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Medical Error Reduction and Prevention

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Continuing Education Activity

Medical errors have more recently been recognized as a serious public health problem, reported as the third leading cause of death in the US. One study reported that approximately 400,000 hospitalized patients experience some preventable harm each year, while another estimated that >200,000 patient deaths annually were due to preventable medical errors. Moreover, medical errors have a high cost, with some experts estimating adverse events costing the healthcare system $20 billion each year and others approximating healthcare costs of $35.7 to $45 billion annually for hospital-acquired infections alone. Medical errors also negatively impact the patient, their family, involved clinicians and support staff, the healthcare facility, and the community. Healthcare professionals may experience profound psychological effects (eg, anger, guilt, inadequacy, depression, and suicidal ideation) due to actual or perceived errors, which the threat of impending legal action may compound.

Uncovering the cause of these errors, as well as providing viable solutions to avoid these errors from occurring, is challenging. However, patient safety can be improved by identifying the contributing factors and events that result in medical errors, developing multifaceted prevention protocols, and implementing these strategies at various healthcare levels. Healthcare professionals should be familiar with the different types of medical errors to understand better the adverse events that may be caused. Common types of medical errors include surgical errors, diagnostic errors, medication errors, equipment failures, patient falls, hospital-acquired infections, and communication failures. By identifying the deficiencies, failures, and risk factors that lead to an adverse event, corrective measures can be developed to prevent similar errors. Encouraging individuals involved in every aspect of healthcare to report medical errors is essential to this process. Confidential reporting options are necessary to identify deficiencies or failures a system may contain. Changing workplace culture and developing protocols for addressing medical errors can encourage medical error reporting. Institutions that adopt a patient safety culture and implement corrective interventions can make healthcare safer for patients and healthcare workers. This activity for healthcare professionals is designed to enhance the learner's understanding of medical errors and the importance of corrective interventions, enabling them to reduce medical error rates and improve patient safety. The course also highlights the interprofessional team's role in performing this analysis to prevent medical errors and improve clinical outcomes.

Objectives:

- Identify the various different types of medical errors and how they can impact patient care.
- Implement strategies to help improve medical error reporting by clinical providers.
- Differentiate between active and latent errors, and describe how they differ from adverse events, sentinel events, and never events.
- Collaborate with an interprofessional team of clinicians, nurses, pharmacists, and education specialists to build a culture of patient safety and improve clinical outcomes.

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Introduction

Medical errors have more recently been recognized as a serious public health problem, reported as the third leading cause of death in the US.[1] However, because medical errors are comprised of different types of failures (eg, diagnostic or medication errors) that can result in various outcomes (eg, near-miss, injury, or no harm), estimates of the incidence of medical errors vary widely in studies. One study reported that approximately 400,000 hospitalized patients experience some preventable harm each year, while another estimated that >200,000 patient deaths annually were due to preventable medical errors.[2][3][4] Moreover, the reported cost of medical errors is wide-ranging, with some experts estimating $20 billion each year and others approximating healthcare costs of $35.7 to $45 billion annually for hospital-acquired infections alone.[2][3]

The definition of a medical error varies, making analysis via uniform objectives difficult. Furthermore, a lack of standardized terminology has hindered data assessment, synthesis, and evaluation. The Institute of Medicine (IOM) Committee on Quality of Health Care in the US, which performed the first large study on medical errors, defined a medical error as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim."[5] Another definition identifies medical errors as a failure in care that may or may not result in patient harm.[6] Regardless of the definition, medical errors are associated with high morbidity, mortality, and economic burden. Moreover, they can negatively impact the patient, their family, involved clinicians and support staff, the healthcare facility, and the community.[7] Healthcare professionals may experience profound psychological effects (eg, anger, guilt, inadequacy, depression, and suicidal ideation) due to actual or perceived errors, which the threat of impending legal action may compound. Clinicians can also equate errors with failure, a breach of public trust, and patient injury despite their mandate to do no harm, which may lead to decreased clinical confidence.[8]

Some experts believe the term *error* is excessively antagonistic and perpetuates a blame culture. Due to the negative connotation, limited use of the term is prudent when documenting patient records; some experts suggest the term not be used at all. However, adverse events secondary to medical errors occur; therefore, simply discontinuing the word's usage will not prevent or reduce these errors.[9] Uncovering the cause of these errors, as well as providing viable solutions to avoid these errors from occurring, is challenging. Healthcare professionals should be familiar with the different types of medical errors to understand better the adverse events that may be caused.

