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Another Look at Medical Error

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Medical error continues to be a topic of discussion. Blaming the physician or nurse for error is too simplistic and may serve to blur larger system problems from being identified and addressed. This article considers recent history of assignment of errors from a quality assurance perspective, multiple paths which result in error, reviewing the 1999 Institute of Medicine report and looking beyond the numbers to issues that can only be assigned to systems.
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INTRODUCTION

The Institute of Medicine (IOM) report, *To Err Is Human* [1], offers a tremendous challenge to the practice of medicine. Never before has a compilation of such well-researched studies and well-written articles been as convincing and damning to the integrity of medicine. The focal point of the report, as presented by the media, is the finding that potentially 44,000–98,000 people die each year as a result of medical errors in hospitals. Physicians and hospitals are suddenly viewed in this report as more deadly than combined deaths from highway accidents, breast cancer, and AIDS [1].

Bad Apples and Errors

History gives a glimpse of the journey toward the IOM article. A 1989 article [2] suggested that the process of assuring medical quality is based on the *theory of bad apples*; an assumption that once bad physicians were found out and removed from practicing that all would be well. Analyzed data would point to culprit physicians who could then be hunted down, penalized in some fashion, and thus ''quality improved.'' Berwick's assumption, in a seeming contradiction, is that ''physicians, hospital employees, and healthcare workers, like workers anywhere, must be assumed to be trying hard, acting in good faith, and not willfully failing to do what they know to be correct'' (p. 53). It is a dilemma that a process which involves the identification of ''bad apples'' could also assert that all practitioners, indeed healthcare workers in general, act in good faith. Thus an inherent contradiction exists within the theory and process of quality assurance. If it had indeed been successful quality assurance, few errors would remain in medicine and all the ''bad apples'' would have been eliminated by now.

The March 18,2000 issue of the British Medical Journal is entirely devoted to the topic of medical error. One editorialist even suggests that, ''In the time it will take you to read this editorial eight patients will be injured, and one will die, from preventable medical errors'' ([3], p. 730). Leape defines error as an ''unintended act (either of omission or commission) or one that does not achieve its intended outcome'' ([4], p. 1851). While the good news is that most medical errors do not result in injury, the bad news is that the ''professional cultures of medicine and nursing typically use blame to encourage proper performance'' (p. 1852). Placing blame, pointing to the culprit who should have been more responsible is a variation of the *bad apples* theory.

Leape suggests there are at least three levels of error, skill, rule, and knowledge-based error. ''Skill-based errors are called ''slips.'' These are unconscious glitches in automatic activity. Slips are errors of action. Rule-based and knowledge-based errors, by contrast, are errors of conscious thought, and are termed ''mistakes'' ([4], p. 1853). Rule-based errors result from misapplied expertise. As an example a practitioner may misperceive a situation and choose the wrong rule to apply. Likewise a misapplication of the right rule because it seems to fit,

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but doesn't, typifies rule-based error. Knowledge-based errors are more complex and may involve many variables. One example of a knowledge-based error involves a *biased memory* where the memory tends to remember familiar patterns that have usually worked in the past, or to remember specific contradictory experiences which may have left ''an exaggerated impression far outweighing its statistical importance'' ([4], p. 1853). The *availability heuristic*, another knowledge-based error mechanism, is the ''tendency to use the first information that comes to mind'' ([4], p. 1853). Consider a physician faced with a difficult diagnosis. The physician attempts to match what they know to presenting symptoms. This is the process of diagnosis. But while *leaps of judgment* may produce error they do not necessarily produce a bad practitioner.

Harvard Medical Practice Study I and II

Two excellent studies [5,6] attempt to quantify the depth and breadth of medical errors. One, the Harvard Medical Practice Study (HMPS) I [5], addresses the incidence of error and medical negligence after reviewing more than 30,000 randomly selected medical records from 51 acute care, non-psychiatric hospitals in New York State in 1984. Adverse events, or modern parlance for error, occurred in 3.7% of recorded hospitalizations, and almost 28% of these (1% of the total) were due to negligence. More than 70% of the adverse events resulted in disability lasting less than six months, 2.6% caused permanent disability, and 13.6% led to death. Extrapolating to all New York hospitals there were 98,609 adverse events and 27,179 involving negligence ([5], pp. 370–371).

