumer).

**1. Medication-related safety**: Safety initiatives pertaining to medication errors are widespread because 1) medications are extensively utilized in healthcare and 2) the complexity of several interacting professions and systems offer substantial opportunities for error.

Numerous contributors to medication-related error have been identified. Distractions and workload increases are consistently mentioned whenever individual error is identified, but many system-wide factors are also named. These include prescriptions and drug orders with poor handwriting, medications involving similar drug names, use of abbreviations, patient and/or healthcare professional misinterpretation of labeling, dosage miscalculations, lack of knowledge or skill, and incorrect administration practices.  

The Institute of Safe Medication Practices (ISMP) and the JC both warn against using dangerous dose designations, “stemmed names”, apothecary or mathematical symbols, and other abbreviations because of the high potential for error. ISMP published a listing of error-prone abbreviations, symbols, and dose designations in their biweekly newsletter *Medication Safety ALERT!*, and a few of the most problematic abbreviations and expressions are listed in Table 1, along with the suggested more appropriate substitution. The complete listing published by ISMP can be found on the ISMP website at [http://www.ismp.org/tools/errorproneabbreviations.pdf](http://www.ismp.org/tools/errorproneabbreviations.pdf). Healthcare professionals of all disciplines are impacted by these recommendations, most particularly within the disciplines of pharmacy, medicine and nursing.

Clinicians working with medications are particularly advised to recognize “high alert medications”, the small number of medications that have a high risk of injury when misused. Medications are placed on this list not because of the high number of errors, but because of their serious consequences.
when not properly used. High alert medications include adrenergic agents, chemotherapy agents, neuromuscular blockers, IV heparin and warfarin, lidocaine, concentrated electrolyte injections, opiates and insulin.

The National Coordinating Council on Medication Error Reporting and Prevention defines a medication error as any preventable event which 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. This definition implies that patients and consumers also play a role in promoting medication safety.

In 1999, the National Patient Safety Partnership (NPSP), a coalition of healthcare organizations, released a list of the 16 best practices in medication safety that all focused on encouraging patients and family members to participate in error prevention. Since then, nationally based agencies have continued to build public awareness and promote education on how each consumer can prevent medication errors.

Most of NPSP’s 16 best practices in medication safety are currently integrated into standard clinical practice, but they are listed because they illustrate the content driving added policy and procedural recommendations on medication safety.

Patients and family members are encouraged to participate in their own safety. Best practice will inform and educate consumers about their role in preventing medication-related error:

- Tell physicians about all the medications they are taking and their responses/reactions to them.
- Ask for information in terms they understand before accepting medications. This information includes but is not limited to the following:
  - Is this the drug my doctor (or other prescriber) ordered?
  - What is the trade and generic name 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 the other over-the-counter and/or prescription medications or dietary supplements that I am already taking? What food,

<table>
<thead>
<tr>
<th>Abbreviation-Dose Expression</th>
<th>Intended Meaning</th>
<th>Misinterpretation</th>
<th>Recommended Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apothecary symbols</td>
<td>dram minim</td>
<td>Misunderstood or misread (symbol for dram misread for “3” and minim misread as “mL”).</td>
<td>Use the metric system.</td>
</tr>
<tr>
<td>AU</td>
<td>aurio uterque (each ear)</td>
<td>Mistaken for OU (oculo uterque—each eye).</td>
<td>Don’t use this abbreviation.</td>
</tr>
<tr>
<td>D/C</td>
<td>discharge discontinue</td>
<td>Premature discontinuation of medications when D/C (intended to mean “discharge”) has been misinterpreted as “discontinued” when followed by a list of drugs.</td>
<td>Write out the words “discharge” and “discontinue.”</td>
</tr>
<tr>
<td>MSO4</td>
<td>morphine sulfate</td>
<td>magnesium sulfate</td>
<td>Write out the word “morphine”</td>
</tr>
<tr>
<td>o.d. or OD</td>
<td>once daily</td>
<td>Misinterpreted as “right eye” (OD—oculus dexter) and administration of oral medications in the eye.</td>
<td>Use “daily.”</td>
</tr>
<tr>
<td>TIW or tiw</td>
<td>three times a week.</td>
<td>Misinterpreted as “three times a day.”</td>
<td>Don’t use this abbreviation.</td>
</tr>
<tr>
<td>qhs</td>
<td>nightly at bedtime</td>
<td>Misread as every hour.</td>
<td>Use “nightly.”</td>
</tr>
<tr>
<td>SC</td>
<td>subcutaneous</td>
<td>Mistaken for SL (sublingual).</td>
<td>Use “subcut.” or write “subcutaneous.”</td>
</tr>
<tr>
<td>U or u</td>
<td>unit</td>
<td>Read as a zero (0) or a four (4), causing a 10-fold overdose or greater (4U seen as “40” or 4u seen as 44”).</td>
<td>“Unit” has no acceptable abbreviation. Use “unit.”</td>
</tr>
<tr>
<td>ss</td>
<td>sliding scale (insulin) or ½ (apothecary)</td>
<td>Misread as 55.</td>
<td>Spell out “sliding scale.” Use “one-half” or use “½.”</td>
</tr>
<tr>
<td>1 mg</td>
<td>Misread as 10 mg if the decimal point is not seen.</td>
<td>Do not use terminal zeros for doses expressed in whole numbers.</td>
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Table 1. Select Dangerous Abbreviations and Dose Expressions