Common types of medical errors include surgical errors, diagnostic errors, medication errors, equipment failures, patient falls, hospital-acquired infections, and communication failures. By identifying the deficiencies, failures, and risk factors that lead to an adverse event, corrective measures can be developed to prevent similar errors. Encouraging individuals involved in every aspect of healthcare to report medical errors is essential to this process. Confidential reporting options are necessary to identify deficiencies or failures a system may contain. Changing workplace culture and developing protocols for addressing medical errors can encourage medical error reporting. Institutions that adopt a patient safety culture and implement corrective interventions can make healthcare safer for patients and healthcare workers. Working together, healthcare professionals can improve patient safety by identifying the contributing factors and events that result in medical errors, developing multifaceted prevention protocols, and implementing these strategies at various healthcare levels.[10]

Function

Patient safety has previously been outcome-dependent, focusing on preventing adverse patient outcomes. However, several studies have recognized that understanding the organizational failures that often lead to medical errors is critical to developing effective prevention strategies. To accurately identify the type of medical errors occurring, assess their prevalence, and determine potential inciting events, healthcare professionals must be familiar with the nomenclature typically utilized.[6][11]

Active and Latent Errors

An active error is a specific event that causes patient harm and involves the healthcare professionals providing some aspect of patient care, such as operating on the wrong eye. A latent error consists of intrinsic failures within the patient care process (eg, faulty equipment, ineffective organizational structure, or poor system design). These errors may go unnoticed for a long time without adverse effects. Latent errors are typically "accidents waiting to happen." An example of a latent error is a malfunctioning ventilator machine. However, the clinician's failure to check the device before use is an active error.[1]

Medical Error

The IOM defined a medical error as the failure to complete the intended plan of action or implementation of the wrong plan to achieve an intended outcome. Other experts characterized medical errors as deviations from the standard care process that may or may not result in patient injury. Additionally, medical errors can be categorized as either errors of omission or commission. Errors of omission cause adverse events through actions not taken (eg, not strapping a patient into a wheelchair or not stabilizing a gurney before patient transfer), while errors of commission occur secondary to a direct action by a healthcare team member (eg, administering a medication to a patient with a known allergy or mislabeling a laboratory specimen with the wrong patient name.[6][1] Subsequently, some experts define an adverse event as an act of omission or commission in medical management planning or execution that causes or can potentially cause patient harm.[6] Subtypes of medical errors include errors of communication, diagnostic errors, surgical errors, and patient suicide.[2] (Refer to the **Issues of Concern** section for more information on the types of medical errors.)

Adverse Event

The IOM identifies an adverse event as a patient injury resulting in disability or prolonged hospitalization caused by medical or surgical management rather than the patient's underlying condition. Adverse events can also include complications from prolonged hospitalization or factors inherent in the healthcare system. However, not all adverse outcomes are the result of a medical error. Instead, a *preventable adverse event* refers to a patient injury caused by a medical error.[6][5] Preventable adverse events are further categorized into the following subgroups:

- **Negligent adverse event**: Legal negligence is the failure of an average, qualified healthcare worker to meet the reasonably expected standard of care for a patient with similar circumstances (eg, failure to check a pathology report resulting in a missed cancer diagnosis). Similarly, a negligent adverse event refers to substandard medical or surgical management to the level that the legal criteria for negligence are met, which causes patient harm.[6][5]
- **Near miss event**: A medical error that could have resulted in patient harm but did not due to intervention or chance is identified as a *near miss*. Near misses are identical to adverse events except that a patient harm outcome does not occur. Therefore, near misses provide opportunities for developing preventive strategies and actions and should receive the same scrutiny as adverse events.[6][1]
- **Potentially compensatable event**: An adverse event (eg, disability and prolonged hospitalization) that could lead to malpractice claims is referred to as a potentially compensatable event.[5]
- **Never event**: These are medical errors that should never happen (eg, the development of pressure ulcers or wrong-site surgery).[5]
- **Noxious episode**: Diagnostic or treatment modalities that cause adverse events or complications are termed *noxious episodes*. For instance, sending a hemodynamically unstable trauma patient for prolonged imaging studies instead of the operating room, resulting in traumatic arrest and death.[5]

Analyzing Root Causes and Sentinel Events

A deficiency or decision that, if corrected or avoided, would eliminate the adverse event is referred to as a *root cause*. Several factors may often contribute to a preventable outcome of patient harm. The most common types of root causes include human error (eg, deficiencies in education, incomplete assessments, misdiagnosis), communication issues (eg, failure to disclose problems, inadequate patient counseling, failure to obtain informed consent), and organizational process deficiencies (eg, inadequate methods of identifying patients, equipment failures, lack of organizational protocols, or poor staffing and supervision).[12][13]

Furthermore, a *sentinel event* is defined by the Joint Commission as any unexpected adverse event "involving death, serious physical or psychological injury, or the risk thereof. The phrase 'or the risk thereof' includes any process variation for which a recurrence would carry a significant chance of a serious adverse outcome." Sentinel events indicate the need for an immediate investigation to discover the cause and develop corrective measures. Moreover, the Joint Commission reviews all sentinel events that have resulted in unexpected mortality, significant permanent harm,

or severe, temporary harm requiring intervention to sustain life, which they require all member healthcare agencies to report.[14] Sentinel events include:

- Patient abduction
- Unanticipated death of a full-term infant or any intrapartum maternal death
- Discharge of a child to the wrong family
- Hemolytic transfusion reaction involving administration of blood or blood products with significant incompatibilities
- Procedures on the wrong patient or at the wrong site
- Rape, assault, or homicide of any patient receiving care
- Severe maternal morbidity resulting in permanent harm or severe, temporary harm
- Severe hyperbilirubinemia in a neonate greater than 30 milligrams/deciliter
- The suicide of any patient receiving care in a staffed-around-the-clock care setting within 72 hours of discharge
- Unintended retention of a foreign object in a patient during surgery

The most commonly utilized methods of evaluating and assessing factors that led to a sentinel event or a medical error include root cause analysis and failure mode effect analysis. These investigations are essential to identify active and latent errors and develop prevention strategies.[15]

- **Root cause analysis**: Root cause analysis (RCA) identifies the causative factors contributing to adverse and sentinel events.[13][15] The Joint Commission requires healthcare institutions to do a root cause investigation after sentinel events to discover the causative and contributing factors that resulted in a sentinel event. Identifying these factors helps prevent repeated errors by constructing an improvement action plan. Members of the RCA team focus primarily on systems and processes, not individual actions.[13] For instance, when a hospital conducts a root cause investigation of a patient allergic to erythromycin who developed an acute anaphylaxis reaction after being prescribed azithromycin, an action plan to educate the entire medical staff on drug-drug interactions and similarities may be developed. Furthermore, an electronic medical record "stop alert" may be implemented to prevent this error from reoccurring. The Joint Commission is then provided this report, which is aggregated with all other RCA reports, and a risk-reduction strategy is published in the "Sentinel Event Alert" newsletter. Healthcare agencies failing to perform an RCA are placed on an "accreditation watch" by the Joint Commission, a public disclosure that a sentinel event occurred without completing an acceptable action plan. When a sentinel event threatens patient health and safety, the Joint Commission conducts onsite reviews.[13]

- **Failure mode effect analysis**: Failure mode effect analysis fosters safety and the prevention of accidents by proactively identifying potential or actual failures and their effects. Failure mode effect analysis engages in continual quality improvement processes and corrects areas where an error has occurred or is likely. The primary goal of failure mode effect analysis is to build redundancies to serve as multiple safety nets that prevent errors.[16]

