Prevention of Medical Errors: Root Cause Analysis and Misdiagnosed Conditions

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Abstract

Multiple studies benchmarking the incidence of medical errors have led to efforts to improve patient safety, resulting in regulatory agencies and healthcare providers across the nation making the prevention and reduction of medical errors a priority. Providers should understand how regulatory agencies have shaped the patient safety movement, provided a structure for identifying causes of medical errors, and developed effective preventive strategies. Based on state and national reports of patient safety events and malpractice data, regulatory agencies have established patient safety goals for the prevention of medical errors.

Introduction

A ***medical error*** has been defined in varied ways by a multitude of patient safety organizations. The Institute of Medicine (IOM) defines a medical error as the failure to complete the intended plan of action or implementing the wrong plan to achieve an aim.[1] This error may or may not lead to patient harm or impact the patient in any tangible way. Errors may be those of omission or commission. An error of commission occurs because of the action of a provider. For example, a provider administers an overdose of medication to a patient. An error of omission results from the failure of a provider to take action. For example, the provider may fail to follow up on significant radiologic study. Errors that never reach the patient also have value in the potential to improve patient safety and prevent future events. A ***near miss*** is an event that could have had an adverse patient consequence but did not because a provider or a process served to intervene and prevent that event from reaching the patient or causing harm.

A number of additional definitions have been developed from the underlying cause of the event or the resulting outcome of the error. A ***latent error*** is one that results from underlying errors in policies, processes, equipment, or the healthcare organization. Studies have shown that most

latent errors are the result of systems issues, rather than one individual provider's act or failure to act.

Negligence is defined as the failure to meet the reasonably expected standard of care of a qualified healthcare provider under similar circumstances. Florida Statutes define the standard of care as follows: "The prevailing professional standard of care for a given health care provider shall be that level of care, skill, and treatment which, in light of all relevant surrounding circumstances, is recognized as acceptable and appropriate by reasonably prudent similar health care providers."[2] Only healthcare providers and facilities can be liable for medical malpractice. ***Medical malpractice*** is negligence committed by a licensed healthcare provider or facility. In order to establish a claim of medical malpractice, the patient must establish four elements: duty, breach, causation, and damages. Prior to actually receiving a medical malpractice claim from a patient, a healthcare provider or facility may identify a medical error that could potentially lead to a medical malpractice claim as a ***potentially compensable event***.

In 2002, the National Quality Forum published *Serious Reportable Events in Healthcare: A Consensus Report*, which listed 27 adverse events that were, "serious, largely preventable and of concern to both the public and health care providers."[3] These events and subsequent revisions to the list became known as never events. ***Never events*** are medical errors that should not ever happen. Examples of never events include: wrong surgery performed on a patient, surgery performed on the wrong body part, or surgery performed on the wrong patient. Centers for Medicare & Medicaid Services (CMS) has determined that when one of these three never events occurs involving a Medicare beneficiary, Medicare will not cover these costs as they are not a reasonable and necessary treatment for the Medicare beneficiary's medical condition.

The Joint Commission (TJC) is an independent, not-for-profit organization that accredits and certifies more than 22,000 healthcare organizations across the nation and has become a symbol of patient safety given its commitment to the highest quality performance standards. TJC defines a ***sentinel event*** as a patient safety event that reaches a patient and results in death, permanent harm, or severe temporary harm and intervention required to sustain life.[4] These events are called sentinel events because they signal a need to immediately investigate and respond to the event. In 2022, a total of 1,441 sentinel event reports were received by TJC, with 90% (1,299) of those self-reported by an accredited or certified facility. The top 10 events reported in 2022 included:[5]

- Fall - 611
- Delay in treatment - 89
- Unintended retention of a foreign object - 88
- Wrong surgery - 85
- Suicide - 73
- Assault/rape/sexual assault/homicide - 60
- Fire/burns - 49
- Perinatal event - 33
- Self-harm - 30
- Medication management - 30

Under Florida law, an ***adverse event*** is defined as, "an event over which healthcare personnel could exercise control and which is associated in whole or in part with medical intervention, rather than the condition for which such intervention occurred", that results in a specified injury, including death, brain damage, additional medical or surgical intervention, or transfer to a higher level of care.[6] Hospitals, ambulatory surgical centers, nursing homes, and physician offices licensed under Florida law are required to report statutorily defined adverse events to the Florida Agency for Health Care Administration (AHCA) or Department of Health (DOH).[7] Certain licensed facilities are also required to establish and maintain internal risk management programs to track these and other types of events.