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>No zero before decimal dose</td>
<td>0.5 mg</td>
<td>Misread as 5 mg.</td>
<td>Always use zero before a decimal when the dose is less than a whole unit.</td>
</tr>
</tbody>
</table>
Healthcare providers are encouraged to practice more safely. Best practice will design and implement the organizational processes that will promote medication-related safety:

- Educate patients
- Put allergies and medications on all patient records
- Stress dose adjustment among children and older adults
- Limit access to high hazard drugs
- Use protocols for high hazard drugs
- Computerize drug order entry
- Use pharmacy based IV and drug mixing programs
- Avoid abbreviations to reduce misinterpretation
- Standardize drug packaging, labeling and storage
- Use “unit dose” drug packaging systems (drugs are packaged and labeled in standard patient doses)

Healthcare purchasers are encouraged to provide safer products. Best practice will include the following recommendations:

- Require machine readable labeling (bar coding)
- Buy drugs with prominent display on name, strength, warnings
- Buy “unit of use” packaging (unit dose)
- Buy IV solutions with two sided labeling

2. Patient practice related safety. In 2001, AHRQ and the University of California at San Francisco-Stanford University Evidence-based Practice Center (EPC) evaluated and rated clinical safety practices based on evidence in the literature. Opportunities for improved patient safety were identified and healthcare professionals who accept these recommendations will actively contribute to patient safety and reduced medical error.

- Appropriate prophylaxis for venous thromboembolism in at-risk patients.
- Appropriate use of β-blockers to prevent perioperative morbidity and mortality.
- Maximum sterile barrier use during central intravenous catheter placement to prevent infections.
- Appropriate antibiotic prophylaxis to prevent perioperative infections.
- Having patients recall and restate information given them during the informed consent process.
- Continuous aspiration of subglottic secretions to prevent ventilator-associated pneumonia.
- Pressure ulcer prevention with bedding material that relieves pressure.
- Central line insertion with real-time ultrasound guidance to prevent complications.
- Patient self-management of warfarin for appropriate outpatient anticoagulation and prevention of complications.
- Appropriate nutrition with particular emphasis on early enteral nutrition for critically ill and surgical patients.
- Prevention of catheter-related infections with antibiotic-impregnated central venous catheters.

AHRQ and the EPC also identified and rated some patient safety opportunities that appear promising but require further research. The following rated most highly:

- Improved perioperative glucose control to decrease perioperative infections,
- Localizing specific surgeries and procedures to high volume centers.
- Use of supplemental perioperative oxygen to decrease perioperative infections.
- Changes in nursing staffing to decrease overall hospital morbidity and mortality.
- Use of silver alloy-coated urinary catheters to prevent urinary tract infections.
- Computerized physician order entry with computerized decision support systems to decrease medication errors and adverse events primarily due to the drug ordering process.
- Limitations placed on antibiotic use to prevent hospital acquired infections due to antibiotic-resistant organisms.
- Appropriate use of antibiotic prophylaxis in surgical patients to prevent perioperative infections.
- Appropriate use of prophylaxis to prevent venous thromboembolism in patients at risk.
- Appropriate provision of nutrition, with a particular emphasis on early enteral nutrition in critically ill and post-surgical patients.
- Use of analgesics in the patient with an acutely painful abdomen without compromising diagnostic accuracy.
- Improved handwashing compliance (via education/behavior change; sink technology and placement; or the use of antimicrobial washing substances.