Issues of Concern

Types of Medical Errors

Healthcare professionals should be familiar with the different types of medical errors to understand better the adverse events that may be caused. By identifying the deficiencies, failures, and risk factors that lead to an adverse event, corrective measures can be developed to prevent similar errors in the future. Subsequently, individuals involved in every aspect of healthcare can help implement appropriate preventative strategies to reduce future medical errors and improve patient safety.[15] Common types of medical errors being studied include surgical errors, diagnostic errors, medication errors, equipment failures, patient falls, hospital-acquired infections, and communication failures.[3][12]

Surgical Errors

Errors in surgery have the highest risk of severe patient injury and death. Intraoperative errors are estimated to be the primary issue in 75% of malpractice cases involving surgeons. Surgical errors involving the wrong site, patient, or procedure should never occur. Investigations into the factors that led to these types of surgical errors have demonstrated that common causes include clinician factors (eg, feeling rushed, distractions, and fatigue), miscommunication, changing or inadequate staffing, organizational factors (eg, discarding specimens as waste and not labeling specimens), medical record issues, and cognitive errors.[17]

Prevention measures have frequently consisted of adopting checklists, counting instruments, initiating antibiotic prophylaxis for deep vein thrombosis, and utilizing radio-frequency marked sponges.[3] Additionally, the performance of a surgical time-out has become a widespread strategy to reduce surgical errors. A time-out is a pause before a surgical procedure begins. The surgical team pauses and reviews the patient's identity, the consent form, the procedure being performed, and the correct anatomical structures and side involved, which should be marked on the patient's skin. If multiple procedures by separate surgical teams are planned, separate time-outs must be done. Surgeons and every surgical team member involved in the procedure must be present during the time-out, and any disagreement during the time-out should trigger an investigation by the surgical team until the discrepancy is resolved.[18]

Diagnostic Errors

The National Academy of Medicine defines a diagnostic error as "the failure to establish an accurate and timely explanation of a patient's health problems or to communicate that explanation to the patient," therefore, delayed or missed diagnoses are considered errors as well.[19] According to the Joint Commission, diagnostic errors result in the death or injury of 40,000 to 80,000 patients annually. Diagnostic errors are most common in primary care solo practices due to workload, time constraints, and the inability to confer easily with colleagues.[20] One study estimated that 12 million patients in the US had a diagnostic error made during their care, with 33% of those errors resulting in patient injury.[21] Conversely, patients seen in teaching medical institutions have many clinicians (eg, attendings, residents, fellows, and medical students), decreasing the chance of diagnostic error.[22] Diagnostic errors cause adverse events for approximately 5% of outpatients and 17% of hospitalized patients.[1][20]

Malignancies, surgical complications, and neurological, cardiac, and urological issues are the 5 conditions most frequently misdiagnosed.[23][24][21] According to studies, these conditions are frequently misdiagnosed secondary to knowledge gaps, resulting in deficient bedside assessment and clinical reasoning. Identifying these commonly misdiagnosed conditions is beneficial, as diagnostic errors are primarily cognitive rather than organization-based errors; therefore, clinicians can be forewarned of the potential challenges when caring for these patients.[25] In addition to a clinical knowledge deficiency, common contributing factors to diagnostic error include a clinician's fatigue, distraction, failure to consider differential diagnoses, neglect of diagnostic testing follow-up, and inadequate patient follow-up care.[1][20]