Although these numbers sound outlandish, adverse events do not, of course, necessarily signal poor-quality care; nor does their absence necessarily indicate good-quality care. For example, a drug reaction that occurs in a patient who as been appropriately prescribed the drug for the first time is an adverse event, but one that is unavoidable given today's technology. If, on the other hand, the drug reaction occurs in a patient who is given the drug despite a known sensitivity to it, the adverse event is properly judged to be due to negligence ([5], pp. 372–373).

The review of medical records allows the episode of care to be *played backwards* with the results already known. Retrospectively reviewing the medical record, which includes patient outcomes clearly points toward markers of illness that were found and those which were missed. This does not negate the findings of HMPS I, but it does presume a considerable amount. Retrospective review allows the reviewer to determine where certain lab values or physiologic changes should have been noticed. A physician's thought process with the patient in front of them can only be speculated on, however, it seems that even this type of sophisticated review is yet another variation of the ''bad apple'' theory. The HMPS I is none the less on target in terms of quantifying ''too much'' error or too many adverse events as evidenced by what occurred in New York hospitals in 1984.

The HMPS II study [6] categorizes these medical error statistics by defining specific types of adverse events. For the 1133 patients directly affected by medical error, 48% were classified as adverse events occurring from surgery, with wound infections accounting for 29% of all surgical complications. Drug complications, found to be the most common single type of adverse event in this study, were more than 19%. The most common errors were categorized as errors in performance, prevention, diagnosis, drug treatment, system and other, or unclassified ([6], p. 381). For example, an adverse event occurs when a patient is misdiagnosed and the physician in turn treats the wrong illness or conversely if the correct illness is diagnosed but treated with an incorrect regimen. Negligence, on the other hand, occurs when the degree of the error exceeds an accepted norm.

Utah and Colorado

Another research study sought to quantify the costs of adverse events. The 15,000 medical records used by the Utah Health Data Commission (5,000) and the Colorado Hospital Association (10,000) were from hospitals chosen to mimic the aggregate characteristics of US hospitals ([7], p. 255). They found 459 adverse events and extrapolated that 5,388 adverse events in Utah and 11,221 in Colorado had occurred in 1992. Preventable adverse events in Utah and Colorado were estimated to cost $308,382,000 while all adverse events were estimated to be in excess of $661,000,000. Extrapolating for the 33 million admissions in US hospitals in 1992, excluding rehabilitation, psychiatric, and Veterans Affairs hospitals, adverse events were estimated to cost an estimated $37.6 billion, of which $17 billion was for adverse events that were considered preventable (pp. 259–261). The focus of this study, like HMPS I & II, was on the hospitalized population, so including outpatients would necessarily increase the total.

The effects of Diagnostically Related Group (DRG) reimbursement was generally thought to reduce hospital lengths-of-stay and while it might seem reasonable to assume fewer inpatient days would result in decreased medication errors and medication error deaths, the opposite has occurred.

> In 1983, 2,876 people died from ME (medication errors). By 1993, this number had risen to 7391, a 2:57-fold increase . . . if the increase in ME deaths results partly from the shift to outpatient care, the increase should be steeper for outpatients than for inpatients ([8], p. 643).

While inpatient days have fallen by more than 20% from 1983 to 1993, outpatient visits have increased by 75% ([8], p. 643) and the number of adverse events has not been quantified. Thus, the figures of adverse events compiled for inpatients have an unknown factor for outpatients that is thought to be substantial.

Gawande suggests that the public views medical error as a ''problem of bad physicians,'' and when physicians make mistakes, one response is to ''call such doctors 'incompetent,' 'unethical,' and 'negligent.' We want to see them punished'' ([9], p. 44). The problem with such an approach is that it assumes only the bad physicians make mistakes.

> The fact is that virtually everyone who cares for hospital patients will make serious mistakes, and even commit acts of negligence, every year. For this reason, doctors are seldom outraged when the press reports yet another medical horror story. They usually have a different reaction: *That could be me*. The important question isn't how to keep bad physicians from harming patients; it's how to keep good physicians from harming patients ([9], p. 45).

At the Morbidity and Mortality Conference, a periodic meeting during physician training in which all problems and errors are discussed as a group, the focus is on the individual, the bad apple, with the following effect: ''I felt a sense of shame like a burning ulcer. This was not guilt: guilt is what you feel when you have done something wrong. What I felt was shame: I was what was wrong ([9], p. 49).''

