



ASSOCIATION OF
AMERICAN
MEDICAL COLLEGES

Patient Safety and Graduate Medical Education

February 2003

A Report and Annotated Bibliography by the Joint Committee of the
Group on Resident Affairs and Organization of Resident Representatives

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The committee acknowledges with thanks the constructive comments received on an earlier draft of this monograph that was circulated at the 2002 AAMC Annual Meeting.

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Preface

This monograph emerged from the joint efforts of the Group on Resident Affairs (GRA), comprising GME leaders from AAMC member organizations, and the Organization of Resident Representatives (ORR), the voice of residents in the AAMC, on an issue that is important to both bodies. Its beginnings were in thought-provoking presentations by James Bagian, M.D., Robert Wears, M.D., Peter Clark, Ph.D., and others, in sessions sponsored by GRA. The issues were discussed by ORR and GRA members in a plenary session in the spring of 2001. Progress was advanced through subsequent meetings of the GRA Steering Committee with the ORR Administrative Board. These meetings led to the formation of the joint committee that authored the document.

The committee considers the monograph both an important perspective on patient safety in relation to medical education and an excellent example of productive collaboration between two AAMC constituencies.

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Introduction

Even though the 2000 Institute of Medicine report, *To Err is Human*, builds upon more than 30 years of literature reports on medical errors in hospitals, the resulting public scrutiny of this issue has been unprecedented.¹ The technological excellence and the quality of care in American hospitals had been previously unquestioned. The magnitude of the problem, estimated in the Institute of Medicine report as 44,000 to 98,000 preventable deaths each year due to medical error, can be debated. Nonetheless, all hospitals, medical professionals, and medical educators are now challenged to improve the safety, while maintaining the efficacy and cost efficiency, of medical care.

We believe that teaching hospitals have many advantages. When studies have compared teaching and non-teaching hospitals, patient outcomes in teaching hospitals generally have been better.² Teaching hospitals also develop and disseminate cutting edge medical technologies and innovative treatment strategies that result in widespread improvements in patient care. Too, the inherent redundancy in teaching hospitals--where students, residents, fellows, and attending physicians provide input and oversight into the care provided to each patient—can serve as a fail-safe mechanism.³

We must acknowledge, however, that the conduct of graduate medical education, especially in large teaching hospitals with diverse patient populations, presents both challenges to patient safety and opportunities for education about patient safety. The overall severity of patient illness in teaching hospitals is generally greater than in non-teaching hospitals, increasing the risk of adverse outcomes. Too, patients from underserved populations may present late in the course of their diseases and with significant medical and socioeconomic disabilities. As the sophistication and complexity of medical interventions and their surrounding systems increase, along with the proliferation of drugs, tests, and procedures, the chances of human error or systems failure increase. And with very tight financial margins, teaching hospitals may find it difficult to provide optimal staff, supplies, and equipment.⁴

Not least, teaching hospitals have the dual-edged sword of resident supervision and graded resident responsibility, with the need to balance the needs of current patients against the future societal needs for competent, adequately trained physicians.⁵ While study, observation, and simulation can contribute to residents' development, at some point they must learn by performing real procedures on live

¹Kohn, Linda T., et. al., eds.; *To Err is Human: Building a Safer Health Care System*. Committee on Quality of Health Care in America, Institute of Medicine. National Academy Press, Washington, D.C., 2000.

²Allison, J.J., et al, Quality of care at teaching and nonteaching hospitals. *JAMA* 284:1000-1005, 2000;Ayanian, John Z., et al, "Quality of care in teaching and non-teaching hospitals for two common illnesses. *Health Affairs*, 1998.

³"In a teaching hospital, the management of the patient includes not only a cross-section of disciplines, but also the participation of medical students, interns, residents, and attending physicians. Such teams have the potential to make better decisions than lone problem solvers because they have the collective power to consider larger and more varied constellations of facts." Page 45 in Christensen, Caryn, et al, Decision making of clinical teams: communication patterns and diagnostic error, *Medical Decision Making* 20:45-50, 2000.

⁴MEDPAC, Medicare Payment Policy: Report to the Congress , March 2002, Table B-13.

⁵Gawande, Atul, The learning curve, *The New Yorker*, January 28, 2002

patients. When this occurs the likelihood of errors increases. And errors by residents are well documented in the medical literature.⁶

This monograph is in no way a comprehensive review of the rapidly expanding literature on patient safety.⁷ However, the Steering Committee of the Group on Resident Affairs and the Administrative Board of the Organization of Resident Representatives believe that the perspective of resident educators and residents needs to be articulated in the evolving public debate. We hope that this monograph and its accompanying bibliography of basic references will be useful to Designated Institutional Officials for GME, GME program directors, and residents as they evaluate their graduate medical education programs for risks to patient safety and assess programmatic strategies to reduce these risks.

We also recognize the importance of patient safety issues in the ACGME core competencies and hope the monograph contributes to the development of education strategies in patient safety for residents.

Last, we recognize that teaching about medical errors and patient safety should begin during medical school. That educational process should continue throughout residency and fellowship training, and thereafter into the clinical practice setting.

Implicit Risk To Patient's Safety

While patient safety should be foremost in the minds of caregivers, medical error is an inescapable reality. As physicians, we are obligated to diligence, effort, and expertise in the care we provide to patients, but our results can never be guaranteed. Reason has noted that in medicine, as in all hazardous human activities, the possibility of an accident can never be completely discounted.⁸ This possibility exists because:

1. Human beings make fallible decisions and commit unsafe acts,
2. All "man made" systems contain latent errors and failures that, in specific circumstances, combine to cause disasters, and
3. Medicine, like all human endeavors, involves risks for patients and caregivers.

Public proclamations and legislative mandates of "zero tolerance" for medical error suggest a lack of understanding of Reason's observations and of complex human systems. Health professionals do not willingly commit errors, and conversely, no amount of personal diligence or technological innovation—not to mention legislative mandates--can eliminate all errors. This being said, medicine has lagged far

⁶Shaughnessy, Allen F., and Ronald Nickel, Prescription-writing patterns and errors in a family medicine residency program, *Journal of Family Practice* 29: 290-295, 1989; Gratton, Matthew C., et al., Clinically significant radiograph misinterpretations at an emergency medicine residency program, *Annals of Emergency Medicine* 19:497-502, 1990; Wray, Nelda P. and Joan Friedland, Detection and correction of house staff error in physical diagnosis, *JAMA* 249:1035-1037, 1983; Cohn, K.H., Misadventures in surgical residency: analysis of mistakes during training, *Current Surgery* 42:278-85, 1985.

⁷This literature covers a large territory including how patient safety efforts should be focused (e.g., JAMA April 17, 2002 articles by McNutt et al and Layde et al), the nature and type of possible public policy interventions, and the need for tort reform to encourage reporting and prevent errors (e.g., Studdert, David and Troyen Brennan, No-fault compensation for medical injuries: the prospect for error prevention, *JAMA* 286:217-223, 2001).

⁸Reason, James T., *Human Error*. Cambridge: Cambridge University Press, 1990. Reason defines error as the failure of a planned action to be completed as intended (i.e., error of execution) or the use of a wrong plan to achieve an aim (i.e., error of planning).

behind other complex, “high-risk” endeavors, such as commercial aviation and nuclear power generation, in which human and systems errors are acknowledged as inescapable consequences of the human condition. In these industries, the focus is not on individual errors but on systems that will reduce probability of errors and mitigate their effects on clients, employees, and the general public when they do occur.

