CHAPTER 199

Process Improvement and Patient Safety

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PERSPECTIVE

The overall process of patient care in the emergency department (ED) begins with the initial decision by the patient (or caregiver or family) to seek emergency assistance and ends with the patient's disposition and follow-up. The care process is highly complex, with many separate components, people, and interfaces with other processes in the health care organization (Fig. 199-1). This complexity, among other things, provides many opportunities for process failures, "errors," and adverse outcomes. Although process failures in health care have been studied for decades, most of that effort originated from outside of the field of health care, with health care professionals largely unaware of it.[1]

This began to change in the early 1990s when the Harvard Medical Practice Study reported that almost 4% of hospitalized patients suffered significant adverse events during their care and that almost 30% of these were due to human "error."[2] The study noted that failures in ED care accounted for only approximately 3% of all adverse events, but it estimated that more than 90% of adverse ED events were judged to be preventable. This study and others ultimately led the Institute of Medicine (IOM) to issue a report in 1999 titled *To Err Is Human: Building a Safer Health System*.[3] This report provoked the interest of the media and the general public and thrust the issue of safety in health care onto the national agenda. The major accomplishment of the IOM report was the introduction of some of the fundamental concepts regarding safety in complex systems for the first time into the world of health care. The most transforming concept was the idea that failures (or "errors") in care were not the result of bad decisions or bad individuals but were instead intrinsic properties of the processes of care in the health care system. Thus, efforts to reduce these failures should be focused on changing the processes of care rather than identifying, retraining, or punishing the workers.

The response within health care was mixed. Most health care professionals focused on the projected number of deaths due to "error," arguing that they were either too high[4,5] or too low,[6] and a third, smaller group argued that the concept of "error" was essentially contestable and thus an approach aimed at counting "errors" was fundamentally flawed.[7] The transforming concept of "system failure" rather than "human error" gradually gained acceptance, despite going against the natural human tendency to believe that individuals cause outcomes. This viewpoint is problematic because it undermines a clinician's sense of free agency; health care providers prefer not to view themselves as trapped in a system that is moving inexorably toward a bad outcome.

Within emergency medicine, safety and quality have been addressed by task forces, interest groups, and special sections examining the practice of emergency care, its processes, and environments using tools from the "science of safety"[8] to improve performance and cultivate patient safety. A basic curriculum for teaching about safety at the undergraduate level was developed with similar efforts taking place to implement safety concepts into medical education.[9]

Interesting lines of research on the safety and processes within emergency care have been performed, with a number of patient safety case reports published in the emergency medicine literature.[10] Chisholm and colleagues[11] reported that emergency physicians are interrupted, on average, approximately once every 6 minutes and that two thirds of those interruptions cause a change in task; this is important because both interruptions and task switching frequently lead to process failures. Fordyce and associates[12] reported that self-detected errors occurred in almost 20% of all ED cases but that only 2% were associated with adverse events. Fordyce and associates' work emphasizes that errors are ubiquitous but only rarely combine with other factors to produce adverse events, and it supports the notion that focusing on eliminating errors is not likely to be a productive strategy for improvement.

Coiera and colleagues[13] studied emergency physicians in Australia and reported high communication loads and found similar levels of interruptions. Morey and coworkers[14] reported that specific training of emergency physicians and nurses to work together in teams led to reductions in failures and improved performance. Perry and colleagues[15,16] identified a number of unexpected yet highly consequential failures of information technology that were difficult to detect, some occurring during emergency resuscitations. Wears and Perry[17] noted ergonomic shortcomings in the workplace and pointed out their potential for contributing to failures in care. Hall and colleagues[18] identified significant delays related to ED layout, with time to assessment of chest pain patients being greater for patients placed behind a door or who were 25 feet or farther away from the physicians assigned to care. These examples of safety research in emergency care demonstrate the wide range of known and unknown contributors to patient safety and the importance of the work processes that overlay this very complex work environment.