Added opportunities to promote safe clinical practice include the utilization of evidence based clinical protocols, standardization of routine tasks and available equipment, and ongoing efforts to educate staff, patients and their families. Studies have shown that standardization of equipment, guidelines, and protocols have dramatically reduced error rates. For example, errors attributable to anesthesia were reduced from 25-50 per million to 5.4 per million through just such standardization.

3. Technology enhanced safety. The use of advanced technology, computerized applications and sophisticated digitized equipment has grown exponentially over the last decade, impacting healthcare systems along with everything else in our environment. Positive changes include the increased consistency and readability of the computerized medication administration record (MAR) and computerized physician order entry (CPOE), safer intravenous infusion pumps, and real time documentation with inventory control.
using bar code technology. Some of the negative impacts include issues regarding the confidentiality of medical records, the cost of added hardware, software and information technology staff, and the ongoing training of all personnel.

One of the biggest barriers to technology enhanced safety is the reticence of staff that cannot or will not embrace computerization. Healthcare professionals within every professional discipline and at all levels of healthcare delivery are actively contributing to error reduction and patient safety when they can accept and adapt to computerized technology. Reliance on outdated methods and old equipment may have worked in the past but they always had limitations that can now be overcome. Since healthcare professionals who cannot use the newer methods and updated equipment become a potential source of error themselves, their acceptance of newer technology becomes an ethical imperative. Examples of how technology enhanced systems can reduce error are provided below.

- **Clinicians** worry about caring for patients using a “cookbook” approach rather than individualizing care, and therefore want to resist the use of computerized decision support systems. However, using evidence based artificial intelligence to guide thinking (prompt, suggest and remind – not demand) can improve both clinical and financial outcomes. Regional and/or cultural bias is minimized and evidence based strategies are promoted. Published evidence suggests that patients will significantly benefit when computerized decision support systems are used - with a better chance of survival. 38,39

- **Physicians and other prescribing practitioners** understand that hand written prescriptions may be misinterpreted with sometimes disastrous results. CPOE offers a clearly legible order that can be processed more efficiently. When combined with some sophisticated alerts programmed into the system, CPOE has demonstrated significant contributions to error reduction.

- **Clinical laboratory professionals** find that the time and resource constraints significantly increase opportunities for error, particularly human error. There may be misplaced or mislabeled test tubes, delayed turnaround time, or communication of erroneous test results. Replacing manual tasks with automated procedures (automated alliquotters, closed-tube sampling systems to eliminate manual uncapping and capping of test tubes, electronic auto-validation of results) contributes to error reduction and also results in improved productivity, worker safety, and cost savings.

- **Nurses, mental health counselors, physical therapists and other direct care professionals** recognize that documentation of care delivery is important, yet they have always encountered barriers when trying to complete all the required information. The electronic medical record (EMR) offers these professionals the opportunity to eliminate most barriers while documenting even more comprehensive and timely information. Additional technology such as voice recognition software and bar coding devices further optimize documentation by inputting real time data directly into the EMR and then populating all the required fields.

- **Radiographers** are required to adjust kilovoltage peak (kVp), milliamperage (mA) and exposure time based key variables such as on source to image receptor distance (SID), thickness and tissue type of the body part and pathology. Using automatic exposure control (AEC) technology reduces errors in film screen imaging and contributes to improved patient safety by limiting radiation exposure.

4. Education to Promote Safety. Promoting and enhancing awareness of medical error is the initial step in developing a “culture of safety”. The topic of medical error can no longer remain invisible, and so educational efforts focusing on patient safety must become clear, strong, and visible. Continuing education (mandatory and voluntary) using journal articles, live presentations and web-based programs all contribute needed knowledge and stimulate further discussion. Ultimately, it is the availability and promotion of ongoing education that becomes crucial in laying the foundation for collaborative initiatives that will reduce medical errors. This education is needed at the professional level, the support staff level, and the consumer level.