Medical Error Risks in Teaching Hospitals

1. Resources in Teaching Hospitals

Teaching hospitals traditionally have provided the most technically advanced medical services, and yet currently operate on the slimmest financial margins. A high proportion of uninsured or underinsured patients served by the teaching hospitals, including patients in under-funded government payment programs, reduce the ability of teaching hospitals to invest in supplies, equipment, information systems, and personnel necessary to maximize patient safety. Involving house staff in support and clerical tasks may be cost-effective, but these practices can compromise both the quality of the graduate medical educational experience and the safety of care provided.

The work environment of teaching hospitals must enable safe patient care. At a fundamental level, medical care is the continuous exchange of information between patients and caregivers. Hospital information systems that facilitate the accurate, timely transmittal of critical clinical information are essential. Adequate systems and personnel allow residents to concentrate on educationally appropriate physician activities, rather than serving as surrogates for ward secretaries, transport personnel, electrocardiography, laboratory technicians, and phlebotomists. Appropriate information systems also facilitate the transfer of patient responsibilities from one physician or care team to another.

Workforce shortages such as the current national nursing shortage also are felt most acutely in major teaching hospitals. These hospitals often have difficulty in outbidding more financially secure non-teaching hospitals for the limited pool of qualified nurses and other patient care professionals such as physician assistants. Reductions in bedside caregivers such as nurses and respiratory therapists can reduce the number and quality of bedside observations that inform residents and attending physicians of the clinical progress of their patients.

The IOM Report focused attention on medication errors, although all hospital processes that require the transmittal of complex information between multiple individuals or sites, are prone to error. The Leapfrog Group, among others, has recommended computerized physician order entry systems as a critical strategy to reduce medication errors.⁹ Ideally, such systems would include logic-based forcing functions that screen for inaccurate data entry, drug allergies, drug food, drug medication, and other potentially adverse interactions and “critical path” recommendations for cost effective drug utilization. For optimum system efficiency, computerized medication order systems should be linked to automated drug dispensing by hospital pharmacies and bedside patient recognition systems. While the inherent value of such systems would seem self-evident, the availability of such comprehensive integrated medication systems is limited, and the costs currently associated with their development and implementation are substantial.

⁹http://www.leapfroggroup.org/consumer_intro2.htm

In addition to their potential for improving patient safety, these systems offer excellent educational opportunities for residents. They can provide case examples for discussion at conferences and rounds. They offer opportunities for research by faculty and residents into prescribing practices in terms of cost, efficacy, and patient outcomes. They also give residents a chance to scan the latest literature and contribute to updating the algorithms that guide drug prescribing and dispensing.

2. Underserved Patient Populations

Major teaching hospitals provide a disproportionate share of primary and specialty medical care to underserved populations, particularly in large urban centers. Patients often present for medical evaluation and care late in the course of their disease. Young woman may receive little prenatal care before presenting for delivery. Outpatient programs designed to improve continuity of care and access to preventive health services may be challenged by economic or cultural barriers to access. Continuity also may be disrupted by the inevitable turnover of residents, faculty, and nursing staff in teaching hospital clinics, as well as the migratory behaviors of certain populations served. A seamless longitudinal electronic medical record, allowing instantaneous access to critical patient data by caregivers in multiple sites may alleviate some of the difficulty with data storage and transmission, but such systems represent a significant capital investment for institutions already operating on reduced financial margins.

While diverse patient clients, including immigrants and migratory populations, present medical challenges that can contribute to errors, they also offer important educational opportunities for residents in learning to care for people from various cultures whose medical and treatment histories are not always well documented.

3. Residents

The excellence of care provided in teaching hospitals in no small way relates to the presence of residents. The availability of round-the-clock bedside assessment by such highly trained and motivated professionals allows the rapidly evolving course of critically ill patients to be carefully monitored. As a result, many problems are identified and treated before significant morbidity or mortality results.

At the same time, inexperience, resident stress and fatigue, and the quality of faculty supervision can impact the safety of care provided by residents. Both acute and chronic fatigue can contribute to errors by residents and likewise contribute to resident stress and burnout. A recent survey of internal medicine residents found that 53% of internal medicine residents experienced a high rate of emotional exhaustion and 64% demonstrated high depersonalization, both characteristics of burnout. A high score for depersonalization was associated with self-reported suboptimal patient care.¹⁰ Resident stress also is felt in family and social relationships, even more so as increasing numbers of residents are women.¹¹ Acute and chronic sleep deprivation increases the risk of errors by residents, especially in the

¹⁰Shanafelt, Tait D., M.D., et.al, Burnout and self-reported patient care in an internal medical residency program, *Annals of Internal Medicine*, Vol. 136, pgs 358-367, 2002.

¹¹Landau, Carol, et al, Stress in social and family relationships during the medical residency, *Journal of Medical Education* 61:654-660, 1986.

performance of routine tasks.¹² Lessons learned from other industries that rely on sustained critical performance by individuals working long-duty hours (e.g., commercial airlines, long-distance trucking), indicate:

1. the need for periodic rest during extended duty hours,
2. recognition of “sleep inertia”, the delay after awaking until peak performance is achieved,
3. recognition of the impact of circadian rhythm cycles on performance,
4. the need for work schedules that prevent chronic sleep deprivation.¹³

It is difficult to justify asking patients to pay attention to their health if we do not demonstrate respect for the health of their doctors.

The 2001 AAMC policy statement, “Graduate Medical Education: Assuring Quality Patient Care and Quality Education”, clearly articulates these principles in its recommendations for resident duty hours.¹⁴

1. No more than 80 hours of duty in any week (including moonlighting).
2. No more than 24 hours of continuous duty.
3. In high-intensity areas (the emergency department, critical care units), no more than 12 hours of continuous duty.
4. Duty-free intervals between periods of on-call of at least 8 hours.
5. Overnight on duty hours no more frequently than one night in three (average total of 4 weeks).
6. At least 24 hours of consecutive hours free of all assigned duties, every 7 days.
7. On-duty hours spent delivering patient care services of marginal or no educational value should be minimized.

The Accreditation Council for Graduate Medical Education recently is developing slightly more flexible requirements limiting residents to 80 hours per week with the possibility of a 10 percent increase if required for education, and 24 hours of continuous duty plus an allowance of up to 6 hours for patient transfer. These requirements are to become effective in July, 2003. To attain an 80-hour week for residents, some programs will need to change how residents are utilized in patient care and how educational activities are conducted. Program changes to reduce resident hours on duty will need to be made in ways that are not detrimental to patient care or patient safety. Residents will continue to need to

¹²D. Dinges and N. Kribbs, “Performing while sleepy; effects of experimentally-induced sleepiness” in T. Monk, ed., *Sleep, Sleepiness, and Performance* 1991; D. Dinges, “Probing the limits of functional capability: the effects of sleep loss on short-duration tasks” in R.Broughton and R. Ogilvie, eds, *Sleep, Arousal, and Performance* 1992.

¹³Presentation to GRA spring meeting by Dr. David Dinges, April 15, 2002.

¹⁴AAMC Policy Guidance on Graduate Medical Education: Assuring Quality Patient Care and Quality Education, October 2001; <http://www.aamc.org/hltcare/gmepolicy/start.htm>

observe the evolution, over time, of a patient's disease, and to learn to place the patient's interest first. They will continue to need to learn how to appropriately transfer responsibility for a patient to another physician through a combination of rounds and sign-offs and computerized patient information systems or other technological aids to recording and transferring clinical information.