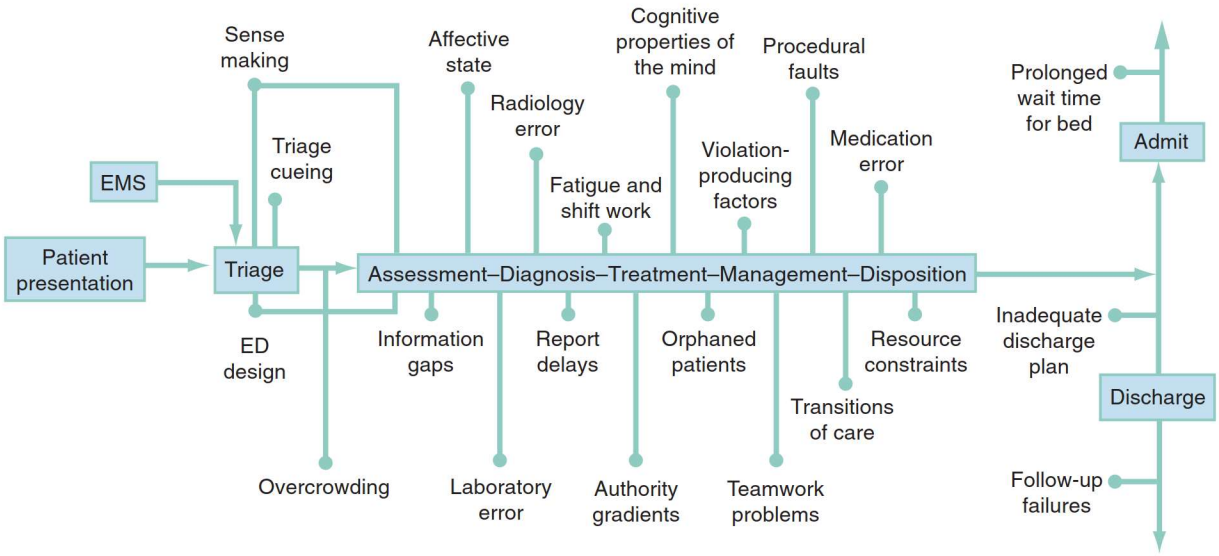

Figure 199-1. Process mapping showing sources of failures. The overall process is highly simplified and presented as a linear model of a patient's trajectory. (The actual process is much more complex, involving multiple simultaneous patients at different stages and loops within a given patient's trajectory.) Sources of failure may occur in parallel or at multiple stages in the sequence and are often additive in their overall effect on patient safety.

SOURCES OF FAILURE IN EMERGENCY CARE

Many characteristics of emergency medical practice make it vulnerable to failures (Table 199-1).[19-26] This section focuses on some of the principal factors that contribute to adverse outcomes and how they might be better managed to improve safety.

Emergency Department Design/Human Factors and Ergonomics

Two frequently overlooked contributors to lowered safety in any work environment are the design of the workspace and the engineering of the tools, technology, and procedures used to do the work.[27] This is especially true for EDs because the majority were not designed for the care actually being delivered there.[28] Emergency department caregivers are required to adapt to the space by creating "work-arounds" to cope with the limitations and impediments of the workspace.

Consistency is rarely found in equipment across or between areas. For instance, the blood pressure monitor in the ED is often not the same type or model as that used in the radiology department when the patient goes for diagnostic tests. In addition, tools and technology are seldom developed or assessed for their "user-centered design" or ability to be integrated into existing workspace and the associated hazards for doing so. This is most apparent with regard to health information technology, which is often introduced for improving safety and quality; however, embedded latent features that can produce clinical failures that are "hard to see" have been demonstrated.[29,30] Study of computerized physician order entry by Koppel and colleagues[31]showed that the software facilitated 22 types of medication error risks; for example, displays that prevented a coherent view of the patients' medications and inflexible ordering formats that generated wrong orders. Other contributors to information technology failure within health care are the lack of usability testing,[32] delays in in-service training, and failure to reassess the impact of the new technology and changes in clinical work following pre- and postimplementation.[33]

Table 199-1 Characteristics of the Emergency Department That Affect Performance

INTRINSIC*	EXTRINSIC†
Human cognitive properties	High communication load
High levels of uncertainty	Poor teamwork
High decision density	Overcrowding
High cognitive load	Production pressures
Narrow windows of opportunity	High ambient noise levels
Multiple interruptions/ distractions	Information gaps
Low signal-to-noise ratio‡	Report delays
Surge phenomena§	Inadequate staffing
Novel or infrequently occurring conditions	Poor feedback
	Inexperience
Patient factors (e.g., acuity, language, delirium)	Inadequate supervision
	Sleep deprivation/sleep debt
	Fatigue
	Multiple transitions of care
	Poorly designed procedures
	Emergency department layout