Blunt End/Sharp End

Feeling intense personal failure is usually inappropriate [10]. Adverse events are described as having two ends, one blunt and one sharp. At the sharp end are practitioners to whom errors are usually ascribed, and on the blunt end are individuals who may never treat or see a patient, and systems supporting them. Both have a profound effect on the ability of the sharp end practitioner to be successful. ''In order to understand the sources of expertise and error at the sharp end, one must also examine this larger system to see how resources and constraints at the blunt end shape the behavior of sharp-end practitioners'' ([10], p. 256). Attributing error to an individual is suspect because ''labeling actions and assessments as 'errors' identifies a symptom, not a cause'' (p. 257) and has limited value.

Various cognitive factors at the sharp end must come together to allow smooth integration, and functional overlap. The *organizational context* in which the practitioner works, including resources made available to perform their work, have a direct bearing on the increased potential for error. There are various types of knowledge which are used for problem solving: knowledge *content*, knowledge *organization*, and knowledge *activation* (1994, p. 262). Simply, they represent knowledge that can be retrieved in a manner that enables it to benefit the task at hand. Individuals may possess education, or knowledge content, but be unable to recall it when needed. Likewise, some may have appropriate recall but be unable to apply it in a manner that is relevant to the situation. Cook and Woods suggest going ''behind the label of 'human error' '' to determine how ''knowledge was or could have been brought to bear'' ([10], p. 262) in reviewing incidents. Each practitioner carries with them a *mental model*, which is the ''collection of knowledge used by a practitioner'' ([10], p. 262) to make decisions. If the mental model is inaccurate or incomplete it will contribute to inappropriate actions. *Knowledge calibration* refers to the gaps in the knowledge or mental model of a device or system.

> Everyone has some areas where their knowledge is more complete and accurate than others. Individuals are well calibrated if they are aware of how well they know what they know. People are miscalibrated if they are overconfident and believe that they understand areas where in fact their knowledge is incomplete ([10], p. 264).

A practitioner may remain miscalibrated if they have created the ability to work around certain areas ''with a few well-practiced and well-understood methods'' (p. 264) which allow them to compensate for the ability they don't have. It is a condition where one physician described another as being ''often wrong but never in doubt'' (p. 264), an indication there was a calibration problem.

Another problem is one of *inert knowledge*, ''whether relevant knowledge is activated for use in the actual problem-solving context'' ([10], p. 265).

> The critical question is not to show that the problem solver possesses domain knowledge, as might be determined by standardized tests. Rather, the more stringent criterion is that situation-relevant knowledge is accessible under the conditions in which the task is actually performed ([10], p. 265).

This is an increasingly difficult practitioner problem, given higher acuity of patients presenting with multiple problems, ''because they have not previously confronted the need to join the pieces together'' (p. 265) in a similar manner dealing with patients. There is both the problem of knowing what you don't know and knowing that what you know is not sufficient.

Heuristics is a mental process where ''people tend to cope with complexity through simplifying heuristics, that is, through rules of thumb and simplifications'' ([10], p. 266).

> At issue is whether a simplification is (a) generally useful because it reduces mental workload without sacrificing accuracy, or (b) a distortion or misconception that appears to work satisfactorily under some conditions but leads to error in others ([10], p. 266).

Examples of oversimplification included:

> (1) seeing different entities as more similar than they actually are; (2) treating dynamic phenomena statically; (3) assuming that some general principle accounts for all of a phenomenon; (4) treating multidimensional phenomena as unidimensional or according to a subset of the dimensions; (5) treating continuous variables as discrete; (6) treating highly interconnected concepts as separable; and (7) treating the whole as the sum of its parts ([10], pp. 266–267).

Yet oversimplification and use of heuristics, given constraints on time, are found to be widely used, and the best approach. ''Put simply, if the time and effort required to arrive at a decision is important, it may be possible to have an overall higher quality performance using heuristics than using a 'mathematically ideal'" approach ([10], p. 267). Given the contradictory nature of simplicity versus mathematical precision, it is not surprising that ''All . . . factors tend to lead medical practitioners toward an empirically based approach to diagnosis and therapy in which successive treatments are applied until the desired result is achieved'' ([10], p. 268).