Changes also will need to be mindful of the resident's education needs. Formal educational events may need to be scheduled differently. Multidisciplinary rounds, with input from other disciplines participating in that patient's care, may provide a more comprehensive picture of that patient's clinical course in response to prescribed therapies and increase a case's educational value. Finally, timely accurate communication between the resident team and the responsible faculty is a mutual responsibility.

The "AAMC Policy Statement on Graduate Medical Education" emphasizes the importance of patient wellbeing, stating that "Limiting required duty hours does not imply that residents must cease providing essential patient care services at arbitrary cut-off times. Priority must always be given to patient safety and well-being and to avoiding transferring patient care responsibilities to others at inappropriate times in the continuum of care (e.g., during an operative procedure, in the midst of a rapidly evolving clinical event)."

The AAMC Policy Statement also emphasizes the importance of faculty supervision to assure quality patient care in GME settings.¹⁵ The faculty physician of record is fundamentally responsible for the quality of all clinical services provided to his or her patients. The involvement of residents or fellows in the care of an individual patient in no way diminishes this responsibility. The faculty must be capable of managing patients in the absence of residents. Faculty must recognize when fatigue or stress may compromise a resident's performance, and must make appropriate adjustments to that resident's responsibilities so that patient safety is not compromised. These issues are addressed in existing ACGME requirements and are to be further emphasized in the new requirements.

We believe that all GME programs must balance appropriate faculty supervision with graded responsibility, as residents progress through their training programs. Without progressive delegation of authority and responsibility, residents would be ill-prepared for independent practice at the conclusion of their training. The use of medical simulations, so that residents can acquire many specific procedural and decision making skills before learning on patients, coupled with procedure-specific credentialing, should assure that residents independently perform specific clinical interventions only when their competence has been confirmed through faculty observation and an objective evaluation of clinical outcomes.

Lessons learned from the success of flight simulators in the initial training and the subsequent maintenance of competence of airline pilots, as well as experiences to date with medical simulations, confirm that these are effective strategies to minimize the inevitable impact of the learning curve for new

¹⁵AAMC Policy Guidance on Graduate Medical Education: Assuring Quality Patient Care and Quality Education, October 2001; <http://www.aamc.org/hltcare/gmepolicy/start.htm>

clinical skills. The discipline of anesthesiology has pioneered the use of simulation technology in error reduction and resident education,¹⁶ and other disciplines are increasingly adopting it.¹⁷ Simulations can include intentional system malfunctions and other incidents, thus improving resident skills in error recognition and recovery.¹⁸

Faculty observation and objective clinical skills assessments may also be used to assess the progressive acquisition of factual knowledge and clinical judgment by residents. Learning how to perform a clinical intervention must be complemented by knowing which intervention, when to perform that intervention, and the risks and benefits of that intervention versus other interventions (and versus no intervention at all).

As resident performance assessment moves towards competency assessment consistent with the six Core Competencies of the ACGME,¹⁹ the supervision principle of “graded competence” (versus “graded responsibilities”), becomes germane.²⁰ While the principle involves grading of residents by faculty, there is a concomitant need for the learner to recognize the boundaries of his or her competence, and to seek timely assistance from senior residents, fellows, or faculty when such boundaries are reached. The fatigued or overly stressed resident may be ill-equipped to recognize when he or she needs help, and a negative supervisory culture (“to call for help is a sign of weakness”), only heightens the danger to patients. Residents must be encouraged to call for help when needed and taught to recognize when their colleagues need help. Equally important, nurses and other caregivers must be empowered to promptly move their concerns up the “chain of command” when they perceive that the action of a resident reflects incomplete knowledge or understanding of a rapidly evolving clinical situation. The “360°” evaluations of residents by nurses, fellow residents, patients, and self assessments by residents, can give program directors important insights into the performance of their residents that supplement faculty observation alone and contribute to the development of graded competence.

Communication, Resources, and Training

Institutional and program responsibilities for the safe work environment extend beyond adequate supplies, equipment, libraries, information systems, humane work hours, and effective faculty supervision. Information skills become paramount, especially when trainees from diverse cultural backgrounds encounter patients from equally diverse backgrounds. To reduce the risk of errors that could harm patients, translators must be readily available in all patient care settings. We believe that residents

¹⁶Gaba, David M., and A. De Anda, A comprehensive anesthesia simulation environment: re-creating the operating room for research and training, *Anesthesiology* 69:387-394, 1988; Gaba, D.M., et al, Anesthetic mishaps:breaking the chain of accident evolution, *Anesthesiology* 66:670-676, 1987.

¹⁷Gunther, Stephen B., et al, Interactive computer simulations of knee-replacement surgery, and Sedlack, Robert E. and Joseph C. Kolars, M.D., Colonoscopy curriculum development and performance-based assessment criteria on a computer-based endoscopy simulator, *Academic Medicine* 77:753, 750a, 2002.

¹⁸Deanda, Abe and David M. Gaba, Unplanned incidents during comprehensive anesthesia simulation, *Anesthesia & Analgesia* 71:77-82, 1990.

¹⁹ACGME Institutional Requirements effective July 1, 2002; Section II.B.

²⁰Timothy Flynn, M.D., Presentation to the Group on Resident Affairs April 16, 2002

should receive explicit training in working through translators and in communication skills that emphasize cultural competency and sensitivity. The work environment should include adequate time, calm and quiet for effective communication between house staff, patients and families, and the entire patient care team, including faculty.

Communication training should also emphasize enlisting patient and family participation in medical decision-making. A healthcare system expressly designed to ensure patient safety empowers the patient and family to actively participate in all decisions affecting their care, and to question caregivers when medications are changed or new interventions proposed. The current “Speak-Up” campaign of the JCAHO encourages patients and their families to speak-up, pay attention, educate themselves, and to participate in all decisions about their care.²¹ The responsibility of patients to fully disclose all critical health related information to caregivers, and to adhere to proposed treatments and safe-health practices within the boundaries of patient autonomy, are the patients’ responsibilities to assure their own safety.

Patients and their caregivers exist within greater communities, and safe patient care opportunities and responsibilities extend into those communities. Residency programs that facilitate and encourage resident participation in community-based programs of patient education and preventive health interventions heighten resident and faculty awareness of patient safety issues in both inpatient and outpatient settings, and broaden the citizenship responsibilities of their participants.

Emotional Support For Residents Who ERR

Root cause analysis, morbidity and mortality conferences, epidemiological studies—all these are essential to understanding errors, preventing them, and mitigating their effects when they do occur, as discussed below. However, in addition to dissection and analysis, there is a need for emotional support for a resident who makes an error that harms or kills a patient. The work of Wu and others suggests that this need is generally ignored or poorly handled.²² It can contribute to resident stress and reduced confidence. Making counseling through EAP or other programs available to residents who make errors, and encouraging them to take advantage of this help, can shorten the impact of error on the resident’s wellbeing and give them coping skills to deal with errors in the future.²³

Even error analysis and system change are grinding and, at times, emotionally charged work. Resident and faculty may experience anxiety and depression as a result of medical errors. Institutional and graduate medical education cultures must support full disclosure of errors and “near misses” as required by law and professional ethics, and provide emotional counseling and support, as needed, to those individuals touched by error and/or participating in the error disclosure and analysis processes.