Reducing diagnostic errors requires a comprehensive approach that implements various strategies due to the many factors that can lead to these errors. System-based safety checks and cognitive aids are often recommended as interventions to help prevent diagnostic errors. Cognitive aids include algorithms to help guide decision-making based on accepted guidelines, "trigger tools" within electronic health records that remind clinicians to consider differential diagnoses for commonly misdiagnosed conditions, and checklists to prevent the omission of critical steps.[1][26] The use of cognitive aids and trigger tools has been shown to decrease the rate of misdiagnoses in recent studies.[26] Addressing deficiencies through various other strategies (eg, device-based decision support, simulation-based training, and increased specialist utilization) may also help reduce diagnostic errors.[21] Though ingrained practice methods and physician overconfidence can attenuate the success of these interventions, fostering critical thinking and promoting "pause and reflect" methods have been found to help avert diagnostic errors, especially in cases with obscure clinical findings or unexpected clinical trajectories.[27][25] Aside from encouraging critical thinking, opportunities for case discussions and second opinions should be made available for the treating providers. Healthcare facilities should also provide avenues for second opinions or interdisciplinary teams where cases can be discussed.[27] Other interventions to reduce diagnostic errors of commonly misdiagnosed conditions include simulation-based

training, performance feedback, and encouraging the contributions of nurses, pharmacists, and other health professionals during patient care.[21]

Medication Errors

Because there are several components involved with patient medications (eg, prescribing, dispensing, dosing, and administering), errors can occur in any of those areas. However, many medication errors are considered preventable.[28] Common medication errors include overriding medication-use safeguards, mistakenly administering a similar-sounding medication, or using out-of-date medications. System changes that can help decrease medication errors include computerized provider order entry (CPOE), barcoding systems to identify patients and medications, standardized units of measure, weight-based dosing, and having a pharmacist available to assist with calculating the correct dose. Furthermore, rechecking medication names and dosing before administration is critical to avoid preventable medication errors.[1][3]

Barcode administration and handheld personal digital assistants increase medication administration safety by providing real-time patient information, medication profiles, laboratory values, drug information, and documentation. Moreover, electronic medication administration helps identify incorrect medications and orders that have been canceled or modified. However, circumventing barcode procedures decreases safety at the point of care. Automatic dispensing systems that quickly make drugs available to patients allow pharmacy clinicians to engage in other safety activities, such as medication reconciliation. Additionally, look-alike medications should be stored away from more dangerous medications. Hospitals can also standardize storage areas and avoid medication containers that have a similar appearance. Pharmacy clinicians should remove dangerous medications from floor stock and discard out-of-date drugs as a preventative measure. Other strategies include using color-coded intravenous lines, utilizing standard concentrations of vasoactive agents, labeling syringes immediately after preparation, and capitalizing the differences on the labels of medications with similar names.[1][3]

Device and Equipment Errors

Health professionals generally believe technology will improve healthcare efficiency, lower cost, increase quality, and promote safety; however, these same technologies may also introduce errors and adverse events. Millions of healthcare providers use approximately 5000 types of medical devices worldwide, so device-related errors are inevitable. Medical equipment design flaws, mishandling, user error, and malfunction are common causes of medical errors. Additionally, a significant number of medical devices have been implanted in patients (eg, pacemakers, defibrillators, and nerve and brain stimulators), which may malfunction and result in life-threatening complications. Equipment errors can be due to device differences between manufacturers, inadequate testing and maintenance, poor design, and poor maintenance. Errors involving tube and catheter connections (eg, using catheters for unintended purposes, running the wrong line through a pump, and misplacing feeding tubes into the lung) are also common. These adverse events can have life-threatening effects if a misconnection is not corrected early.[29][30] To complicate the situation further, medications and food supplements are often delivered via these routes, and placement errors can result in administration or omission mistakes.

Health professionals should be involved in setting and evaluating institutional, organizational, and public technology-related policies. Safety primarily can be improved by developing protocols for equipment maintenance, training, monitoring, and reporting adverse events related to technology. Additionally, clinicians should be educated in remaining vigilant despite clinical assistance by devices and able to manage equipment failure situations.[31] Unique connectors for anesthesia catheters and feeding tubes can be used to reduce the chances of tubing misconnections.[32] Furthermore, clinicians and support staff should always trace lines back to the origin before connecting or disconnecting devices or starting infusions and labeling high-risk catheters.[29][30]