**Intrinsic* factors are intimately part of the nature of emergency care and as such are not amenable to change but instead must be compensated for.
†*Extrinsic* factors are in principle manageable and typically relate to resource constraints.
‡*Low signal-to-noise ratio* refers to the low likelihood of a critical diagnosis compared with a benign diagnosis for similarly presenting symptoms and findings (e.g., subarachnoid hemorrhage *vs.* tension headache).
§*Surge phenomena* refers to the rapid changes in volume and acuity, routinely experienced in many emergency departments.

The contribution of poor design to the difficulty in maintaining safety in a health care environment is generally overlooked by staff, who cope with these difficulties as "part of the job."[17] Vigilance is the common solution but despite caregivers' best efforts cannot be sustained given competing demands for their attention. This increases the risk of a failure not being

recognized as linked to the workplace, the procedures, or the equipment, despite being "tightly coupled" to any or all of these.

Overcrowding

Emergency department overcrowding has long been recognized as a major source of time-delay failures and a threat to patient safety.[34,35] It is important to understand that such delays are not simply an inconvenience to the patient but may give rise to significant adverse events. For example, patients with atypical presentations of severe illness who have been mis-triaged to low levels of acuity may experience inordinate and, occasionally, fatal delays. In other cases, such as community-acquired pneumonia, cellulitis, lacerations, and others, more expedient care may significantly improve the course of the illness. A significant proportion of patients who leave without being seen may have serious illness and incur delays in diagnosis and treatment. At the other end of the process, when the patient is ready for admission to the hospital from the ED, further time-delay errors may occur (see Fig. 199-1). Not only do such delays create throughput problems for the ED and contribute to overcrowding by front-end loading or "entry block" but also they give rise to discontinuities in care and may lead to adverse events that are difficult to identify because they manifest once the patient has left the ED.[36-38]

Information Gaps

Missing information is common in emergency care and can significantly affect quality of care.[39] Hospital records, especially discharge summaries, details of past medical history, and other important information is often difficult to access in an expedient manner, even with electronic medical records. Referral notes sent in by family doctors with the patient may not reach the emergency physician or may not contain relevant or significant details. In these situations, emergency physicians make clinical decisions and take action on the basis of incomplete, limited, or erroneous information. Emergency clinicians often end up not seeking additional or clarifying information due to time pressures, patient volume, or limited methods for obtaining more information (e.g., referring physician's office is closed), essentially accommodating to this "gap" in continuity of care and the associated increase in patient risk.[40]

Performance-Shaping Factors

Blaming individuals for "errors" in the ED contributes little to an understanding of risk, vulnerability, and failure. A wide variety of ambient, systemic conditions in the ED contribute to the majority of adverse events and near misses that occur (see Table 199-1). Some performance-shaping factors can be considered to be "intrinsic," part and parcel of the milieu of emergency medicine and thus not amenable to direct control (e.g., cognitive workload, multiple distractions and interruptions, and high acuity). These factors must be managed by strategies for buffering or mitigating their effects. In contrast, other "extrinsic" performance-shaping factors typically reflect limitations of resources (e.g., staffing ratios, production pressure, and ED layout). When resources are limited, a tradeoff can occur in the ability of the ED to provide safety and quality in patient care. This condition is referred to as RACQITO (*r*esource *a*vailability *c*ontinuous *q*uality *i*mprovement *t*rade-*o*ff),[41] a concept derived from speed-accuracy tradeoffs described in industrial settings.

BOX 199-1 VIOLATION-PRODUCING FACTORS

Gender
Mood
Ill health
Risk-seeking/risk aversion
Normalization of deviance
Maladaptive group pressures (groupthink)
Maladaptive copying behavior
Underconfidence/overconfidence
Perceived authorization to deviate
Authority gradient effects (obeying authority figure or absence of disapproving authority figure)
Likelihood of detection

Based on an original schema by Williams JC: Assessing and reducing the likelihood of violation behavior—Preliminary investigation. In Proceedings of an International Conference on the Commercial and Operations Benefits of Probabilistic Safety Assessment. Edinburgh, Institute of Nuclear Engeneess, 1997; adapted for emergency medicine in Crosherry PG, Wears RL: Safety in emergency medicine. In Markovchick V, Pons P (eds): Emergency Medicine Secrets, 3rd ed. Philadelphia, Hanley & Belfus, 2003. A summary can also be found in Reason J: Managing the Risks of Organizational Accidents. Aldershot, UK, Ashgate, 1997.