Licensed facilities must report specified adverse events, including unplanned foreign objects, wrong site surgical procedures, wrong surgical procedures, or surgical procedures on the wrong patient, within 15 days of the occurrence, hence the name ***Code 15*** report. Healthcare providers in an office practice setting are also required to report these types of events.[7] The Code 15 Report includes a description of the circumstances surrounding the event, as well as analysis and interventions taken to correct and prevent recurrence. License numbers of practitioners who were directly involved in, or witnessed an adverse event are also required on these reports and are routinely forwarded to the DOH to determine whether to initiate a practitioner investigation. The Florida Board of Medicine has prescribed a range of disciplinary actions for a variety of medical errors, practicing beyond the scope permitted by law or competency, and gross or repeated malpractice.

Error Reduction and Prevention

The Institute of Medicine (IOM) is a division of the National Academies of Sciences, Engineering, and Medicine focused on improving health and healthcare in our nation and throughout the world. This team issues recommendations and reports to foster discussion and critical thinking, such as the oft-cited 1999 report *To Err Is Human.* The IOM has estimated as many as 98,000 people die every year as a result of preventable medical errors. A 2016 study published by Johns Hopkins University researchers in the British Medical Journal claims that 251,000 lives are lost every year as a result of medical errors.[8] A more recent study published in 2023 from Johns Hopkins School of Medicine and the Risk Management Foundation of the Harvard Medical Institutions, looked at 15 diseases that accounted for 51% of events with serious harm. About 75% of these serious harm events involved cancer, infections, and vascular events. In total, this study found that 371,000 Americans died and 424,000 were permanently disabled as a result of misdiagnoses. In part, this study concluded that diseases with high error rates should be the priority for targeted solutions.[9] Medical error prevention is, therefore, an urgent public health concern requiring close examination of contributing factors and prompt identification of appropriate strategies to reduce risks to patients.

In an effort to control increasing government costs resulting, in part, from pervasive medical error in the United States, Congress passed the Deficit Reduction Act (DRA) in 2006. Among its other provisions affecting domestic entitlement programs, the DRA required CMS to compile a list of conditions that result in high costs that can reasonably be prevented. CMS developed a list

of Hospital Acquired Conditions (HACs) and implemented policies denying or limiting payment by CMS for treatment made necessary by HACs. The list of HACs is lengthy, but some notable examples include falls, catheter-associated urinary tract infections, unplanned retained foreign objects after surgery, and significant pressure ulcers. While HACs may not be the result of error or negligent care, CMS reimbursement consequences have raised the stakes significantly in medical error prevention. Since 2010, the Agency for Healthcare Research and Quality (AHRQ) has been collecting information on HACs. In its most recent National Scorecard on Hospital-Acquired Conditions, updated in January 2019, AHRQ data showed that from 2014 to 2017, HACs fell by 13 percent, saving about 20,700 lives and about $7.7 billion in healthcare costs.[10]

Root Cause Analysis (RCA)

When a sentinel event occurs, TJC requires a Root Cause Analysis (RCA) to be completed within 45 days. While in Florida, AHCA's definition of an adverse event is not necessarily synonymous with TJC's sentinel event; most adverse events undergo RCA. The first step involved in RCA is gathering the information and circumstances surrounding the event by using a multidisciplinary team that includes leadership and all those involved in the event. The causal factors identified drive the corrective action plan, and specific individuals and departments are assigned to be the responsible stakeholders for the corrective actions. Once solutions to the patient safety event are determined and implemented, timely follow-up to assess effectiveness is essential. Not all sentinel events occur because of medical errors, and not all medical errors result in sentinel events. Because reporting is voluntary, reported RCA events represent only a small proportion of actual events. Since 1998, TJC has published "Sentinel Event Alerts" which address root causes and risk reduction strategies of sentinel events. Many of the strategies and recommendations have since become TJC hospital standards of accreditation.