The practitioner, especially in acute situations, must recognize and respond appropriately to information from multiple sources. ''Attentional dynamics refers to those factors affecting cognitive function in dynamic evolving situations, especially those involving the management of workload in time and the control of attention when there are multiple signals and tasks competing for a limited attentional focus'' ([10], p. 270).

Each of these cognitive processes can result in ''operational difficulties in handling the demands of dynamic, event-driven incidents'' ([10], p. 273). In aircraft carrier parlance it is known as *losing the bubble* for the aircraft pilot trying to land ([10], p. 274). ''In each case what is being lost is some of the operator's internal representation of the world at that moment and the direction in which the forces active in the world are taking the system that the operator is trying to control'' ([10], p. 274).

There is also a *failure to revise* situation assessment, which suggests that ''evidence discrepant from the agent's or team's current assessment is missed or discounted or rationalized as really being discrepant with the current assessment'' ([10], p. 274). The *responsibility-authority double bind* may also be involved in producing errors. It occurs when there are ''situations in which practitioners have the responsibility for the outcome but lack the authority to take the actions they see as necessary'' ([10], p. 284).

> If they follow the standard procedures strictly, the job will not be accomplished adequately; if they always wait for formal permission to deviate from standard procedures, throughput and productivity will degrade substantially ([10], p. 284).

It is suggested that large system failures have characteristics that produce latent failures, or failures waiting to happen, since large systems failures are ''comprised of multiple failed components or procedures,'' and ''are likely to be catastrophic rather than minor'' ([10], p. 289). They encourage ''the employment of human skill and expertise'' where ''both the flexibility and judgment necessary to control them'' are available, and ''large system failures appear in retrospect to be unique'' (1994, p. 289).

One of the best metaphors for understanding both latent error, and large system error, is the description of a system as a slice of Swiss cheese. Swiss cheese is known for the holes that differentiate it from other types of cheese. Imagine multiple slices of Swiss cheese standing on end, moving relatively freely, on a horizontal axis. Only when the holes from each of many pieces of Swiss cheese are aligned, which happens with great infrequence, will an error occur. Each piece of Swiss cheese is representative of a system or process that usually works without difficulty. But given the fact that it is possible for the holes to align, it is a matter of *when* rather than *if* they will align. Latent errors, or errors waiting to happen, are the errors required for large system problems: they result from multiple, simultaneous failures. ''Thus, there are reasons to consider that anesthesia practice and, by extension, modern medical practice, has the characteristics of a large, complex system and may be expected to fail in similar ways'' ([10], p. 290).

If we know all of this regarding medical error, one may question the reason for blaming individuals rather than improving systems. Cook & Woods provide four answers, including ''operators are available to blame'' (1994, p. 292). A second reason is the difficulty in tracing backward after an accident has occurred to determine the causal chain that led to a system failure. Since the sharp-end operator is available to blame it is easier to conclude that a person rather than a sequence of system events caused an error. A third reason is the seeming paradoxical nature of human involvement.

> Those closely studying human operations in these complex systems are usually impressed by the fact that the opportunity for large-scale system failures is present all the time and that expert human performance is able to prevent these failures. As the performance of human operators improves and failure rates fall, there is a tendency to regard system performance as a marked improvement in some underlying quality of the system itself, rather than the honing of the operator skills and expertise to a fine edge ([10], p. 293).

The advantage of hindsight provides blurred insight to the event.

> Studies have shown consistently that people have a tendency to judge the quality of a process by its outcome. The information about outcome biases their evaluation of the process that was followed. After a system failure, knowledge of the outcome biases the

> reviewer toward attributing failures to system operators. During post event reviews, knowledge of the outcomes will give reviewers the sense that participants ignored presumably obvious or important factors and that participants, therefore, erred ([10], p. 294).

From this perspective it would seem that the results of HMPS I may include outcome bias that may serve to diminish the number of adverse events and error prone physicians.

Problems in Addressing the Problems

Recognizing errors and openly discussing the system problems that caused them must occur before solutions can be determined. Entrenched hospital and professional cultures may make an open discussion difficult. A recent study [11] compared attitudes regarding error, stress and teamwork of over 30,000 airline cockpit crews to intensive care unit (ICU) staff, including 1033 doctors, nurses, fellows and residents in the United States, Israel, Germany, Switzerland, and Italy. Differences were noted. Although much progress had been made to effectively address errors in the aviation industry, the health field applied substantial pressure to cover up their mistakes. Reasons ICU staff gave for not acknowledging or discussing errors included worries about personal reputation (76%), threat of malpractice suits (71%), and perception of high expectations of the patients' family or society (68%). Possible punitive action by a licensing board was mentioned often (64%) as was the threat to job security (63%), plus 61% and 60% cited expectations or egos of other team members ([11], p. 745).