Violation-Producing Factors

Although at first one might think that violations of organizational policies, rules, and procedures would always be culpable causes of failures and adverse events, the modern approach to safety has pointed out that some violations are actually necessary for the safe functioning of the system, and others fall somewhere in between.[42] Aside from recklessness, drug use on the job, moral failings, and other egregious acts, research in other domains has identified other factors that are associated with the occurrence of rule and safety violations (Box 199-1). The "normalization of deviance"[43] is an accumulated tolerance of small variances from safe operating conditions that develops over time, ultimately compromising safety. This is evidenced in overtaxed EDs coping with overcrowding of patients (e.g., performing evaluation and management of patients in hallways). Violations can also occur in response to perceptions of authority. They may occur through a directive supporting violation from an authority figure (e.g., nursing supervisors order admitted patients moved to inpatient beds without calling to report if there are delays in reaching inpatient nurses), the absence of a disapproving authority (e.g., physicians leaving shifts early and the medical director does not address the behavior), or from an individual's self-perception that he or she is authorized to disregard or deviate from prescribed procedures (e.g., ED electrocardiograms done on patients in chairs because there are no available stretchers).

Fluctuations in mood can also contribute to violations for a variety of reasons and will result in inconsistent clinical performance; males are more likely to break safety rules and engage in more risk-taking behavior than females.[42] Risk-seeking and risk-averse attitudes have been associated aspects of decision-making in the ED.[44]

Teamwork

Good teamwork is essential to the safe practice of emergency medicine, but emergency caregivers are not trained or evaluated as teams. Teamwork training in other fields, such as aviation, has been successful in reducing failures related to poor communication, cross-monitoring (observing others' behaviors to reduce risk of failure and share workload), and authority

gradients (both within and between professions).[45] Work on transferring teamwork training principles to emergency medicine suggested that teamwork failures were involved in approximately 40% of malpractice cases.[46] The lack of cross-monitoring across team members and the failure of advocacy or assertion on behalf of the patient by caregivers to avoid patient harm were two of the most frequent factors identified. A multidisciplinary teamwork training course implemented in nine EDs showed a significant improvement in quality of team behaviors and a sixfold decrease in observed clinical errors.[14] Teamwork is not a specific fix for any one type of error, but it should be viewed as one type of adaptable human factor intervention with a set of teachable skills and behaviors capable of increasing system resilience and safety, which are hallmarks of high-reliability organizations.[47]

Teamwork training requires a change of culture, which can be difficult for ED staff. Institutional and ED leadership must be fully committed to the process before implementing teamwork training for all staff. Resistance to behavioral change is likely to be encountered, and it will be necessary to demonstrate the clinical relevance of this training. High-fidelity medical simulation supported by audiovisual feedback offers the educational methodology to help clinicians and staff understand the necessity of behavioral change.[48] A major unanswered question is how to embed teamwork behaviors into medical training and how to sustain the behaviors over time.

Authority Gradients

Almost all human groups have some form of authority gradient among members. This hierarchy can be based on profession (e.g., doctors have greater authority than nurses) or organizational rank (e.g., attending physicians have more authority than residents). Ideally, information between team members should flow freely, but this may not occur if low-authority members are inhibited by differences in seniority, stature, expertise, profession, or social status. There are clear examples of cases in which authority gradients have been responsible for adverse events.[49] A work environment in which all team members feel comfortable expressing their viewpoint, especially if it is a dissenting one, requires cultural change that can begin with the physicians who occupy the highest authority position in the clinical setting. Authority figures have the ability to initiate change by recognizing the value of perspectives other than their own and eliciting them from other clinicians and staff (e.g., asking a patient's nurse what he or she thinks may be going on with the patient). Senior clinicians are in a powerful position to bridge gradients by fostering open communication through multidisciplinary rounds, demonstrating that they are approachable (e.g., acknowledging staff by name), and the use of clinical narratives from their own experience that illustrate near misses and judgment failures.[50]