The proactive counterpart to RCA, Failure Mode and Effect Analysis (FMEA) is a method for evaluating processes before an adverse event occurs by identifying where and how failures might occur. A FMEA team, comprised of individuals involved in the process, reviews the steps in the process to identify and evaluate those parts of the process most in need of change. Prioritizing is important to ensure systems and processes with the highest likelihood of patient or staff harm are addressed first.

In 2015, the National Patient Safety Foundation published "RCA^2: Improving Root Cause Analyses and Actions to Prevent Harm."[11] Recognizing the value of the RCA process, but noting its inconsistent success, RCA^2 incorporated a second "A" to the RCA acronym: Action. Root Cause Analyses and Action emphasizes the importance of positive action to prevent recurrence of future patient safety events, in addition to techniques to identify causes of past events and remedial measures. "The most important step in the RCA^2 process is the identification of actions to eliminate or control system hazards or vulnerabilities identified in the causal statements." Once identified, the focus turns to the development of strong action plans with support of facility leadership. Numerous patient safety organizations, including TJC, have endorsed the use of RCA^2.

Patient Safety

In 2005, Congress passed the Patient Safety and Quality Improvement Act (PSQIA) which established federal privileges and confidentiality for patient safety work product reported to a Patient Safety Organization (PSO).[12,13] As of November 2023, there are a total of 102 listed PSOs, with 69 serving providers in the state of Florida.[14] The legal protections of the PSQIA have significantly enhanced provider willingness to share patient safety and performance improvement information to facilitate the development and dissemination of preventive measures and best practices.

In 2002, TJC established the National Patient Safety Goals program to help accredited organizations focus on specific areas of patient safety concern. For 2024, TJC identified the following National Patient Safety Goals for hospitals:

1. Identify patients correctly
2. Improve staff communication
3. Use medicines safely
4. Use alarms safely
5. Prevent infection
6. Identify patient safety risks
7. Improve health care equity
8. Prevent mistakes in surgery[15]

The first goal addresses the issue of reliably identifying the patient for whom service or treatment is intended and matching the service or treatment to that patient using acceptable identifiers, including their name, identification number, or telephone number. Two identifiers must be used when administering medications or blood products. The second goal is to improve the effectiveness of communication among caregivers, focusing on prompt communication of critical test results to the appropriate caregiver so that indicated treatment can be started immediately. The third National Patient Safety Goal promotes reducing or eliminating errors involving medication administration. The fourth goal is the safe use of critical alarms which addresses issues such as overuse. Overuse of alarms may confuse or desensitize staff to critical alerts. The fifth goal is to reduce infections in healthcare facilities, including post-operative infections, central line infections, and urinary tract infections from the use of catheters. Prevention and control strategies must be tailored to the specific needs of each hospital, based on its own risk assessment. The sixth goal is to identify patient safety risks, including patient assessments for suicide risk, which is a frequently reported sentinel event. Identification of individuals at risk for suicide while under the care of, or following discharge from, a healthcare organization is an important step in protecting at-risk individuals. The seventh and newest goal is to improve health care equity. The TJC seeks to emphasize that all patients needs safe and equitable care. This newest goal seeks to improve accountability and oversight of health care equity. As such, equity must be the foundation for safety and quality in healthcare. The final National Patient Safety Goal is the prevention of mistakes during surgery. Having a pre-procedure verification process and performing a time-out with the operating room team before anesthesia is administered to ensure the correct procedure, for the correct patient, at the correct

site, is a recognized standard of practice. Marking the location of the surgery is also recommended, as is pausing before the surgery to make sure a mistake is not made.