²¹JCAHO’s recent pamphlet titled: “Speak-Up, Help Prevent Errors in Your Care”.

²²Wu, Albert W., et. al., How house officers cope with their mistakes, *Western Journal of Medicine* 159:565-569, 1993.

²³Firth-Cozens, Jenny, Stress, psychological problems, and clinical performance. *Medical Accidents*. Oxford, Oxford University Press, 1993.

Error Analysis

Historically, GME programs have relied on the assessment of individual behaviors, through morbidity and mortality conferences and faculty peer review, to analyze adverse medical outcomes, including medical errors. This “bad apple” approach may identify and remediate those individuals committing grievous errors or remove individuals committing multiple errors. However, it is inconsistent with the current belief that many errors are “hard wired” into our patient care processes, rather than the sole result of poor individual performance. The punishment of an individual resident will not significantly reduce the risk to subsequent patients if the “root-cause” of the error lies within the clinical care process. Principles of “Total Quality Management”, first articulated by W. Edwards Deming, have a special relevance in the analysis of care processes.²⁴

To improve the outcome of a process, that process must be intensively reviewed.¹ If every process is perfectly designed to achieve the results that it does,⁵ then analysis of poor results should begin with analysis of the process leading to those results. Similarly, if safety is not designed into the work process itself, it will not be a natural result of that process.²⁵ While some redundancy may be necessary, overly complex systems are inherently at greater risk for malfunction. Also, the people most directly involved in the process should be involved in its analysis and redesign, as they have the greatest knowledge, from daily experience, of the flaws in the current process. Finally, errors and “near misses” while regrettable, provide opportunities for re-evaluation and additional insight into the anticipated ways a process can go wrong.

Errors provide educational opportunities and can be used to improve the GME curriculum.²⁶ Although their attention is primarily on individual patients, residents are especially well positioned to participate constructively in clinical systems analysis and the development of improvement initiatives.²⁷ As first line providers, they witness the processes of care “up close and personal.” Because of their broad-based skills, they also may be called upon to fill in the gaps when systems or staffing fail. And, as they rotate to multiple institutions, residents readily can compare and contrast the most functional and dysfunctional clinical processes at each institution. We encourage program directors, quality assurance managers, and attending staff to recognize and employ the resident’s unique perspective in error analysis and patient care improvement.

This experience can and should be incorporated into the development of competencies in “systems-based practice”, “practice based learning”, and “professionalism”. The requirements for these competencies offer additional motivation for residents to participate in system analysis and improvement.

²⁴Deming, W. Edwards, *Elementary principles of the statistical control of quality; a series of lectures*. Tokyo, Nippon Kagaku Gijutsu Remmei, 1952.

²⁵Kambe, Joseph C., *Can Medicine Learn Anything from Aviation Safety?* Saint Francis Hospital Critical Care Symposium, Hartford, CT, May 8, 2002.

²⁶Battles, James and Christine Shea, *A system of analyzing medical errors to improve GME curricula and practice*, *Academic Medicine* 76:125-133, 2001.

²⁷Weingart, Saul, *House officer education and organizational obstacles to quality improvement*, *Joint Commission Journal* 22:9, 640-646, 1996.

Tools for Error Analysis

Widely used tools for medical error analysis include morbidity and mortality conferences and root-cause analysis of errors and near-misses. Morbidity and mortality conferences, a weekly tradition and RRC requirement for surgical GME programs, can serve both educational and quality improvement objectives if properly designed and implemented. Recent reports have described strategies to move away from a punitive or rare occurrence mentality, towards evidence-based discussions of best practices and best systems, and outcomes assessments, based on qualitative and quantitative assessments of local institutional experience.²⁸ The “root-cause analysis” methodology promulgated by JCAHO for review of unexpected bad clinical outcomes, significant system failures, and near misses can also be a useful tool in resident education.

As noted by Runciman, the shortcomings of root-cause analysis must be acknowledged: the memory of what actually happened is often replaced by what must have happened, a bare minimum observable facts are often recorded, and the pet theories and prejudices of investigators may cloud objective analysis of the facts.²⁹ However, resident participation in such processes can demonstrate effectively their critical role in the complex care delivery structure of hospitals and their obligations as citizens in the overall hospital community.

Through root-cause analyses residents can effect meaningful change in processes of greatest importance to them: the systems impacting direct patient care. These changes can occur within a short time frame, giving residents tangible evidence of the benefits of their participation in the error-analysis process.

The mature professional acknowledges and accepts personal responsibility for their actions, especially when errors of knowledge, judgment, or technique compromise patient safety or lead to adverse clinical outcomes. That said, competent physicians also recognize their place in the complex, hierarchical structure of hospitals, and that dysfunctional clinical systems can create “latent errors” awaiting the unsuspecting clinician and patient. Institutions, GME programs, and residents must “forgive and remember” as the first step in increasing patient safety.³⁰

Ethical Dimension

The foundation of the physician-patient relationship is trust and trust is based on truthfulness. The problem is that often “while drawing important ‘lines in the sand’ regarding whether and why to tell the truth, ethics codes promulgating honesty fail to provide clinicians with guidance regarding what is

²⁸Hamby, Birkmeyer, Birkmeyer et al “Using Prospective Outcomes Data to Improve Morbidity and Mortality Conferences, *Current Surgery*, 2000; 57:384-388.

²⁹Runciman, W.B., et al, Errors, incidents, and accidents in anesthetic practice, *Anaesthesia and Intensive Care* 21:506-519, 1993.

³⁰Bosk, Charles L., *Forgive and Remember: Managing Medical Failure*. Chicago University Press, Chicago, 1979

the truth, as well as when and how to disclose it."³¹ The basic ethical principle that can be used by clinicians to guide them in determining when to disclose adverse events is respect for a person's dignity. Respect for a person's dignity means that we are honest and direct in communicating to a person who may have been harmed while under a clinician's care.

The ethical responsibility of the clinician is promptly to supply all information to a person that is rightfully his or hers, including his/her medical record, the circumstances which resulted in the harm, the extent of the damages and the right to fair compensation. As soon as the facts are fully known, the clinician has an ethical obligation to take responsibility for any mistakes made and apologize for any harm that has resulted. This not only ensures respect for the individual patient but serves as the basis of the principle of justice, which states that all people must be treated fairly and equitably. Members of the public give the medical profession a basic trust by placing their health and at times their lives in our hands. This trust requires clinicians to be stewards of integrity. If this sense of honesty and truthfulness appears to be lacking, then the relationship between physician and patient will become, at best, one of suspicion, and, at worst, adversarial. In either event, all parties lose, because the core of the mission of health care has been damaged and in some cases destroyed.

Ethical medical practice, including ethically appropriate responses to and disclosure of medical error, is explicit in two of the ACGME core competencies, "interpersonal and communication skills" and "professionalism," and is implicit in others. We believe the curriculum of all GME programs should include formal didactics; opportunities for resident skill refinement through role-playing, OSCE's or similar tools; and outcome-based assessment of resident performance that assure resident mastery of the ethical dimension of patient safety.

Patient Safety and the ACGME Core Competencies

Throughout the manuscript, reference has been made to the ACGME Six General Competencies: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. It is of interest to note that in the description of the General Competencies, the ACGME does not explicitly discuss patient safety. Perhaps this is because patient safety, and the ability to practice medicine in a fashion which includes patient safety as a specific outcome goal, is a competency that transcends each of the aforementioned general competencies. Specific patient safety activities that could be included in the residency curriculum, and methods to document attainment of competency by residents, might include some of the following:

- I. Patient Care
 - A. Procedure-specific credentialing of residents, based upon faculty observation, with use of simulators to minimize learning on patients prior to minimal skill acquisition.
 - B. Objective structured clinical evaluations of patient care skills and/or computer cases that include clinical simulations of error recognition and recovery.