Cognitive Properties of the Mind

The human mind has characteristic dispositions to respond to particular stimuli and contexts in specific ways. A great deal of effort has gone into identifying and describing these; more than 30 *cognitive dispositions to respond* have been described.[17,51,52] A number of strategies have been proposed to reduce the adverse outcomes associated with cognitive dispositions to respond.[53]

The overall process of patient care in the ED is driven by a process of making clinical sense out of multiple sets of fragmented, tangential, and interrupted stimuli. This is aimed at making an accurate diagnosis if possible or, more commonly, a useful framing of the problem, which can determine management and disposition. Although many diagnoses, such as lacerations, dislocations, fractures, and foreign bodies, are self-evident, others (e.g., chest pain, fever, headache, abdominal pain, and syncope) are often associated with high levels of diagnostic uncertainty and are more likely to lead to problems. Cognitive biases can frequently be identified in retrospect following diagnostic failures,[54] but the problem of hindsight bias makes this identification problematic.[55]

In addition to cognitive mental properties, the emotional state of the physician can affect his or her decision-making; this has been referred to as *visceral bias*.[17,52] Relatively little attention has been directed at the important role of affective bias in decision-making. Although processes such as countertransference, fundamental attribution error,[41] and the economy of perception that underlies stereotyping are well understood in psychology, health care workers are typically less aware of them (e.g., "She's a drug seeker," "He's a frequent flyer," and "She just wants attention") and their effect on clinical interactions.

Fatigue and Shift Work

Both fatigue and shift work contribute to performance failures,[56] but relatively little research has been directed at their respective impacts on clinical performance in the unique milieu of the ED.[57] Although the two are often considered together, they are different entities and exert both qualitatively and quantitatively different effects on performance.[58] Fatigue has a number of determinants separate from those associated with shift work (Fig. 199-2).

Shift work has extensive, well-documented, detrimental effects on health that, in turn, have an impact on well-being and job performance.[59] Importantly, it leads to disruption of circadian rhythms that inevitably result in sleep deprivation. Circadian dyssynchronicity largely occurs through missing sleep in the *anchor period*, approximately midway through the sleep phase when core temperature and arousal level are at their lowest. It has been stated that the performance degradation of someone who has been up all night is roughly equal to that of a person with a blood alcohol level of 0.1% (Box 199-2).[60]

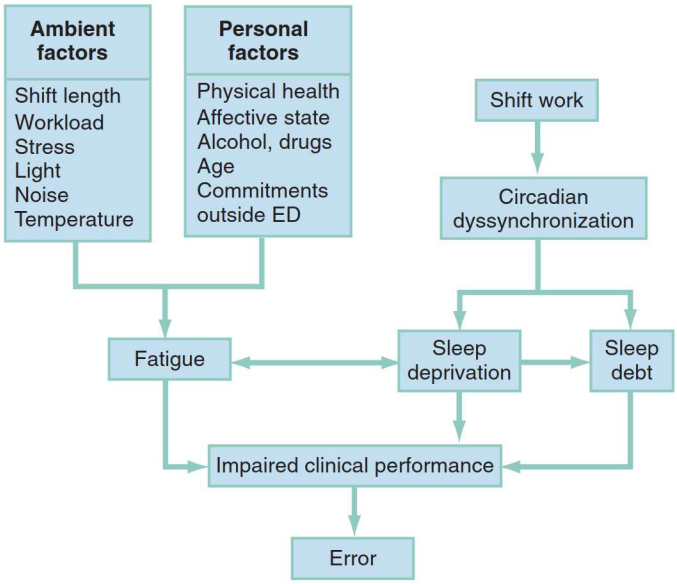

Figure 199-2. Relationships between shift work, fatigue, and performance.

BOX 199-2 EFFECTS OF SLEEP DEPRIVATION

- Longer reaction time
- Lapses in attention or concentration
- Lost information
- Errors of omission
- Poor short-term memory
- Poor mood (increased confusion, stress, and irritability)
- Reduced motivation
- Distractibility
- Sleepiness
- Poor psychomotor performance
  - At circadian low points
  - When sedentary
  - On long, difficult, or externally paced tasks with no feedback
  - In unchanging surroundings, particularly with reduced light or sound, or with low motivation, interest, or novelty

Adapted from Bonnet MH: Sleep deprivation. In Kryger M, Roth T, Dement WC (eds): Principles and Practice of Sleep Medicine. Philadelphia, Saunders, 2000, pp 53–71.