Patient safety is also a Florida statutory requirement. Under Florida Statute 395.1012,[16] each licensed facility is required to adopt a patient safety plan. Hospitals receiving reimbursement from CMS must comply with the CMS Conditions of Participation, and it is sufficient to, "develop, implement, and maintain an effective, ongoing, hospital-wide, data-driven quality assessment and performance improvement program."[16] Each licensed facility must also appoint a patient safety officer and a patient safety committee, that includes at least one person who is neither employed by nor practicing in the facility, to promote the health and safety of patients by evaluating patient safety measures of the facility and implementing the patient safety plan.[16]

Diagnostic Errors

Diagnosis is the foundation upon which all healthcare services and treatment rest. It is through correct diagnosis that subsequent healthcare decisions are made. Building upon *To Err is Human*, IOM published *Improving Diagnosis in Healthcare* in 2015, revealing the occurrence of diagnostic errors had been largely underestimated and that most patients would suffer at least one diagnostic error in their lifetime. Noting numerous conflicting definitions of diagnostic error in the healthcare industry, IOM endorses a patient-centered definition: "failure to (a) establish an accurate and timely explanation of the patient's health problem(s) or (b) communicate that explanation to the patient."[18] Taking some inspiration from the TJC National Patient Safety Goals, the IOM outlined eight goals to reduce diagnostic error and improve diagnosis:

- Facilitate more effective teamwork in the diagnostic process among healthcare professionals, patients, and their families.
- Enhance healthcare professional education and training in the diagnostic process.
- Ensure that health information technologies support patients and healthcare professionals in the diagnostic process.
- Develop approaches to identify, learn from, and reduce diagnostic errors and near misses in clinical practice.
- Establish a work system and culture that supports the diagnostic process and improvements in diagnostic performance.
- Develop a reporting environment and medical liability system that facilitates improved diagnosis through learning from diagnostic errors and near misses.
- Design a payment and care delivery environment that supports the diagnostic process.
- Provide dedicated funding for research on the diagnostic process and diagnostic errors.[18]

Diagnostic errors cause harm by preventing or delaying the appropriate treatment or providing unnecessary or harmful treatment. In the outpatient setting, it is estimated that each year, five percent of adults will experience a diagnostic error. In the hospital setting, diagnostic errors are estimated to account for 6-17 percent of adverse incidents each year.[18] Diagnostic errors are also the leading type of paid medical malpractice claims and twice as likely to have caused the patient's death, compared to other claims.[19] In a 2013 study analyzing 25 years of data submitted to the National Practitioner Data Bank,[19] diagnostic errors were the highest claim type at 28.6

percent and accounted for 35.2 percent of total payments, which was also the highest proportion. Diagnostic errors were the leading cause of claims-associated death and disability. After adjusting for inflation, diagnosis-related payments totaled $38.8 billion.[19]

More recently, patient safety organizations, led by The Leapfrog Group, have focused on the prevention of harm from diagnostic errors and developed 29 actions that hospitals can implement to reduce the risk of patient harm from diagnostic errors.[20] These 29 practices were grouped into two domains: Organizational Leadership and Systems, and The Diagnostic Process. Each of these domains had subdomains that then identified 29 practices to reduce the risk of harm. These practices are outlined in Table 1.

This study, and the 29 actions developed therefrom, recognized that patient and family involvement in care can lead to a better experience and better outcomes for the patient. A good provider-patient relationship is more likely to develop from this greater involvement, resulting in increased communication and better reporting and taking of history, leading to a higher likelihood of a correct diagnoses. Further, teamwork amongst providers and departments improves communication, coordination of care, and provides a fresh perspective on diagnosis. Finally, when leadership is involved in and sets goals for improving these areas, diagnostic errors are less likely to occur because it encourages communication and teamwork, but also conveys to all staff that reducing diagnostic errors is a priority of the organization.[20]

Misdiagnosed Conditions

Recognizing the paramount importance of timely and accurate diagnosis of medical conditions, the Florida Board of Medicine requires continuing education for physician license renewals to include information relating to the five most misdiagnosed conditions during the previous biennium.[21] Effective March 2, 2022, the five most misdiagnosed conditions include:

- cancer related conditions,
- gastroenterology related conditions,
- cardiology related conditions,
- neurological conditions, and
- missed spinal cord compression,