The survey questions were used because of their ability to ''tap into attitudes toward stress, hierarchy, teamwork, and error. Previous research has found that these items are relevant to understanding error, predictive of performance, and sensitive to training interventions ([11], p. 745).'' The study also found that surgeons seemed to be set apart from their medical counterparts in relationships between perceptions of teamwork and status in the team. ''Surgeons are most supportive of steep hierarchies in which junior staff do not question senior staff. Surgeons also perceive teamwork and communication in the team to be of a higher quality than the rest of the team ([11], p. 748).'' Suggested as instructive of the difference between cockpit crews and intensive care unit teams is communication. ''*Highly effective* cockpit crews use one third of their communications to discuss threats and errors in their environment, but *poor* performing teams spend only about 5% of their time doing the same [emphasis added] ([11], p. 748).''

Legal Blame and Inadequate Taxonomy

Threat of malpractice suits was a major concern of healthcare workers, mentioned by more than 70% of respondents in the previous survey [11]. It is suggested that quality improvement activities have been outsourced to the legal profession, and that this move has created difficulty in defining error. ''Under the rubric of 'malpractice,' legal adversaries obscure the distinctions between error, luck, tactical judgment, biological variance, negligence, fraud, and other sources of adverse outcomes ([12], p. 38).''

In proposing a uniform taxonomy for reporting adverse events, Victoroff suggests, ''speculating about which errors are 'avoidable' will be unproductive until errors are viewed as dispassionately as microbes-hazards to be classified, counted, compared, understood, and ultimately controlled ([12], p. 39).'' But until errors are significantly reduced, there will be continued speculation about which errors were avoidable and which negligence. A review of the Utah/Colorado study [7] even attempted to determine whether age discrimination existed for the adverse events found. Though there was a higher number of preventable adverse events among elderly patients, they were more acutely ill, in general, and their care was more complex, ''age was not independently associated with preventable adverse events'' ([13], p. 741).

One proposal for creating a taxonomy suggests analyzing, and separating errors into categories of human factors to include active failures and latent failures ([14], pp. 1154–1155). Active failures were defined as ''unsafe acts or omissions committed by those whose actions can have immediate adverse consequences-pilots, air traffic controllers, anesthetists, surgeons, nurses, etc.'' ([14], p. 1154). These action failures include ''action slips or failures, such as picking up the wrong syringe, cognitive failures, such as memory lapses and mistakes through ignorance or misreading a situation, and ''violations''-deviations from safe operating practice, procedures, or standards'' ([14], p. 1154).

Latent failures include work conditions, such as ''heavy workloads; inadequate knowledge or experience; inadequate supervision, a stressful environment; rapid change within an organization; inadequate systems of communication'' ([14], p. 1155). Such a description parallels the reality of many healthcare environments confronted with heavy workloads, too few experienced and knowledgeable employees, too few supervisors, rapid change and inadequate communication. Yet the Institute for Safe Medication Practices (ISMP) suggests that developing a non-punitive culture in hospitals to allow system improvements may be difficult to achieve [15].

Two models are proposed as alternative methods for addressing error in medicine, the *person approach* and the *system approach* ([16], p. 768). In the person approach errors are viewed from a *just world hypothesis*, meaning bad things happen to bad people; errors are justified on

the basis of the ''badness'' of the individual. Within this model are such antiquated standards of bureaucracy as ''poster campaigns that appeal to people's sense of fear, writing another procedure (or adding to existing ones), disciplinary measures, threat of litigation, retraining, naming, blaming, and shaming'' ([16], p. 768). This approach is another form of ''bad apple'' theory. In contrast, the system approach sees errors ''as consequences rather than causes, having their origins not so much in the perversity of human nature as in 'upstream' systemic factors'' ([16], p. 768).

During this time of national focus on errors there are tangential issues as well. In a recent study [17] to determine the extent to which physicians experience cost-control arrangements as ethical problems they were found to be in a quandary.