BOX 199-3 RATIONAL APPROACHES TO SHIFT WORK

- Optimize circadian-friendly schedules
  - Forward rotating (clockwise with circadian rhythms)
  - Rapid changes
  - Minimize consecutive nights (1 or 2)
  - 24–48 hr off after nights
  - Allow social time, including some weekends
  - 8-hr shifts (absolute maximum 12 hr)
  - Institute regular, predictable template
- Employ proper sleep hygiene
  - Use a sleep-friendly room: room-darkening blinds, "white noise" (e.g., electric fan) or earplugs, no phones, family aware
  - Maintain a regular sleep routine
  - Try anchor sleep
  - Avoid caffeine, alcohol, and drugs
  - Prophylactic naps
- Modulate circadian rhythms
  - Exercise
  - Consider bright light
- Eat healthy
  - Eat a balanced diet
  - Avoid junk food
  - Keep regular mealtimes
- Promote a healthy lifestyle and work style
  - Promote a personal healthy lifestyle
  - Educate friends and family about shift work issues
  - Educate colleagues about shift work issues
  - Advocate for department improvements in working conditions
  - Advocate for shift worker–friendly community services
- Avoid pharmaceuticals
  - Use caffeine in moderation, prn
  - Do not use sedatives or stimulants
  - Avoid alcohol before sleep

Adapted from Jha AK, Duncan BW, Bates DW: Fatigue, sleepiness, and medical errors. In *Making Health Care Safer: A Critical Analysis of Patient Safety Practices.* Evidence Report/Technology Assessment No. 43, AHRQ publication 01-E058. Rockville, Md, Agency for Healthcare Research and Quality, 2001; and Frank JR: Shiftwork and emergency medicine practice. Can J Emerg Med 4:421, 2002.

The acute effects of sleep deprivation are well-known, but the chronic effects are less appreciated. Invariably, working a night shift results in less sleep the following day, and subsequent sleep is often disrupted and fragmented in the struggle to restore the circadian rhythm before the night-shift cycle repeats itself. This results in the accumulation of a *sleep debt* that has a significant impact on performance. A study of anesthesia residents on a normal work schedule, with no on-call duty in the preceding 48 hours, showed daytime sleepiness scores comparable to those of patients with narcolepsy or sleep apnea.[61] The on-call schedule of these subjects (five periods per month) entailed considerably less sleep deprivation and fragmentation than an average emergency physician's schedule. Increasing age is associated with decreased tolerance for sleep deprivation.[62]

Performance declines as work hours increase,[63] but the optimal shift length in the emergency department is unknown and difficult to delineate for several reasons. The relationship with workload or acuity is not well appreciated, and some workers exhibit contradictory incentives, such as preferring to work longer shifts to get more days off. More recovery time between shifts might be expected to enhance job performance, but these issues remain relatively unexplored. A survey of emergency physicians found a preference for 8-hour over 12-hour shifts,[64] but it is not known whether job satisfaction in the ED translates into improved clinical performance and fewer adverse events. Other ambient conditions within the ED, competing commitments outside the ED, age, ill health, and other factors all contribute to fatigue, with evidence pointing toward additional health implications for emergency physicians.[65,66]

The appropriate management of shift work and fatigue to improve patient safety is not well understood, and further research is needed in this area. In most high-hazard industries, the assumption is that fatigue and long, aberrant work hours lead to poor performance; however, in the health care industry, concerns regarding discontinuity of care and difficulties in changing medical culture have obscured these issues. Given that medical personnel, like all human beings, function suboptimally when fatigued, efforts to reduce fatigue and sleepiness should be undertaken, and the burden of proof should be in the hands of the advocates of the current system to demonstrate that it is safe.[60] In the meantime, shift scheduling should be optimized to reduce the impact of circadian disruption, and ED personnel should practice good sleep hygiene. Some basic approaches have been reviewed (Box 199-3).[59,63]

PROBLEM AREAS IN EMERGENCY CARE

The mechanisms of failure within the ED are remarkably variable, with a cadre of known and unknown contributors. Areas of consistent concern within emergency medicine include triage, technical procedures, laboratory and radiographic tests, transitions in patient care, orphaned patients, and medications.