³¹DeVita, Mark, "Honestly, do we need a policy of truth?" Kennedy Institute of Ethics Journal 11:2, 157-164, 2001.

- C. Documented participation in multi-disciplinary teams devoted to the provision of patient-focused care in safe clinical settings.

II. Medical Knowledge

Participation and mastery of didactic curriculum on the science of human error and error prevention as applied to medicine, confirmed by objective measures such as written and oral examinations.

III. Practice-Based Learning and Improvement

- A. Logs and literature reviews, emanating from the analysis of errors encountered in the provision of patient care. For example, evidence-based analyses performed in preparation for a service's mortality and morbidity conference could provide material to be included in each resident's portfolio.
- B. Participation in root cause analyses and the review and revision of critical paths that use errors and "near misses" as opportunities for patient care improvements.

IV. Interpersonal and Communications Skills

- A. Implementation of specific curriculum—lectures, simulations, and faculty role-modeling – that emphasizes effective communication with patients and their families regarding the disclosure of adverse patient outcomes; competency assessment through OSCE's.
- B. Resident participation in multidisciplinary sentinel event and root cause analyses and other quality improvement activities designed to improve the safety of patient care.

V. Professionalism

- A. Demonstrated personal accountability for the consequences of actions that adversely effect patient safety
- B. Mastery of specific curriculum on the ethics of patient disclosure of adverse outcomes, as demonstrated through performance on written and oral examinations.

VI. Systems-Based Practice

- A. Mastery of specific curriculum on quality assurance and the systematic basis of safe medical practice, as evidenced by written examination performance
- B. Research papers or literature reviews that incorporate evidence-based recommendations and the analyses of current hospital systems and practices to propose new approaches to the provision of patient care in inpatient and outpatient settings that maximize patient safety. These materials could be included in the resident's portfolio.
- C. Participation in institutional quality assurance committees, where the resident's input can provide unique perspective in the committee's deliberations. Such participation can also reinforce the systemic consequences of the actions and performances of residents in the provision of patient care.
- D. Participation in password-protected, secure residency or institutional web sites, where residents could document actual or potential errors and near-misses anonymously. Such entries would be

the basis for educational activities that include residents, faculty, hospital administrators, or other hospital staff.³²

As institutions are reviewed by the ACGME in regards to their compliance with the documentation and the evaluation of each resident's mastery of the several competencies, there is the opportunity for the ACGME and the AAMC to identify "best practices" in regards patient safety education and evaluation, and to disseminate this information broadly among faculty, residents, and others engaged in graduate medical education.

Conclusion

The "AAMC Policy Statement on Graduate Medical Education Assuring Quality Patient Care and Quality Education" emphasizes institutional and programmatic responsibilities in the provision of safe, high quality graduate medical education and clinical care.⁹ The educational opportunities, as well as professional and ethical responsibilities of residents and faculty in the patient safety improvement process, also deserve emphasis.

As medical error is an inescapable reality of medical practice, it should be an explicit part of the curriculum of all GME programs. Residents need to be taught, through didactics and faculty role modeling, what to do when things go badly. How can error be mitigated? What are the effects of medical error on patients, families and caregivers? What are the ethical and legal obligations of health professionals to disclose error to patients and families as well as to external agencies? Finally, what are effective coping strategies for dealing with the many conflicting feelings engendered by an error?

By recognizing and reporting medical errors and "near misses", by acknowledging the limits of personal competency and seeking help from more experienced clinicians when needed, by participating in system analysis processes, by encouraging active participation by patients and families in patient care, and by fully communicating and listening as members of the multi-disciplinary patient care team, residents can significantly improve the quality and safety of the already outstanding clinical care provided in our teaching institutions.

We believe that graduate medical education can make significant improvements in patient safety by building it into the GME curriculum, involving residents in analyzing medical systems and making system improvements, and emphasizing graded competence.

At the same time, the involvement of learners in the care of patients in teaching hospitals requires that special attention be given to systems supporting patient safety: communication among faculty, staff, and residents; information transfer at patient hand-off; order entry and communication of diagnostic results; simulation to teach basic skills without risk to patients; and a general culture of safety that is passed on to residents as part of their education.

³²Borland, James L., Jr., Chair, AMA Council on Medical Education. Personal communication.

Annotated Bibliography

Academic Emergency Medicine, Special Issue: Errors in Emergency Medicine, 7:11, November 2000.

This entire journal issue reported on a May, 2000 conference on medical errors in emergency medicine. The multidisciplinary conference included experts from psychology, group and team dynamics, and organizational behavior. The journal's editor-in-chief Michelle Boros MD noted that the emergency department is the site of many patient care errors and called on emergency medicine to work at defining error, think about how to identify and quantify errors, and develop ideas for education and research on errors. Keynote speaker Robert Wears, M.D., of the University of Florida Department of Emergency Medicine, called for purging the term "human error" from the lexicon because it retards progress in understanding how complex systems, including their human components, fail. He argued that ascribing an adverse outcome to "human error" is in itself evidence of an inadequate investigation and noted that solutions amounting to admonishing people to "be more careful" or "have a high index of suspicion" will guarantee that the same bad outcome will occur in the future, only with different people.

Barach, Paul and Stephen D. Small, Reporting and preventing medical mishaps: lessons from non-medical near miss reporting systems. *British Medical Journal* 320: 759-763, 2000.

These authors reviewed 25 non-medical incident reporting systems. They argued, in medical quality improvement efforts, that near misses should be reported in addition to full-blown incidents and adverse events. Other complex, high-risk endeavors such as aviation, the military, chemical and petrochemical production, and nuclear energy have adopted this approach to help reduce errors and adverse outcomes. One advantage of this approach is that near misses occur much more frequently than adverse events, making quantitative analysis more feasible. Reporting near misses also offers less risk to those who report, since there is no harm that could bring professional or legal penalty. Near misses, they suggest, also are less susceptible to hindsight bias than adverse events.

Battles, James and Christine Shea, A system of analyzing medical errors to improve GME curricula and practice, *Academic Medicine* 76:125-133, 2001.

These authors described a root-cause-analysis approach developed for use in transfusion medicine and suggest that it be more broadly applied to errors made by residents. Three examples were used to illustrate how event reporting and associated root-cause analysis can be used to identify, study, and classify near-miss events involving residents. They recommend that the results of this type of analysis be used by program directors and others to evaluate resident education and define needed changes in the curriculum.

Bogner, Marilyn Sue, ed. *Human Error in Medicine*. Hillsdale NJ: Lawrence Erlbaum Associates, 1994.

The editor of this collection of papers noted that its contributors illustrated the range of disciplines that can contribute to studying and working on medical errors. Beyond medicine, the disciplines include systems analysis, human factors, and cognitive sciences. In Chapter 2, Lucian Leape, MD, reported the results of the Harvard Medical Practice Study and noted that the focus needs to change from the management of malpractice liability risk to patient safety. Only one-fourth of adverse events detected in the Harvard study could be attributed to negligence. As counter-measures, depersonalizing errors and developing redundant injury-prevention systems have the most potential.