Cancer Related Conditions

Early detection and diagnosis of cancers is crucial for selecting the appropriate treatment approach and to ensure optimum outcome. An estimated 12% of cancer patients are initially misdiagnosed, and the missed or delay in diagnosis remains a significant cause of medical malpractice. According to the Florida Department of Health, the top five most frequently diagnosed cancers in Florida in 2017 accounted for just over half of all cancer diagnoses (50.3%). The top five cancers were lung and bronchus (17,138), breast (16,785), prostate (12,539), colorectal (9,908), and melanoma (6,798).[21] In females, the top five cancers were breast, lung and bronchus, colorectal, non-Hodgkin's lymphoma, and melanoma. In males, the top five cancers were prostate, lung and bronchus, colorectal, melanoma, and bladder.[22]

Misdiagnosis of cancers are largely due to a missed or delayed diagnosis. According to a retrospective study published in 2021, the top cancers that were misdiagnosed or in which there was a delay in diagnosis, were lung cancer, melanoma, colorectal cancer, breast cancer, and prostate cancer.[23] The threshold for including a delay in "diagnostic error" was linked to the impact of the delay or missed diagnosis on the patient. The causes of misdiagnosis varied and were typically related to the patient not fitting the typical profile for the cancer. The study suggested that one should consider including cancer in a differential diagnosis if symptoms are ambiguous. In addition, consistent and timely follow-up on testing is encouraged to prevent delays.

For 2023, the American Cancer Society estimates there will be a little over 1.9 million new cancer cases diagnosed, and 609,820 cancer deaths in the United States.[24] Florida had one of the highest state diagnosis rates at 162,410. The top three most diagnosed new cancers in Florida were prostate, female breast, and lung and bronchus cancers.[24]

Misdiagnosis of cancer includes missed diagnosis, wrong diagnosis, and delayed diagnosis. In one case presented to the Board of Medicine, the patient's chest x-ray revealed a focal area of increased density in the lung. The physician documented the findings, as well as the patient's reluctance to undergo a CT scan, citing lack of insurance. Six years later, new diagnostic studies revealed a small infiltrate of the lung and radiographic follow-up was recommended. The physician documented a plan to follow up, but failed to do so, and failed to order additional studies. Over a year later, the patient presented to another physician, who ordered a CT of the chest, which revealed a malignant appearing mass in the right lung. A biopsy later revealed adenocarcinoma.

The Florida Board of Medicine found that the initial ordering physician failed to practice medicine with the level of care, skill, and treatment which, in light of all relevant surrounding circumstances, is recognized as acceptable and appropriate by a reasonably prudent similar healthcare provider. The physician was also cited for keeping illegible records, failing to maintain a concise ongoing problem list, and not documenting tests ordered, radiographic follow up, or crucial conversations with the patient.

Gastroenterology Related Conditions

A 2015 study by The American Journal of Gastroenterology on the leading causes of medical malpractice claims against gastroenterologists analyzed 1,041 closed claims collected by the Physician Insurers Association of America between January 2009 and December 2013.[25] The most common error was improper performance of a procedure (32%), followed by errors in diagnosis, and medication errors. Diagnostic procedures of the large intestine most commonly led to claims (27%), followed by small intestine and biliary tract procedures. The most common complication was accidental puncture or laceration during a procedure (7%), and of those events actually reported, the most common injury was death (29%).[25]

In one adverse event reviewed by the Board of Medicine, the patient was consented to undergo a colonoscopy with sedation. Several attempts were made to obtain IV sedation by inserting the

needle into the patient's arms and hands. The IV infiltrated resulting in redness and puffiness in the patient's arm, but was finally placed. Unfortunately, the provider did not obtain adequate sedation because the patient was experiencing pain during the procedure and asked the provider to stop. The provider continued despite the patient's loud and repeated cries and requested that the nurses hold the patient down against their will. The medical record failed to document any of these events. The Florida Board of Medicine found that the provider performed a wrong procedure by having performed a colonoscopy without adequate sedation, when the consent was for a colonoscopy with sedation. It was also considered an unauthorized procedure by virtue of the patient having withdrawn their consent repeatedly by asking the provider to stop. The provider received a reprimand from the Board of Medicine, was fined $15,000, and ordered to perform 100 hours of community service.