Education of the general public is also needed to increase awareness of the consumer’s role in providing safe medical care. Responsibility for solving the medical error problem does not lie solely with healthcare professionals. Patients, their families, and their lay advisers must also become active members of the patient’s healthcare team. Clinicians can more easily accomplish this with automated patient education material that is appropriately distributed. Added educational approaches might include staff call-backs within 24 hours after facility discharge, consumer information “hot lines”, and frequently needed health information available using printed brochures and web site technology.

The Joint Commission (THE JC)
The Joint Commission (Formerly the Joint Commission on Accreditation of Healthcare Organizations –THE JCAHO), the nations predominate standards-setting and accrediting body in healthcare, has taken an active role in addressing medical errors. It began tracking sentinel events in 1995. “A sentinel event is any unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof. Serious injuries specifically include a loss of limb or function. The phrase “or the risk thereof” includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome.” 40 Sentinel event data is used to trend safety concerns and is shared by the Commission to educate other participants.
The intent of the Sentinel Event Policy is to address patient safety issues within the healthcare industry by (1) identifying significant medical errors, (2) performing root cause analysis to understand their causes, (3) making changes to reduce future occurrences, and (4) evaluating the effectiveness of those changes. Such activities compose “lessons learned” and are shared for the benefit of all. The Joint Commission produces and distributes a newsletter, Sentinel Event Alert, which informs organizations of sentinel events and how they can be prevented. Reporting to the Joint Commission is voluntary and is encouraged to expand its data base. The policy, however, identifies some functions by organizations responding to sentinel events as being subject to review by the Joint Commission. This means that for certain events the organization is required to perform a suitable root cause analysis, make revisions to prevent future occurrences, and demonstrate plans for evaluating the effectiveness of those changes. Continued accreditation requires that this be done within 45 days of the known occurrence of the event. The Joint Commission advises participants on methods to protect confidentiality and limit the risk of legal exposure of documents related to this process.

So what is next?

The JC has established multiple standards addressing patient safety in healthcare organizations in its chapters on Leadership, Improving Organization Performance, Management of Information, Education, Continuum of Care, and Management of Human Resources. Leadership’s role in patient safety is specifically addressed and it is made accountable for all related activities. Leadership is responsible for integrating and coordinating all patient safety efforts. In 2002, the JC streamlined its patient safety requirements of accredited facilities by establishing a select list labeled National Patient Safety Goals (NPSGs). Each year an individual goal may be retained, expanded, or replaced by a new priority. The requirements are based on scientific evidence when available. In its absence, expert consensus and data from the JC’s Sentinel Event Database provide the basis for the requirements. These can be viewed at the JC website: http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/.

The goals include requirements for organizations to improve accuracy of patient identification, effectiveness of communication, medication safety, reduce the risk of healthcare associated infections, reconcile medications, reduce falls, reduce the risk of influenza, and pneumococcal disease, reduce the risk of surgical fires, encourage patient involvement, pressure ulcer prevention, and identify safety risk for each institutions patient population.  

Performance Improvement

During the 1990s many health organizations took to heart the teachings of business quality leaders by looking for ways to improve their complex systems. The JC recognized the benefit of such improvement efforts and mandated them in their standards. Many methods exist: FOCUS-PDCA, Six Sigma, Quality Related Events and Continuous Quality Improvement programs.

National Recommendations

The federal government has noted that this country’s healthcare system is at least a decade behind other high risk industries (such as aviation) in its attention to ensuring basic safety. A review of the experience in non healthcare industries revealed the following characteristics:
- No tolerance for high error rates
- Development of tracking systems to expose error
- Reliance on abundant reports involving actual error and “near misses”
- Thoroughly investigating error
- Use of a systems approach embracing human, technical and organizational remedies
- Promotion of a non-punitive culture that enhances safety
- Allocation of adequate resources to error prevention
- Recognition that solutions sometimes come from unexpected sources

Recognizing current inadequacies, the federal government promotes the following recommendations (many of which are already in existence):
- Hold national summits on medical error
- Endorse and support further research
- Develop and maintain an aggregate database on medical error
- Partner with other agencies to publish and enforce specific practice recommendations
- Collaborate with health professional licensing bodies to develop competency standards
- Work with drug and product manufacturers to maximize safety
- Endorse and support decision support systems and information technologies to enhance real-time decision support to clinicians
- Partner with other agencies to develop and articulate standardized procedures, checklists and protocols that are based on current research based evidence.