Triage

The point of entry of all patients into the ED is through triage. Triage, or sorting by acuity, is by definition an abbreviated decision-making process that can never be completely safe because of the limited information available, lack of time invested, and the variety of presentations of illness and injury. An additional problem is that there is a low "signal-to-noise"

ratio for a number of serious conditions (i.e., when the incidence of a serious condition is far exceeded by that for a benign condition, but their clinical presentations are similar). Inevitably, the triage process involves tradeoffs between sensitivity and specificity. Undertriage for a particular patient would have a greater potential for an adverse event than overtriage, whereas overtriage affects resource utilization and may have an impact on the care of other patients.

Triage assessments are important contributors to process failures and adverse events. Beyond treatment delays, which can occur with undertriage or be produced by overtriage, an incorrect assessment may be the triggering event that initiates a chain of failures. Geography can become destiny, and an inappropriate triage to a specific treatment area may create a bias in the minds of the treating clinicians and staff. The use of five-level triage systems for adults and children, with excellent inter-rater reliability, offers an opportunity to reduce the risk associated with undertriaging.[67,68]

Technical Procedures

The practice of emergency medicine requires proficiency in a wide range of procedures with varying degrees of difficulty. Patients who require procedures are at greater risk for adverse events.[12] Contributors to this higher risk include not only problems with proficiency but also a low frequency for use of higher risk procedures. Critical procedures, such as cricothyrotomy, pericardiocentesis, and endotracheal intubation, are rarely performed in many EDs. When they are needed, they are highly consequential events under significant time pressure for intervention, therein reducing opportunity for refreshing skills prior to performing the procedure. The acquisition and especially the maintenance of a requisite level of skill is an important problem in emergency medicine. Simulation techniques have considerable potential here[69] but require both capital and human investment to be effective.

Laboratory

The interface between the ED and its ancillary services is critically important. Failures can occur at three phases of laboratory processes. Preanalytic errors mostly occur through inappropriate collection of specimens due to lapses in technique, timing, and identification of both patient and specimen. Analytic errors refer to those that arise directly from the testing process. Postanalytic errors occur after the test result has been obtained and can take many forms (e.g., keyboard entry errors, overlooked or lost data, and failure of results to reach physician). Studies on a blood bank and a stat lab both found that the majority of failures occurred in the pre- and postanalytic stages, with less than 5% in the analytic stage.[70,71] Overall, the laboratory defect rate is less than 1%, but the number of exposures is very large. Of the failures that do occur, up to 50% may have a moderate impact, with up to 8% having a severe impact on patient care.[72]

Radiology

Radiographic imaging is a critical aspect of diagnosis and management in the ED. Although patient identification and wrong-side problems are important sources of failure, the majority lie in interpretation. Assuming the radiologist's interpretation to be the criterion standard, the rate of errors in interpretation by emergency physicians and residents may be as high as 16% for plain radiographs and more than double that rate for computed tomography scans.[73] Clearly, not all misinterpretations are consequential, and emergency physicians typically seek the advice of the radiologist when they recognize difficult interpretations. The introduction of digital imaging and picture archiving communications systems has resulted in new patient safety issues related to usability, the effect of monitor resolution on interpretation, and reconciliation of ED physician and radiology readings.[74] Significant interpretation errors can be detected with prompt review of all films by the emergency physician and radiologist, but effective procedures are required to ensure that timely and appropriate feedback and review occurs. This approach has been demonstrated to substantially reduce the rate of clinically important misinterpretations.[75]

Transitions in Patient Care

The need for 24-hour access to care and the fragmented nature of health care delivery require the occurrence of transitions of care between providers, either within the ED (at shift changes) or between the ED and other care areas (when patients are admitted, transferred, or discharged). The shift "sign-over" or "handoff" is generally thought of as a communication activity performed for the transfer of clinical information, but it also embodies the transfer of responsibility and authority from one provider to another. The sign-over also conveys general situational awareness (e.g., the state of the department, hospital, and city) and provides a forum for reviewing decision-making and treatment plans.