Cardiology Related Conditions

There has been much publicity recently regarding the failure to diagnose heart disease, particularly in women, and the historical and cultural reasons for this disparity.[26] According to the Centers for Disease Control and Prevention, heart disease is the leading cause of death for women in the United States.[27] In one study that reported on a projected lifetime risk of cardiovascular disease, which included 30,447 participants from seven U.S. cohort studies, among individuals over the age of 60 with low cardiovascular health, the 35-year risk of cardiovascular disease was highest in white males (65.5%), followed by white females (57.1%).[28]

The Florida Board of Medicine reviewed an incident of a patient who presented to the emergency room with unstable vital signs and complaints of left arm, side, and knee pain subsequent to a fall. Their history was positive for myocardial infarction, coronary artery bypass grafts, hypertension, and myelofibrosis. The emergency department physician incorrectly interpreted the chest x-ray, despite the radiology report indicating pleural effusion and left lower lobe atelectasis and an abnormal electrocardiogram showing tachycardia. The only treatment rendered was a 500 mL bolus of normal saline. Without further evaluation or timely intervention, the patient continued to deteriorate, coded, and expired.

The Board determined the physician failed to meet the standard of care by failing to properly diagnose and treat the patient, failing to correctly interpret the chest x-ray, failing to address the abnormal electrocardiogram, and failing to recognize a hemothorax in a patient with left sided chest trauma with hypotension and tachycardia. The physician was ordered to pay an administrative fine of $10,000, complete five hours of risk management, present a one-hour lecture to the entire medical staff of the hospital on diagnosis and treatment of hemothorax, and pay investigative costs of $1,073.

Neurological Conditions

A retrospective study of diagnostic errors in neurological emergencies found that these incidents can be classified into three categories: knowledge gaps, cognitive errors, and systems-based errors.[29] Misdiagnosis of cerebellar lesions and erroneous radiology resident interpretations of neuroimaging were the most common mistakes nationwide. Further, neurologic conditions can

be challenging to diagnose, because there are a number of diseases that may manifest with neurologic symptoms. These symptoms are even more difficult to diagnose in minors, impaired patients, or those who are differently abled because they may not be able to accurately describe their symptoms. A detailed physical examination and past medical history, as well as imaging, and timely consultation from the neurology service are critical to an accurate diagnosis.

In a related incident before the Florida Board of Medicine, a patient presented with severe headaches, confusion, and dizziness, as well as a history of previous shunt insertion for hydrocephalus. A CT scan revealed hydrocephalus with shunt catheter in place and no signs of acute intracranial hemorrhage. The patient was diagnosed with a malfunctioning shunt and was taken to the operating room where the old shunt was replaced. A left frontal burr hole was also made. The physician documented in the operative report that he had evacuated blood from the patient's head and informed the patient. Post-operatively, the patient was obtunded and having seizures, requiring ventilator-assistance. The investigation revealed the physician performed an unnecessary procedure by drilling a burr hole that was not indicated and deceptively documented that a hematoma was evacuated.

Missed Spinal Cord Compression

In a study published in 2017 in the American Journal of Medicine, of 119 newly diagnosed spinal epidural abscesses, 55.5% experienced diagnostic error.[30] Symptoms that were considered red flags were unexplained fever, and focal neurological deficits with progressive or disabling symptoms. Although the incidence of spinal cord compression diagnostic errors is far below other categories mentioned, the outcome of a misdiagnosis or delay in diagnosing a spinal cord compression can be catastrophic.