Braddock, Clarence H., III, et. al., "How doctors and patients discuss routine clinical decisions", *Journal of General Internal Medicine* 12 (339-345), June 1997.

Braddock and his colleagues studied communication practices of physicians with their patients and pointed out where work needs to be done to improve these practices. The authors defined six elements of informed decision making: (1) discussion of the clinical issue and nature of the decision to be made, (2) discussion of the alternatives, (3) discussion of the pros (or benefits) and cons (or risks) of the alternatives, (4) discussion of uncertainties associated with the decision, (5) assessment of the patient's understanding, and (6) asking the patient to express a preference. They studied physician-patient encounters to see if the elements were present and found on average 1.3 of the 6. Most frequently present was element 1, discussion of the nature of the clinical problem. Least frequent was assessment of the patient's understanding (element 5).

Braddock, Clarence H. III, et al, "Informed decision making in outpatient practice", *JAMA*, 282:24, pages 2313-2320, December 22/29, 1999

Two years later these authors added element 7, discussion of the patient's role in decision making, i.e. an explicit invitation for the patient to participate. They also distinguished among three levels of complexity for the decisions to be made, reasoning that not every element would need to be included for the most basic decisions. They found that the nature of the problem was still the element most often present in doctor-patient communications. As they hypothesized, occurrences of a discussion of the patient's role and preferences increased with the complexity of the decision. Discussions to ascertain the patient's degree of understanding continued to be rare.

Clark, Peter A., What residents are not learning. *Academic Medicine* 76:419-424, 2001.

After six months conducting research on medical futility in a neonatal intensive care unit, and, as a by-product, observing the education of residents on that unit, ethicist Clark wrote critically of resident education. He observed, first, that residents, fatigued after being on call all night and into the next day, made errors. They confused patients with one another and incorrectly ordered drugs. Second he noted that residents relied almost entirely on the results of diagnostic tests rather than their own clinical observations, the family history, and other factors. Third, residents were unskilled at communicating with parents and family members, speaking in technical language and appearing to lack compassion. They appeared to distance themselves from cases where further treatment was futile. And fourth, residents often fell asleep in or wandered away from rounds, unprofessional behavior that was also detrimental to their education. Dr. Clark pointed particularly to the importance of supervising faculty as teachers and role models.

Commentaries by **Lucian Leape, Donald Berwick, Albert Wu, Dennis O'Leary, Michael Cohen**, and **James Reinertsen**, *British Medical Journal* 320: 725-730, 2000.

These experts called for applying current knowledge to reduce harm to patients while continuing to develop new knowledge and techniques. They also pointed out that physicians and other members of the health care team suffer from adverse outcomes. These individuals need assistance coping with guilt, informing patients and families about errors, and contributing to the development of systems to reduce error. The authors called for voluntary error reporting, and pointed to the need for health care leaders to exercise leadership in reducing errors.

Firth-Cozens, Jenny, Stress, psychological problems, and clinical performance. *Medical Accidents*. Oxford, Oxford University Press, 1993.

This literature review by a British psychologist found the incidence of depression, alcohol and drug abuse, and stress to be higher in physicians than in the general population. It also found that sleep deprivation and time pressures negatively affect mood and wellbeing. Studies of sleep loss and long-sustained work also “generally support the everyday presumption that working long hours causes deficits in the accuracy of tasks.” The author recommended a program of counseling and stress reduction for physicians, particularly residents, as an aspect of quality of care.

Gaba, David M., Anesthesiology as a model for patient safety in health care, *British Medical Journal* 320: 785-788, 2000.

The author reviewed the progress made by anesthesiology in improving patient safety. This discipline began studying adverse events as early as the 1950s and has applied a variety of techniques to identify the characteristics of mishaps and suggest improvements. It has employed technology, practice standards, and guidelines to improve safety. It has employed human factors techniques such as observation and the use of simulators. Dr. Gaba suggested that the most important contribution of his discipline to patient safety may have been the institutionalization of the topic as an issue of concern. But it also has reduced adverse outcomes by a large degree.

Gawande, Atul, E. J. Thomas; M. J. Zinner, et al. The Incidence and Nature of Surgical Adverse Events in Colorado and Utah in 1992. *Surgery* 126:66-75, 1999.

These authors conducted a chart review of slightly under 15,000 randomly selected 1992 admissions to 28 hospitals. Following a protocol very similar to the Harvard Medical Practice Study, they identified injuries caused by medical management that resulted in a prolonged stay, disability at discharge, or death.

Surgical adverse events were defined as those related to an operation, to a surgeon’s non-operative care, or to the 30-day period following surgery. The 402 surgical adverse events identified accounted for 66 percent of all adverse events. Older patients and patients with co-morbidities were at greater risk for adverse events. While the article did not focus on residents and did not identify residents’ roles in adverse events, it cited surgeon inexperience as a factor in poor outcomes.

Gawande, Atul, The learning curve, *The New Yorker*, January 28, 2002.

Surgical resident Gawande described the perils of learning to insert a central line, and discussed the issues of “practicing” on patients. Both new and experienced physicians must learn new procedures and techniques on live patients, yet the “moral burden” of practicing on people goes mostly unspoken. The “uncomfortable truth” about teaching, according to Dr. Gawande, is the need to balance the objective of providing the best possible care today against the objective of training physicians for the future.

Gawande, Atul, et al. The incidence and nature of surgical adverse events in Colorado and Utah in 1992. *Surgery* 126:66-75, 1999.

These authors analyzed adverse outcomes in surgery from the same medical records studied by Thomas and others (*Medical Care* 38:2000). Surgical adverse events were defined as those related to an operation, to a surgeon’s non-operative care, or to the 30-day period following surgery. Of the 402 events identified, almost half were technique-related complications, wound infections, or postoperative

bleeding. Older patients and patients with co-morbidity's were at greater risk for adverse events. While the article does not focus on residents and does not identify residents' roles in adverse events, it cites surgeon inexperience as a factor in poor outcomes.

Helmreich, Robert, and **Ashleigh C. Merritt**, eds. *Culture at Work in Aviation and Medicine: National, Organizational, and Professional Influences*. Ashgate: Aldershot UK, 1998.

This book underscored the role of culture—the attitudes, beliefs, and customs of individuals and organizations—in aviation and medicine. Its authors noted that in aviation, a culture that traditionally relied on “gadgets”, training, and strict adherence to rules has given way to a culture that recognizes other factors in safety and performance.

Chapter 5 on error management provided a good introduction to “crew resource management” techniques used in aviation and, increasingly, in medicine.

Helmreich, Robert, On error management: lessons from aviation. *British Medical Journal*, 320: 781-785, 2000.

This author is a psychologist and one of the leaders in the effort to reduce errors in aviation. He drew a number of parallels between the medical operating room and the airline cockpit and suggested that principles derived from aviation are applicable to medicine. Approaches to error management developed for aviation are based on understanding the nature and extent of error, identifying and changing the conditions that induce error, determining behaviors that prevent or mitigate error, and training personnel in their use.

Kohn, Linda T., et. al., eds.; *To Err is Human: Building a Safer Health Care System*. Committee on Quality of Health Care in America, Institute of Medicine. National Academy Press, Washington, D.C., 2000.