There has been little study of these transitions of care, despite their ubiquity and importance to the specialty.[20,76] Sign-overs are highly variable in their content, the number of individuals involved, the physical configuration (e.g., walking, stationary, and at bedside), the tools used to facilitate the transition (e.g., white boards, medical records, and written notes), and the length of the transition process. Although widely regarded as providing a major contribution to adverse events, sign-overs also provide an opportunity for review of decision-making by clinicians and may provide opportunities for recovery by bringing "fresh eyes" to a patient's case.[20,76]

Potential threats to high-quality transitions include the following:

- Interruptions during the turnover (e.g., phone calls and sidebar conversations) can cause a loss of focus and lead to the omission of important information.
- Lack of consistent structure to the turnover: Although the traditional case presentation narrative is generally followed (chief complaint, history, physical examination, initial laboratory results, impression, and plan), the case presentation format does not automatically remind participants of pending or as yet uncompleted tasks.
- Patients are commonly "marked" in ways that can sometimes be helpful but sometimes harmful, especially for at-risk groups such as the homeless, psychiatric patients, alcoholics, or drug abusers.

Common sense and well-meaning approaches such as standardizing verbal content and compulsory use of sign-over checklists risk extinguishing latent safety features inherent to them without further research of this complex and vital work tool for emergency medicine and health care overall.

Orphaned Patients

Orphaned patients are those who have suffered temporary loss or diminished supervision or accountability for their ED care. This may occur at several stages in the process. Patients who are seen and assessed at triage and then wait in the waiting

area are temporarily orphaned. Those who are brought in by paramedics sometimes remain on stretchers for hours before being admitted to the ED. Patients who leave without being seen or before treatment is completed have "orphaned" themselves. Patients can also be temporarily orphaned out of the ED for radiographic studies or other special tests. Occasionally, patients get "lost in the shuffle" and are overlooked at shift change, or they may get "lost" after one or more consultations with other services. With prolonged wait times, occult conditions can mature to serious and potentially catastrophic levels. A significant cause of orphaning in some EDs is the "boarding" of admitted patients because no inpatient beds are available. In such cases, patients may be put in holding areas in or adjacent to the ED and receive sporadic care from a succession of caregivers who know increasingly less about their conditions. The risk of harm to patients caught in this "gap" within the ED is not well studied.[40,77]

Medications

Medication errors constitute the largest proportion of failures in most general studies, with failures occurring in all six steps of the process (prescription, transcription, dispensing, administration, monitoring, and discharge).[78] Many EDs take on the dispensing role, obviating input from the pharmacy, where many errors are corrected. In addition, team communication errors can contribute to many failures: missed medications, wrong medications, and duplicate dosing. Pediatric patients are at higher risk; drug errors are no more common than in adults, but they are typically more serious.[79,80]

The presence of a pharmacist on the clinical team has been shown to reduce medication errors in several settings.[81] There is great interest in the potential for computer technologies, such as bar coding or computerized physician order entry, to enhance medication safety. However, despite some successful demonstrations, widespread implementation has not occurred, and there is evidence that such systems introduce new problems to replace old ones.[82] The Institute for Safe Medication Practices has recommended certain problematic practices be avoided in writing orders or prescriptions.[83] Success in this area will require more than just individual attentiveness; nurses, unit secretaries, and pharmacists will have to feel comfortable challenging improper usage by physicians.

CONCLUSION

The safe management of patients in the ED depends on a multiplicity of processes. All appear vulnerable to failure, yet all have the potential for improvement through judicious process management. Efforts by front-line workers will not be sufficient, and so considerable effort will be required at the administrative or "blunt end" of the system.[84]

Safety in complex dynamic environments, such as the ED, is itself dynamic. *Safety is a "nonevent" because it is evidenced by the absence of things that should not or do not occur*, such as administering a medication to the wrong patient. It cannot be banked for future use but is created by workers in a well-designed and supportive organizational environment. Achieving safe performance in settings such as the ED is analogous to fighting a guerilla war: There are no dramatic victories, but there are occasional horrific defeats, with no end in sight. The establishment and maintenance of successful safety cultures within health care will require constancy of purpose by health care organizations, a willingness to adopt new ideas and tools from outside of health care, and commitment to continued effort and investment.

The references for this chapter can be found online by accessing the accompanying Expert Consult website.