Hospital-Acquired Infection

Healthcare-related infections are considered a failure of the system. As many as 1 in 20 hospitalized patients may acquire a healthcare-related infection, increasing complications and the length and cost of the hospital stay. Healthcare-related infections add close to $35 billion to the annual cost of healthcare in the United States.[33] Common causes of hospital-acquired infections include failure to practice basic hand hygiene and poor technique in placing indwelling urinary and vascular catheters. Subsequently, the most prevalent infections are catheter-

associated urinary tract infections, surgical site infections, hospital-acquired pneumonia, central line-associated sepsis, and care-related skin and soft tissue infections.[33]

Changing the behaviors of healthcare team members is effective in reducing iatrogenic infections. Hand hygiene campaigns have been shown to decrease the number of nosocomial infection rates for various infections and should be universally endorsed.[34] Most healthcare facilities now employ specific protocols for minimizing central venous and urinary catheter use and using protective measures such as chlorhexidine for vascular catheter site care to reduce the incidence of healthcare-associated bloodstream infections, ventilator-associated pneumonia, and catheter-associated urinary tract infections.[3] Minimizing the duration of use of indwelling catheters has also effectively reduced the incidence of associated infections.[34][3]

To decrease the risk of nosocomial infections, pharmacy-driven antibiotic stewardship programs should be regularly employed in all patients admitted to a healthcare facility.[35] Frequent skin assessment and evaluation by wound care teams with regular and focused nursing education and evidence-based treatments should be routinely employed to lower healthcare-associated pressure injuries.[36] The care of surgical sites should follow similar protocols, with some studies proposing chlorhexidine-impregnated dressings to decrease the incidence of surgical site infections.[3]

Falls

Each year, over one-third of people older than 65 suffer a fall, with one-third of these causing injury.[37] In a healthcare setting, several factors may further increase the risk of falls, including:

- Blood loss
- Medication side effects
- Post-anesthesia effects, such as diminished lower-body sensation
- Decreased blood sugar
- Altered mental status
- Decreased strength or balance
- Advanced age
- Mobility impairment
- Inadequate staffing
- Increased proportion of new nursing staff [38]

Instituting fall prevention protocols in hospitals and long-term care facilities has significantly reduced these errors. Studies have shown that fall risk assessments using standardized scales such as the Morse fall scale can decrease patient falls.[3] Institutional interventions such as staff education, patient mobility training with rehabilitation professionals, and nutritionist support have also been shown to reduce patient falls. Other strategies include identifying patients at high risk for falls, providing patient safety companions, educating caregivers about fall prevention, and setting bed alarms and frequent safety rounds for all high-risk patients.[3]

Communication

Optimal interprofessional communication, as well as with patients, is essential for patient care. Therefore, communication errors commonly result in adverse events.[39] Reasons for impaired communication include disruptive patient behavior, environmental distractions (eg, cell phones and pagers), cultural differences, hierarchy issues, personality differences, language barriers, and socioeconomic variables, such as education and literacy.[1]

A courteous and respectful workplace where the interprofessional team collaborates promotes a safe work environment for all healthcare team members, families, and patients. Risk management committees and interprofessional task forces should work collaboratively on risk assessment and reduction. Joint education programs help providers and support staff learn roles and develop relationships to improve safety. The Joint Commission's Safety Goals require that for critical test results and verbal or telephone orders, a "read-back" verbatim to the

practitioner by the person receiving and recording the result or order. The practitioner should then verbally acknowledge the accuracy of the order.[1]

Additionally, healthcare staff should avoid common errors in written communication, such as using nonstandard abbreviations, illegible handwriting, failure to question inappropriately written orders, and failure to complete correct specimen labeling. Therefore, staff should be encouraged to ask questions when uncertain and trained to double-check that the patient's name is spelled correctly and their correct date of birth is present. The Joint Commission requires healthcare professionals to use 2 or more patient identifiers when labeling, delivering, and maintaining specimens. Since this is a National Patient Safety Goal, The Joint Commission closely monitors healthcare institutions' adherence to this requirement as they prepare medications and transfusions and transfer patients from unit to unit.[1]