Medicare Decision effective October 2008

Beginning with hospital discharges on or after October 1, 2008, the Centers for Medicare and Medicaid Services (CMS) no longer pays the extra costs of treating patients who develop eleven serious, preventable conditions after they have been hospitalized. That is, CMS will not pay more than it would have if the complication did not occur or was not present on admission. There are different definitions for these events, but in general, they are events or conditions that should not occur in hospitals (“never events”). These conditions include:
1. Foreign object retained after surgery
2. Air embolism
3. Blood incompatibility reaction
4. Catheter associated urinary tract infection
5. Pressure ulcer (stages III & IV)
6. Vascular catheter associated blood stream infection
7. Surgical site infection—mediastinitis after coronary artery bypass graft surgery
8. Hospital acquired injuries including intracranial injury, crushing injury, burn, dislocations and other unspecified effects of external causes
9. Manifestations of poor glycemic control
10. Surgical site infections following certain orthopedic procedures and bariatric surgery for obesity
11. Deep vein thrombosis/pulmonary embolism after total knee and hip replacement

Conclusion

Medical error continues to be a very serious and complex national concern. What we have learned is that error reduction strategies need to focus on system redesign rather than individual chastisement. We have also learned the importance of building a culture of safety in which people are not afraid to identify errors and learn from each other’s mistakes. In this new culture of safety, there should be no retribution for reporting errors or “near misses”. Healthcare professionals have been identified as essential participants in the team approach to error reduction and remain central to the varied efforts promoting resolution. Through additional study of best practices, organizational guidelines and technical support strategies, our nation hopes to build a healthcare system that can offer the safest patient care possible.

References


Posttest

An answer sheet is provided to record your test answers, please keep this test to check your corrected answer sheet.

1. Examples of latent errors contributing to medical errors include all of the following EXCEPT.
   a. bad management decisions
   b. poorly structured organizations
   c. faulty system design and installation
   d. documenting in the wrong medical record

2. Common categories of medical errors are ______.  
   a. legal impact, severity of injury, risk management, miscellaneous
   b. types of health care settings, types of health care services, types of health care providers
   c. diagnostic, treatment, preventative, performance, medication, other
   d. none of the above

3. It is generally believed that errors occur because of “human error”, system contribution and ______. 
   a. the relative “invisibility” of error
   b. unreported errors that remain silenced and covered
   c. errors that trigger a cascade of additional mistakes
   d. all of the above

4. Using information presented by Charles Perrow, our current healthcare system is considered a complex system because of ______. 
   a. multiple components that interact in a variety of unexpected and invisible ways
   b. unusually flexible and buffered processes
   c. multiple geographic locations
   d. our reliance on highly technical information systems

5. Creating a national “culture of safety” involves all of the following EXCEPT. 
   a. voluntary resolution of mistakes without reporting
   b. participating in root cause analysis
   c. participating in failure mode and effects analysis
   d. identifying potential situations that could lead to medical error

6. The intensive error analysis that occurs after an event is known as ______. 
   a. flow charting
   b. brainstorming
   c. force field analysis
   d. root cause analysis

7. AHQR has categorized common root causes of medical error. These include all of the following EXCEPT. 
   a. communication problems
   b. staffing patterns and work flow designs
   c. unusual or “special” issues
   d. inadequate flow of information

8. Error-prone circumstances and practice settings might include all of the following EXCEPT. 
   a. conditions of insufficient staffing
   b. multiple distractions
   c. portable equipment
   d. stress or fatigue

9. Patients, families and other consumers of healthcare ______. 
   a. are important players in the prevention of medical errors
   b. should not be expected to help eliminate system problems in health care organizations
   c. should allow their physician to formulate treatment plans without informing them of the potential consequences to the patient
   d. are never involved with treatment plans