> Changes in the healthcare system in the past 5 years were believed to have had a negative impact on their own patient's trust in them by 50%, and 80.8% believed that changes in the healthcare system in the past decade have diminished physicians' commitment to an ethic of undivided loyalty to patients ([17], p. 649).

Physicians, as stewards of the healthcare system, are caught between controlling costs and maintaining patient relationships that have been the hallmark of medicine. It is a time for physicians, as a profession, to determine whether it should ''recommit itself . . . to the Hippocratic ideal of undivided loyalty to individual patients, or should the profession reconceive its role as one of balancing 2 commitments, i.e., the care of the patient and the stewardship of collective healthcare resources'' ([17], p. 652).

Either way, physicians must take a position regarding errors in medicine and determine whether they plan on leading the charge for reducing them.

Other Views

The practice of medicine has changed considerably since the patient records were reviewed in 1984 and many unanswerable questions remain. Has the intervening years resulted in an improved practice of medicine: blunting the sharp end and sharpening the blunt end? Was this data appropriate to extrapolate from one region to the entire nation? Was reviewer bias present and did it alter the results? Has the shift from inpatient to outpatient services meant a reduction in adverse events or an increase due to higher acuity levels for those hospitalized? Has the availability of more over-the-counter drugs and self-medication increased or decreased adverse events?

Of particular concern is whether the HMPS I & II data really represents modern medicine or if it is only a cross-sectional analysis of one point-in-time for New York hospitals and patients that should not be extrapolated to the rest of the country? Knowing the answer does not change the basic premise that too many errors occur in hospitals that could be prevented. Not having answers means the boundaries of the problem of adverse events has not really been addressed. Absent those boundaries and quantification a reasonable action plan cannot be initiated without potential to do more harm implementing a faulty solution.

A Path Out of the Woods

At opposite ends, two JAMA articles suggests ''Deaths due to medical errors are exaggerated in Institute of Medicine report'' ([18], p. 93) while another states, ''Institute of Medicine medical error figures are not exaggerated'' ([19], p. 95). Whether they are exaggerated or not is of secondary importance, and may perpetuate a *bad apple* view of the problem. Ultimately, whether the data are 100%, 50% or 25% correct is of little real significance: if errors can be avoided they should be, and too many errors remain. What must be primary is to view adverse events in their entirety, from a systems view, and to improve systems that may help cause them.

Studies, such as was undertaken to reduce errors in interpreting radiography films for emergency department patients ([20], p. 737), are a reasonable approach to reducing adverse events. By reviewing *both ends* of the system they were able to reduce misinterpretations significantly. In an effort to improve, on behalf of the patient, certain physicians stepped forward to provide better services. ''Patterns of errors made by each emergency physician were identified and were discussed as part of routine, ongoing communication and during performance reviews'' ([20], p. 728). Improvements happened because personal goals were set aside, and in their place was a focus on improving services to the patient.

> The team's goal was to improve patients' satisfaction by significantly shortening the time they spent in the department waiting for the interpretation of their radiographs to become available. The team also aimed to further reduce the number of errors made in interpreting radiographs ([20], p. 738).

Healthcare must take their lead from the studies of disasters, of massive errors, to find the reasons for errors, and correct systems that failed. It is not reasonable to blame individuals for their mistakes without looking at the environment or system that allowed the mistake to occur. Those who would perpetuate the ''bad apples'' approach forget that ''not only do all human beings err, but they err frequently and in predictable, patterned ways'' ([9], p. 50). It is not reasonable to simply blame physicians because ''the doctor is often only the final actor in a chain of events that set him or her up to fail'' ([9], p. 52), and the same can be said of any provider on

the *sharp end* of an error. There are no individuals who are exempt from error, indeed, to believe that only the *bad apples* cause errors is inaccurate; ''it is often the best people who make the worst mistakes-error is not the monopoly of an unfortunate few'' ([16], p. 769). When healthcare seeks to improve systems, recognizing that each individual can err, perhaps errors will be reduced. Errors are like mosquitoes. ''They can be swatted one by one, but they still keep coming. The best remedies are to create more effective defenses and to drain the swamps in which they breed. The swamps, in this case, are the ever-present latent conditions'' ([16], p. 769).

High reliability organizations ''are the prime examples of the system approach. They anticipate the worst and equip themselves to deal with it at all levels of the organization'' ([16], p. 770).