Clinicians should also follow well-communicated protocols that guide care and communication with patients. Providers should listen to patients' questions concerning how care is delivered. Concerns must be respected and accepted if care plans contradict established evidence-based medicine. Moreover, the Joint Commission has supported "speak up" initiatives, which encourage hospitals to inform patients about the importance of their contributions to the care they receive in preventing medical errors. To make patients active participants in avoiding medical errors, encourage patients to ask about unfamiliar tests, unplanned diagnostic tests, and medications and to verify the correct surgical site.[1] Implementing standardized clinician-family communication at the patient bedside with family engagement and bidirectional communication also decreased the frequency of harmful medical errors and positively impacted the family experience.[40]

Communication errors during patient hand-offs can occur when incorrect information is passed to the receiving clinician or pertinent information is omitted.[41] Several techniques developed to minimize errors when handing off patients include using electronic records and mnemonics (eg, situation, background, assessment, and recommendation [SBAR]) to address all pertinent information.[42][43] The SBAR tool is considered a best-practice communication technique to deliver information in an organized and logical fashion during hand-off and critical patient care situations.[43]

The US's National Academies of Sciences, Engineering, and Medicine also recommend that these hand-offs occur in real-time and allow the opportunity to ask and respond to questions regarding pertinent facts about patient care.[44] This principle should be used when discharging patients from the hospital as well. Clinicians should remember to perform a final bedside evaluation and review discharge instructions before sending any patient home, including giving the patient a thorough written follow-up plan, counseling on new medications, and instruction to return to the hospital or office for new or worsening symptoms.

Clinical Significance

Medical error is a common cause of injury or death in the United States. Health professionals work hard to save countless lives; however, the incidence of concomitant error is high. All health professions should be focused on the effort to "do no harm" and work towards decreasing human and system errors. Most medical errors do not occur solely as the result of one practitioner or a group of practitioners; most are due to systems or process failures that lead to mistakes such as keeping dangerous and routine medications together without pharmacist supervision or cost-control measures that increase workload and the rate of medical errors.

Errors can be prevented by modifying processes to make performing incorrect actions more difficult, such as utilizing electronic systems for various aspects of patient care. However, system and process changes can not be made unless problems are identified. Through reporting protocols, medical error pattern recognition, root cause analysis, and outcome monitoring can be performed to address institutional deficiencies.[1] However, healthcare professionals may be reluctant to report errors due to fear of punishment or legal consequences. While individuals need to be held accountable for individual mistakes, the system and culture must be revised so that reporting errors leads to system improvement, not individual punishment.[45]

The greatest good for the greatest number of patients is achieved when processes are constantly focused on quality improvement and avoiding repetition of the same error. While they desire increased patient safety, healthcare professionals and other staff may fear reporting an incident may result in disciplinary action, including losing their jobs. Though failing to report medical errors contributes to the likelihood of severe patient harm, many healthcare

institutions have rigid policies that create an adversarial environment. This can cause staff to be hesitant to report errors, minimize problems, or fail to document problematic issues, contributing to an evolving cycle of medical errors and eventually tarnishing a healthcare institution's reputation.[8]

Therefore, an essential first step in reducing medical errors is encouraging reporting by removing any reporting barriers so that adverse events and near misses are identified. The most common barrier to medical error reporting is a fear of consequences.[46] Implementation of confidential reporting options is critical to the success of a reporting system to overcome any hesitancy an individual may have.[1] Furthermore, changing workplace culture, in addition to developing protocols for addressing medical errors, can encourage medical error reporting. Adopting a patient safety culture, where clinicians are empowered and rewarded for identifying medical errors that could lead to patient harm, has been shown to overcome the fear of consequences. Consequently, patient safety is improved by institutional cultures that incorporate both training and improvement efforts that target system redesign and an environment where individuals feel safe from retribution. All individuals on the healthcare team must play a role in making healthcare safer for patients and healthcare workers.[47]

Enhancing Healthcare Team Outcomes

Medical errors are a significant concern for patient safety in the healthcare industry. Healthcare professionals and policymakers can reduce medical errors by focusing on clinical education and implementing healthcare protocols that deter common mistakes.[48] Unintentional medical errors will likely always occur. However, the risk of medical errors may be significantly reduced by encouraging error reporting, standardized communication systems, electronic data and order entry, medication reconciliations, and error prevention clinical care protocols.