10. Medical errors are the ______ leading cause of death in the United States. 
    a. fourth
    b. second
    c. eighth
    d. fifth

11. The impact of medical errors includes ______. 
    a. lost productivity
    b. increased costs of personal care
    c. loss of trust in the healthcare system
    d. all of the above

12. An example of a clinical laboratory diagnostic error is ______. 
    a. equipment failure and mislabeling of a specimen
    b. omission of medication allergy from an MAR
    c. wrong site surgery
    d. delay in treatment
13. An event that could have resulted in an accident, injury or illness, but did not, either by chance or through timely intervention is called a(an) ___________.
   a. sentinel event
   b. near miss
   c. medication error
   d. unfortunate circumstance

14. Many people are kept from revealing their mistakes/errors by _________.
   a. embarrassment
   b. fear of retribution
   c. potential for career-ending litigation
   d. all of the above

15. Error reduction and performance improvement require pro-active system-wide changes rather than reactive person-oriented strategies.
   a. True
   b. False

16. A common example of an active error for clinical social workers and/or mental health therapists is _____.
   a. minimal documentation to describe a client’s response to therapy
   b. inaccurate dispensing of a medication
   c. failure to adequately communicate a worsening symptom that could compromise safety
   d. administration of a drug to which a patient is noted to be allergic to

17. What is the initial step in learning from past mistakes that is vital to identifying system designs that can contribute to error?
   a. mandatory reporting
   b. voluntary reporting
   c. performance improvement
   d. quality assurance

18. The FMEA process differs from RCA in that_____.
   a. instead of focusing on what went wrong, the FMEA process focuses on what could go wrong
   b. it focuses on what went wrong
   c. it is a retroactive process
   d. none of the above

19. Most health professionals recognize ________ as a population particularly vulnerable to error.
   a. infants and children
   b. homeless
   c. under-insured
   d. tourists

20. In an effort to promote safe medication administration, the ISMP and JACHO warn against __________.
   a. computerized medication administration records
   b. the use of the abbreviations “DC” and “u”
   c. computerized clinical decision support
   d. all of the above

END OF TEST
To facilitate accurate recording please provide the following information:

Profession: ____________________ State & License #: ____________________

First Name: ____________________ Last Name: ____________________

Mailing Address: ____________________ City ____________________

State: ____________ Zip: ____________ E-mail Address: ____________________

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<thead>
<tr>
<th>Question</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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<tbody>
<tr>
<td>1. After participating in this activity I am better prepared to:</td>
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<tr>
<td>- Recognize the magnitude and far reaching effects of medical error.</td>
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<td>- Categorize factors contributing to the occurrence of medical error.</td>
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<td>- Describe the healthcare professional's role in identifying error prone situations.</td>
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<td>- Explain the importance of reporting medical error.</td>
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<td>- Specify at least two recommended practice modifications to promote safety and reduce the incidence of medical error.</td>
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<td>- Review the processes of root cause analysis (RCA) and failure mode and effects analysis (FMEA) when analyzing error.</td>
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<td>2. The content was relevant to my professional needs and practice.</td>
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<td>3. The educational level of this activity was appropriate.</td>
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<td>4. The faculty effectively presented the content.</td>
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<td>5. The teaching method(s) and learning materials were effective.</td>
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<td>6. The post-test measured achievement of learning objectives.</td>
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<td>7. Overall, I was satisfied with this educational activity.</td>
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<td>8. The content was objective, current, scientifically based and free of commercial bias.</td>
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<td>If no, please explain:</td>
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<td>9. Based on information presented in the activity, I will:</td>
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<td>- Do nothing; content not convincing</td>
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<td>- Seek additional information</td>
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<td>- Change my practice</td>
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<td>- Do nothing; practice reflects recommendations</td>
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<td>10. The most important concept I learned during this activity that may effect a change in patient care is:</td>
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<td>11. What issue(s) related to the therapeutic area discussed in this activity, or other topics, would you like addressed in future continuing education?</td>
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<td>12. Time spent completing this activity: ______________________________</td>
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<td>13. Comments:</td>
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