Conclusions

What must happen now is for healthcare to allow itself to improve. ''When given the opportunity to help, when the barriers of shame and punishment are removed, doctors, nurses, pharmacists, and others eagerly work to improve safety, implementing best practices or developing new ones'' ([21], p. 725). The reporting systems must not provide a sacrificial scapegoat, even though ''blaming individuals is emotionally more satisfying than targeting institutions'' ([16], p. 768). Nor should *bad apple* physicians be targeted, especially when it is recognized ''that the traditional response—that physicians do the best they can—is no longer enough'' ([22], p. 765).

> The sheer number of specific interventions that good care requires is beyond the ability of any unaided human being to recall and act on effectively. Yet the dominant modes of practice still expect this impossible degree of accomplishment ([23], p. 576).

We must acknowledge that the basic organizational structures of healthcare have been inadequate and people have suffered inappropriately. Healthcare organizations must recognize that even high reliability organizations ''are not immune to adverse events, but [they] have learnt the knack of converting these occasional setbacks into enhanced resilience of the system'' ([16], p. 770). Physicians cannot possibly remember all that their colleagues, and the public, expect them to know.

It is also time for the public to let go of the belief that any practitioner can possibly store all the medical information needed to make consistently accurate diagnoses and treatments in their heads, while being compassionate and friendly at the same time.

> We have created systems that depend on idealized standards of performance that require individual physicians, nurses, and pharmacists to perform tasks at levels of perfection that cannot be achieved by human beings ([23], p. 577).

Removing bad apples in a system that is constantly in flux and can be influenced by so many participants from the blunt end only reduces the practitioner base, it doesn't necessarily remove any barriers to error.

The changes that need to be made in the healthcare system, if it is to appropriately respond to the challenges of the Institute of Medicine report, require cultural, technical and organizational changes. This is not an easy task, but absolutely necessary. It requires a basic rethinking about the way business is done.

> Healthcare alone refuses to accept what other hazardous industries recognized long ago: safe performance cannot be expected from workers who are sleep deprived, who work double or triple shifts, or whose job designs involve multiple competing urgent priorities ([21], p. 725).

Much of the organizational change must come from leaders.

> While local ''champions''—individual doctors, pharmacists, or nurses—can, by their enthusiasm, motivate others to make improvements, major systems changes require direction and support from the top—leaders who communicate their own commitment by insisting on safety as an explicit organizational goal backed by adequate resources ([21], p. 725).

Making this happen quickly will be difficult, considering that ''surveys show that it takes at least five years of persistent effort and outstanding leadership to make cultural change stick'' ([24], p. 156). Yet it is time to develop the taxonomy, time to have the leaders *step-to-the-plate*. It is also time to review what has been done to determine what can reasonably be changed to advance improvements in health without stopping progress altogether. It is not enough to suggest that doing what promotes patient's safety should, in all cases, be used as a measurement of what is right.

> Safety is not a concrete entity, and the argument that one should always choose the safest path (in the sense of the path that minimizes risk to the patient) misrepresents the dilemmas that confront the practitioner. The safest anesthetic is the one that is not conducted, just as the safest airplane is the one that never leaves the ground ([10], p. 287).

The *bad apples* are potentially all of us. Each of us are capable of making mistakes from within systems that don't work well or are equipped with latent errors. It won't be our intention to err if we err, nor to harm if someone is harmed. Opposite the definition of error as an ''unintended act'' ([4], p. 1851), healthcare must take actions with the intent of explaining the various causes of error, and how to reduce them, to employees and physicians, and to revisit systems that no longer function as originally intended. When we consider the damage to patients, plus physicians and staff, from the effects of

sharp end errors created on the blunt end of systems, we must recognize the necessity of comparing notes to create a nation-wide taxonomy for discussion, and dramatic reduction of errors. It is time to demand the humanness of physicians, recognizing the manner of teaching the rugged individualism from medical school teaching is misplaced. Neither the physician nor the patient is served by expectations that remove the inherently fallible components of an individual and only replace it with wishful thinking. Systems work because many people, in collaboration with one another, are concerned about patients, but they fail for many reasons beyond the strength of that collaboration. Whether the cost of errors in healthcare estimated at $37.6 billion ([7], p. 259) is accurate, or not, is mostly irrelevant to the question of whether errors should be reduced.

They should be reduced if it is possible to do so. To do otherwise is irresponsible. It should not be a paradox in healthcare that healing, rather than harming, is the *only* focus.

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