In one recent medical malpractice suit in Florida in August 2022, a jury awarded a patient and his wife $15.5 million after his providers allegedly failed to diagnose and treat his spinal injury, leading to his paralysis. The patient was struck by a car, which resulted in a leg amputation. A few days later, a radiologist performed a CT scan and allegedly missed the diagnosis of a spinal fracture and epidural hematoma, nor did he recommend a follow-up MRI. The neurosurgeon also reviewed the CT scan and also allegedly failed to diagnose a spinal fracture. Additionally, the neurosurgeon took the patient off of spinal precautions that had been put in place for the first two days after surgery. Three weeks later, another provider performed an MRI and diagnosed a herniated disc penetrating his spinal cord. The patient's attorneys argued that but for the missed diagnosis of a herniated disc, the patient would have undergone a surgical repair and would have avoided paralysis.[31]

The State of Florida defines a traumatic spinal cord injury as a lesion to the spinal cord resulting from external trauma with evidence of significant involvement of at least two of the following: motor deficit, sensory deficit, or bowel and bladder dysfunction.[32] Of note, the Florida Department of Health administers the Brain and Spinal Cord Injury Program, funded by a statutory trust fund to provide the cost of care for brain and spinal cord injuries as a payor of last resort. The Program provides all necessary services to return to an appropriate level of function, rehabilitation, as well as case management and additional resources.[33]

Conclusion

Medical errors will never be completely eliminated, but by utilizing available patient safety data, adhering to National Patient Safety Goals, and utilizing tools such as RCA^2 to identify those areas of greatest patient safety concern, providers can play an important role in reduction and prevention. As the preceding examples illustrate, commonly encountered challenges with the stages of the diagnostic process can be minimized by consistently performing thorough histories and physicals, promptly following up on diagnostic tests, communicating findings to patients, and avoiding cognitive biases. Medical record documentation is also an extremely important tool for communication between multiple services and healthcare providers involved in a patient's care. Failure to keep appropriate written records is a frequent cause of Florida Board of Medicine disciplinary action and a hindrance to the provision of appropriate care. The benefits of the electronic health record, including diagnostic decision support, clinical reminders, and system alerts, have the potential to help avert the risk of diagnostic missteps.

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Table 1: The Leapfrog Group's 29 practices identified by Organizational Leadership Systems and The Diagnostic Process to reduce the risk of harm

Domain 1: Organizational Leadership Systems	
Subdomain	**Practice**
1.1 Senior leaders are held accountable for diagnostic safety and quality	A – Establish goals for patient engagement, communication, and teamwork B – Convene a multidisciplinary team to promote diagnostic safety and quality C – Communicate progress of diagnostic safety programs
1.2 The hospital's culture supports diagnostic safety, quality, and transparency	A – Demonstrate commitment to diagnostic excellence through CEO leadership B – Promote teamwork C – Target training and education to nurses, pharmacists, and allied health professionals D – Make it easy for hospital staff to report diagnostic errors and concerns E – Openly communicate diagnostic errors to patients
1.3 Processes and structures are in place to engage patients in their care	A – Help patients and their family caregivers communicate complete and accurate information B – Make it easy for patients and family caregivers to report diagnostic errors and concerns C – Empower patients and family caregivers to escalate care D – Encourage patients to use patient portals
1.4 Processes and structures are in place to identify risks and hazards in the diagnostic process	A – Conduct a risk assessment B – Measure and monitor diagnostic safety outcomes C – Optimize the electronic health record to support accurate and timely diagnosis
1.5 Financial, technological, and staffing resources are allocated to support learning and improvement activities	A – Dedicate time for analysis and learning
Domain 2: The Diagnostic Process	
Subdomain	**Practice**
2.1 Processes and structures are in place to gather accurate and complete information from patients and other sources	A – Train clinicians and others involved in the diagnostic process to collect accurate health information B – Correct inaccurate diagnosis and data in the EHR C – Ensure medical interpreters are available
2.2 Processes and structures are in place to enable correct interpretation and synthesis of information	A – Ensure access to radiology experts B – Jointly review diagnostic discrepancies C – Provide needed diagnostic expertise for

	patients admitted to the emergency department D – Provide knowledge resources to clinicians E – Train clinicians to recognize and minimize cognitive errors F – Implement and monitor adherence to diagnostic guidelines
2.3 Processes and structures are in place to effectively communicate diagnostic information to patients and ensure timely and complete hand-offs during transitions of care	A – Manage diagnostic uncertainty at handoffs B – Communicate clear instructions to patients discharged with an uncertain diagnosis C – Communicate clear instructions to patients discharged with pending test results D – Implement “closed loop” communication