Physicians, advanced practitioners, nurses, pharmacists, surgical and pharmacy technicians, and other healthcare team members must work together to identify deficiencies resulting in medical errors and implement preventative strategies. Interventions such as surgical checklists, medication reconciliation, and confirmation of verbal orders are only effective when these individual team members contribute towards improving patient safety. Furthermore, each healthcare professional is responsible for patient monitoring and creating an environment that encourages effective communication to help minimize clinical errors. Moreover, accreditation agencies and training programs must continually focus on improving patient safety and teach ways to reduce common medical errors. A collaborative interprofessional team of these agencies, clinicians, and administrators can identify inherent system and process deficiencies and develop corrective measures to reduce the incidence of medical errors in the healthcare industry.

Nursing, Allied Health, and Interprofessional Team Interventions

To effectively decrease medical error rates and keep their patients safe, healthcare organizations must restructure nursing work environments, particularly hospitals and long-term care facilities. Inadequate working environments, excess duty hours, and high workloads can lead to missed nursing care and an increased risk of adverse events.[49] According to the Institute of Medicine (IOM), fatigue during shift work increases error rates and must be addressed to improve patient safety.[50] They propose the following recommendations to combat nursing fatigue during shift work:

- Avoid scheduling prolonged periods of wakefulness. Extended shift hours with >17 hours of wakefulness can negatively impact task performance, equivalent to the legal limit of alcohol intoxication.
- Avoid scheduling more than 4 consecutive 12-hour shifts.
- Avoid short off-duty periods. Off-duty periods of <8 hours can result in excessive fatigue during the following shift.
- Avoid extending duty hours beyond what was previously scheduled for the day.

According to the IOM report, these interventions are meant to guide scheduling and are not absolutes for working hours. Furthermore, the IOM stated that the overall error rate by nurses was approximately 0.00336 errors per hour worked, which was not significantly increased by working overtime, working longer than scheduled on a given day, or working extra shifts unless the shift duration exceeded 12 consecutive hours.[50] When shift durations were >12 hours, a substantial increase in error rate was noted even if the shift was voluntarily scheduled. Subsequently, the IOM

called for legislative and regulatory bodies to prohibit nursing staff from providing patient care above 12 hours in any given 24-hour period under any circumstance. The IOM also recommended limiting direct patient care nursing to 60 hours every 7 days.[50]

Other interventions recommended by the IOM focus on establishing a work environment that allows for easy monitoring of patients, limits interruptions, and minimizes clerical tasks. Special education and training should be provided for error-prone tasks such as medication administration, patient hand-offs, and supervising trainees.[50] The latter is essential to promote an ongoing culture of patient safety and error-free medication administration. A recent study surveying nursing students regarding their perception of medical errors committed during direct patient care reported that "less knowledge" about the task or procedure and "lack of supervision" were the primary causes of medical errors they committed during training.[51]

An overall commitment to patient safety at the organizational level greatly influences a nurse's adherence to and compliance with patient safety principles. Creating an organizational patient-safety climate, managing workload, reducing time pressure, and providing education for improving knowledge and skills enhances their adherence to patient-safety principles.[52] Close monitoring for medical errors, near misses, and nurse fatigue should follow the implementation of patient safety interventions, as nonpunitive, focused, and effective feedback can improve patient safety adherence and clinical outcomes.[49]

Additionally, emphasis should be given to individuals who require personal motivation, resist change, or are averse to innovation. These individuals need empowerment and a nonjudgmental approach in their training toward patient safety practices. Improving knowledge regarding patient care tasks and the breadth of medical errors that can be prevented with adherence to patient safety principles has been shown to enhance their commitment to patient safety.[52]

Review Questions

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