This widely-cited study by the IOM Quality of Health Care in America Committee estimated, by extrapolating from the research findings of the Harvard Medical Practice Study of New York hospitals and a similar study in Utah and Colorado, that between 44,000 and 98,000 deaths and billions in medical costs occur as a result of medical errors in the United States each year. The committee recommended a national focus to draw attention to safety issues, raise expectations for improvement, and develop leadership. It also recommended the development of knowledge and tools to “improve safety and break down legal and cultural barriers that impede safety improvement.” The monograph did not address resident education or the role of residents in improving safety.

Leape, Lucian, Error in medicine. *Journal of the American Medical Association* 272: 1851-1857, 1994.

In this important article the author argued that success in reducing errors in hospital care will depend on physicians and others to change fundamentally how they think about errors. He pointed to the substantial number of patients experiencing hospital-caused injuries and suggested that the culture of medical practice, with its emphasis on infallibility and faultless performance, has prevented the development of effective methods of error prevention. Instead of encouraging physicians to admit errors and obtain help coping with the emotional impact of harming a patient, Dr. Leape argued, the culture has isolated them. Instead of encouraging reporting and analysis of errors, the culture has promoted fear that has been a barrier to improvement. The threat of malpractice litigation only has reinforced these tendencies. The author suggested a culture change--an institutionalization of safety where hospitals and physicians begin to apply what has been learned in other fields about human cognition, human factors, error prevention, and the mitigation of harm when errors do occur.

May, Thomas and **Ausilio, Mark**, "Medical Malpractice, Mistake Prevention, and Compensation," *Kennedy Institute of Ethics Journal*, 11: 2, 135-146, 2001.

Without open reporting of medical mistakes, root-cause analysis of mistakes cannot be done, thus undermining efforts to implement safeguards to minimize the occurrence of future mistakes. Efforts to prevent medical mistakes, therefore, must first directly address clinicians' fear of malpractice litigation. This article explored the relationship between the current malpractice system and clinicians' fear of litigation. Ultimately, the authors argued, both the prevention of medical mistakes and the goals of malpractice litigation itself will be better served if substantial malpractice reform is undertaken.

O'Neil, Anne C., et al, Physician reporting compared with medical-record review to identify adverse medical events, *Annals of Internal Medicine* 119:370-376, 1993.

These authors compared different approaches to identifying adverse events, including medical record review, physician (resident) reporting, and standard QA systems, on the medicine service at Brigham and Women's Hospital. Each of the first two approaches identified about the same number of events, but only 30 percent of the incidents were identified by both, suggesting that both approaches are needed. Standard QA methods detected only a small fraction of all adverse events. Ultimately the authors advocate engaging house staff in the process of identifying and analyzing errors, in part because residents are interested and engaged in improving patient care and in part because this experience encourages them to continue their interest in systematic quality investigation after residency.

Pinkus, Rosa Lynn, "Mistakes as a social construct: An historical approach", *Kennedy Institute of Ethics Journal*, 11:2, pages 117-133, 2001

This paper examined the problem of medical mistakes historically. It documented how legal, scientific, and medical trends during the years 1890-1934 intersected to effect the reporting of mistakes in the subspecialty of neurosurgery. At the start of this time frame, mistakes were reported openly in journal articles as an educational tool. By its end, however, mistakes had gone "underground" and were buried amid a more objective, scientific reporting system. Using this historical perspective as a baseline, this article concluded by re-examining the IOM's suggestions for change and what they mean for the culture of medicine.

Reason, James T., The human factor in medical accidents, in *Medical Accidents*, Oxford University Press, 1993.

Reason pointed to three reasons why the possibility of an accident in hazardous human activity can never be wholly discounted: (1) all human beings make fallible decisions and commit unsafe acts; (2) all man-made systems possess latent failures that can combine to produce disasters, and (3) all human endeavors involve some measure of risk. He suggested that the war on accidents is like a guerilla war rather than conventional warfare, requiring "chronic unease" and an understanding of the "true nature of the enemy." Since doctors do not work alone, but in complex organizational settings, "human error" is not a sufficient explanation of adverse events. Rather, he argued, organizational analysis should be conducted when adverse events occur.

Reason, James T., Human error: models and management, *Western Journal of Medicine* 172: 393-396, 2000.

Reason drew a comparison between the person approach and system approach for viewing human error. The person approach, heretofore dominant in medicine, attributes error to human weakness—forgetfulness, inattention, and carelessness—and seeks to prevent error through exhortation, blame,

training, and threat of litigation. The system approach views errors as a consequence of normal human fallibility and seeks to prevent error by changing conditions in which humans work. The aim is systems designed with built-in defenses.

Runciman, W.B., et al, Errors, incidents, and accidents in anesthetic practice, *Anaesthesia and Intensive Care* 21:506-519, 1993.

Anesthesiology has pioneered research into patient safety and has made great progress in reducing errors and adverse events. These authors examined multiple sources of error: inadequate knowledge or experience; failure to follow a rule; absentmindedness; imperfect execution; the requirements of the task; physiological factors such as fatigue; poor equipment design; poor communication; inappropriate workspace layout; poor labeling and packaging; poor training, assistance, or supervision; workplace policies and procedures; social and cultural factors. They pointed out three significant problems with using accident investigations as the sole approach to developing preventive strategies: rapidly fading memory of what happened and its replacement by a memory of what must have happened; the medical habit of recording a bare minimum of observable facts; and the pet theories and prejudices of investigators. Instead they recommended employing ongoing error reporting and analysis.

Shojania, Kaveh G., et al, eds. *Making Health Care Safer: A Critical Analysis of Patient Safety Practices*. Evidence Report/Technology Assessment No. 43, Agency for Healthcare Research and Quality, Rockville, MD, 2001. (Available on line at <http://www.ahrq.gov/clinic/ptsafety/>)

This monograph was a review of the literature on the epidemiology of errors and adverse events in the areas of adverse drug events, infection control, surgery and anesthesia, hospitalized elders, and organizational and systems issues. Authors were cautionary about research in this area, noting significant methodological challenges such as the absence of control subjects for comparison; the difficulty of capturing relevant outcomes, including near misses; the difficulty of analyzing multidimensional practices; and the rarity of important errors that therefore cannot generally be analyzed in a statistically meaningful manner. Chapter 4, Incident Reporting, suggested that while incident reports cannot provide sound epidemiological data (the incidents probably underestimate the numerator, while the denominator—the number of opportunities for incidents—remains unknown), they nevertheless represent an important way to capture data on errors and adverse events. Chapter 5, Root Cause Analysis (RCA), cautioned that, as retrospective case studies, RCAs' identification of causes can be biased by hindsight, or by the "concern of the day".

Thomas, Eric J., et al. Incidence and types of adverse events and negligent care in Utah and Colorado. *Medical Care* 38:261-271, 2000.

In a review of randomly selected hospital medical records from 1992, these authors identified adverse events in 4.2 percent of cases in Colorado and 3.4 percent in Utah. Extrapolated to the population, an estimated 11,578 adverse events occurred in Colorado and 5,614 in Utah that year. Of these, an estimated 439 patients died and 160 suffered grave or major disability as a result. The two leading types were adverse operative events (45 percent of the total) and adverse drug events (19 percent). The authors pointed out that the reduction of operative adverse events might be aided through the use of techniques developed in aviation, including simulators.

Thurman, Andrew, "Institutional responses to medical mistakes: Ethical and legal perspectives," *Kennedy Institute of Ethics Journal* 11:2, pages 147-156, 2001.

Health care institutions must decide whether to inform the patient of a medical error. The barriers to disclosure are an aversion to admitting errors, a concern about implicating other practitioners, and a

fear of lawsuits and liability. However, admission of medical errors is the ethical thing to do and may be required by law. When examined, the barriers to such disclosures have little merit, and, in fact, lawsuits and liability may actually be reduced by informing the patient of medical errors. Therefore, health care institutions should implement a written policy providing for disclosure of medical errors, using a process as is outlined in the article.

Various authors, "Ethical issues involved in disclosing medical errors", *MSJAMA* 286:1078, September 5, 2001 (available on line at http://www.ama-assn.org/sci-pubs/msjama/articles/vol_286/no_9/toc.htm).

In this collection of articles Courtney Wusthoff pointed out that disclosure is called for in the AMA Principles of Medical Ethics, which states, "A physician shall...be honest in all professional interactions" and, moreover, in cases in which "...a patient suffers significant medical complications that may have resulted from the physician's mistake...the physician is ethically required to inform the patient of the facts necessary to ensure understanding of what has occurred." She suggested that disclosure by a patient's physician is appropriate because of the fiduciary nature of the physician-patient relationship, because it may affect a patient's consent in current and future decisions regarding care, because it may allay patient anxieties if recovery is slower or different from expected, because this knowledge permits other caregivers to work with better facts, and because it can help relieve the physician's own emotional stress while fostering a stronger patient-physician bond. Ms. Wusthoff suggested that medical students have a responsibility to facilitate disclosure, while another author, Norman Fost, argued that disclosure also is a responsibility of other physicians (presumably including residents), in part to reduce the probability of future errors.

Vincent, Charles, et al, Safety in medicine, in *Medical Accidents*, Oxford University Press, 1993.

The three editors of this book, which focuses on the British National Health Service, reported on the recurring themes it contains. One theme was the need to examine accidents at the organizational level. They note that the same broad categories of error-producing categories found in other industries are applicable to medicine: " high workload, inadequate supervision or training, poor interface design, a stressful environment, and mental states such as fatigue, boredom, and depression."

The authors pointed to the need for education and training, in contrast to relying on learning that occurs "naturally" during the clinical experience. "Combine trial-and-error learning with a lack of consultant supervision and the risks become apparent. Add work overload, lack of sleep, lack of awareness of hazardous situations, a degree of over-confidence stemming perhaps from a desire to prove oneself, and the potential for serious accidents becomes apparent. These factors are only partially in the control of individual doctors; many also require action at an organizational level." Another theme was that medical practice should increase the use of aids to memory and clinical judgment, particularly in emergency situations.

Volpp, Kevin G.M., M.D., and **David Grande, M.D.**, Residents' suggestions for reducing errors in teaching hospitals. *New England Journal of Medicine* 348:851-855, 2003.

The authors identified eight "areas of concern" that are potential sources of error by residents as they care for patients in teaching hospitals: 1) frequent interruptions by pages, 2) ordering and medical records systems not aided by computerized assistance; 3) informal sign-out procedures, 4) sleep deprivation, 5) difficulty in locating medical charts and equipment, 6) a culture that inhibits frank discussion of errors, 7) unstructured training in performing procedures, and 8) inadequate training in team leadership and communication among caregivers. For each they suggested changes that would reduce the likelihood of errors, calling on service chiefs and residency program directors to lead these efforts.

Weingart, Saul, and others, Epidemiology of medical error, *British Medical Journal* 320: 774-777, 2000.

These authors reviewed studies of the prevalence of error in hospitals, beginning with the Harvard Study of Medical Practice that found injuries from medical management in 3.7% of 1984 admissions in New York State. In a similar Australian study, researchers reviewed medical records and found an adverse event in 16.6 percent of hospital admissions. Observers on the general surgical units of a Chicago teaching hospital detected adverse events in 45.8 percent of cases. Adverse events occurred most frequently in relation to surgery, drug therapy, and diagnostic errors. Patients who were older, the subject of high risk procedures, or seen in the emergency room had higher risks. These risks increase with each successive day in the hospital.

Weingart, Saul N., House officer education and organizational obstacles to quality improvement, *Joint Commission Journal* 22:640-646, 1996.

The author presented three cases in which residents could contribute to improvements in patient care: an administrative error in which a resident wrote a drug order in the wrong patient's chart; the failure of the lab to report a patient's electrolyte profile; and the problem of beeper calls from nurses to residents who had gone off duty. Each case offered opportunities for analysis and steps to improvement, with residents potentially playing a key role. Dr. Weingart recommended making the most of these opportunities by engaging residents with interdisciplinary teams to solve problems and develop skills in organizational analysis. He suggested that this part of their education be similar to traditional clinical teaching—case based, intellectually rigorous, data intensive, and grounded in the scholarly literature. And he called for house staff to be recognized for their contributions to organizational problem solving just as they would be recognized for good patient care or clinical research.

Weingart, Saul N., et.al., Epidemiology of medical error, *Western Journal of Medicine* 172:390-393. June 2000.

The authors reviewed the literature on the prevalence and cost of medical error, attributes of physicians who make errors, and risk factors that increase the likelihood of injury from error. Prevalence estimates have varied widely among studies, ranging from 3.7 to 45.8 percent depending in part on the definition of error or adverse event. Preventable adverse drug events were estimated to add \$4685 and 4.6 days, to a hospital stay. Errors were an equal opportunity issue, not attributable to “bad apple” physicians. However several studies found that inexperienced physicians (trainees) and physicians performing new techniques made more errors. Patients who are sicker, subject to multiple interventions, and remain in the hospital longer are more likely to suffer injury from medical errors.

Woosley, Raymond L., “Centers for education and research on therapeutics are model for efforts to reduce medical errors”, *Academic Physician and Scientist*, May/June 2000.

Dr. Woosley, now Vice President for Health Sciences at the University of Arizona College of Medicine, advocated changes in medical education in response to changes in medicine: “The greater complexity of illness, the greater number of drugs available, and the overwhelming information that must be mastered to practice medicine means we must change our entire approach. Physicians must be taught to work as team leaders who coordinate patient care by calling upon the skills and knowledge of consultants, pharmacists, nurses, disease management specialists, online literature searches, error checking software, and drug interaction software” (page 2). He recommended funding by the Health Resources and Services Administration for “error reduction” residents, with loan forgiveness comparable to that offered trainees in HIV fields by NIH. He also recommended that academic medical centers provide training on safe prescribing practices for practicing physicians, nurses, and pharmacists.

Wu, Albert W., et. al, Do house officers learn from their mistakes?, *Journal of the American Medical Association* 265:2089-2094, 1991.

The author reported the results of a survey of 114 house officers about their most significant medical mistake in the last year. Thirty-one percent of the patients in these reported incidents died; 90 percent had significant adverse outcomes. Errors in diagnosis (33 percent), errors in evaluation and treatment (21 percent), and errors in prescribing and dosing (29 percent) accounted for most of the reported incidents. Most residents reported more than one cause for their mistakes, with 51 percent reporting “too many tasks” and 41 percent reporting fatigue.

Wu, Albert W., et. al., How house officers cope with their mistakes, *Western Journal of Medicine* 159:565-569, 1993.

In additional results from the earlier survey, the authors reported on lessons for coping by house officers and institutions. They suggested reviewing cases in which mistakes occur, encouraging residents to call for help, improving the system of care that contributed to the mistake, providing emotional support for the resident, and actively involving supervising attending to get mistakes out in the open, making the discussion of mistakes a routine part of training.