Error Reduction, Complex Systems, and Organizational Change

With the renewed attention to error reduction and the overall performance of the U.S. health care delivery system that was stimulated by the recent release of the Institute of Medicine's (IOM) report *Crossing the Quality Chasm*,[1] the article on error reduction appearing in this issue of the *Journal of General Internal Medicine* is particularly timely.[2] I would like to offer a few comments on this article, briefly describe the IOM report, and conclude with some thoughts on organizational change.

Ioannidis and Lau have performed a valuable service by attempting to integrate a diverse literature. Their careful review of 37 randomized controlled trials (RCTs) and observational studies of error reduction interventions confirms that errors abound and that their frequency can be reduced using a broad range of approaches. They identify several methodological difficulties inherent in this type of research including the inability to conceal allocation and the difficulty of using rates of serious adverse outcomes as a dependent variable, given their relative infrequency in any one institution over a limited span of time. They also offer a thoughtful description of potential biases in nonrandomized studies, although I'd point out that historical controls can underestimate as well as overestimate intervention effects by virtue of, say, increasing acuity of illness in inpatients.

For all the effort these authors devoted to their study, they were frustrated in their original intent: to shed additional light, based on a synthesis of available evidence, on "which interventions may be used to effectively reduce the incidence and impact of errors in medical care." They found that the studies could not be aggregated in any meaningful way to reveal more general patterns. Pointing to the multiplicity of interventions, settings, patient populations, and types of error, they concluded, "specific interventions must be evaluated according to their own merits... in specific health care settings." Nevertheless, a closer examination of their methodologic difficulty may provide some insights about how we study and pursue health care improvement.

The first insight concerns the nature of activities we refer to when we use the term "intervention." Tables 1 and 4 in their paper list a broad range of well-defined activities: protocols, patient education, computerized reminders, pharmacist participation in rounds, and so forth. I would suggest that the interventions in these studies were actually far more extensive—that they began when people started to wonder about the quality and outcomes of the care in their clinical programs. They must have gathered other people together, collected information, designed and implemented a new specific course of action and then observed the results (variations on the classic Plan-Do-Check-Act cycle).[3] There might be more to learn, and more generalizable findings, from studying the complete process than from studying the specific interventions by themselves, divorced from their context and the story of their implementation. Such studies would offer additional helpful information to readers hoping to implement any of the studied interventions for themselves, who will need to engage in a similarly complete process. These studies would require a multimethod approach[4] comprised of descriptive, qualitative components as well as well as quantitative outcome assessments.

A related insight pertains to the use of RCTs in the area of quality improvement. I have three concerns about this: 1) RCTs are the gold standard for testing hypotheses about linear causal relationships, but they can't illuminate the complex nonlinear interactions and interdependencies of health care delivery. They focus attention on the intervention, but lead attention away from the unique situational context, leading to the excessively narrow gaze described above; 2) Unless we are very careful about our thinking, RCTs and meta-analysis can seduce us with the promise of finding the "one best answer," fostering a "magic bullet" kind of thinking and an orientation towards control rather than relation, that is as problematic in clinical care as it is in health services research.[5,6] The "rightness" of an intervention in a given situation is not so much a property of the intervention itself as it is a reflection of the quality of the process by which it was designed (including the degree of participation by all the various stakeholder groups involved); and 3) The necessarily rigid format of RCTs may actually inhibit the spontaneous innovation and incremental emergence of knowledge through iterative interactive group process.[7] To quote from one informant to the IOM report, "It's an incredible relief to try small changes on a small scale. It's so simple it's brilliant."[1, p. 146]

Let me move on to the IOM report for a moment. This report delivers harsh news:

> *The care delivered is not, essentially, the care we should receive... Health care today harms too frequently and routinely fails to deliver its potential benefits. (p.1) As medical science and technology have advanced at a rapid pace...the healthcare delivery system has floundered in its ability to provide consistently high-quality care to all Americans. (p.2) Despite the efforts of many talented leaders and dedicated professionals, the last quarter of the 20th century might best be described as the 'era of Brownian motion in health care.' Mergers, acquisitions, and affiliations have been commonplace within the health plan, hospital, and physician practice sectors. Yet all this organizational turmoil has resulted in little change in the way health care is delivered. (p.3) ...physician groups, hospitals, and other healthcare organizations operate as silos, often providing care without the benefit of complete information about the*

patient's condition, medical history, services provided in other settings, or medications prescribed by other clinicians. (p.4)

The report then identifies the nature of the problem, and a general strategy for addressing it:

The committee is confident that Americans can have healthcare systems of the quality the need, want, and deserve. But we're also confident that this higher level of quality cannot be achieved by further stressing current systems of care. The current care systems cannot do the job. Trying harder will not work. Changing systems of care will.

Safety flaws are unacceptably common, but the effective remedy is not to browbeat the healthcare workforce by asking them to try harder to give safe care. Members of the healthcare workforce are already trying hard to do their jobs well. In fact, the courage, hard work, and commitment of doctors, nurses, and others in healthcare are today the only real means we have of stemming the flood of errors that are latent in our healthcare system.

Healthcare has safety and quality problems because it relies on outmoded systems of work. Poor designs set the workforce up to fail, regardless of how hard they try. If we want safer, higher-quality care, we will need to have redesigned systems of care, including the use of information technology to support clinical and administrative processes. (p. 4)

The report continues on to describe in more detail the key attributes of a better, redesigned system, including improved collaboration and coordination (especially for chronic illness), an information infrastructure for patient data and decision support, patient values rather than arbitrary professional autonomy as the principle source of variability, the prompt and systematic application of scientific knowledge, and policy changes in areas such as financing and workforce development to create properly aligned incentives. Insightfully combining evidence-based medicine, relationship-centered care, and medical informatics with industrial engineering, the report offers comprehensive yet specific recommendations for getting us started on the road to a complete system overhaul.

The IOM report takes one other very significant step (as far as I know, the first major national report on healthcare and policy to do so): embracing a principle from complexity science, it proposes an approach to organizational change that recognizes the self-organizing nature of organizational and system behavior, and the limitations of traditional approaches of top-down design and control. In essence, the theory of complex adaptive systems holds that in a system comprised of autonomous but interconnected elements that have a shared purpose, complex macro-patterns of system behavior arise from micro-interactions of the independent elements and the rules governing those micro-interactions.[8] Accordingly, in the IOM's vision, the new healthcare system will not be designed by a centralized planning group, but rather will emerge from the interactions of the many individual participants in the system—particularly patients, their families and members of the healthcare workforce. There are four points of leverage for influencing this emergent process where activity should be concentrated: articulating a common purpose and aims; promulgating a new set of simple rules to guide the interactions and behavior of the participants; developing new enabling tools (notably an information infrastructure and evidence-based practice guidelines); and establishing a facilitating environment (particularly with regard to financing, regulation and professional recruitment and education). This strategy for change is in accord with the empirical observation of Ioannidis and Lau that process improvement is heavily situation specific, with the implication that centralized design is not possible.

I want to conclude by offering another convergent perspective on organizational change. The nature of the shift from linear to nonlinear or complexity-based approaches to organizational change became palpably clear to me when it was presented as a change in the basic metaphor for understanding organizations. Traditional management theory regards an organization as a machine, to be designed and operated by its leaders with everyone else serving as a precision part—performing smoothly, consistently and reproducibly, and doing exactly what is expected. Theoretically, when change is needed, the leaders redesign the machine and everyone else conforms to the new specifications. In practice, this approach frequently leads to disappointment, unintended consequences, anxiety (in the leaders and in the workforce), and the stifling of creativity.

In complexity-based management practice, an organization can be understood as a conversation.[9,10] Everyone helps to create it; the richer the diversity of voices, the more creative it can be. That the conversation takes unpredictable turns is accepted as the natural way of things, not seen as failure, and is regarded as an opportunity for serendipitous discovery. The conversation cannot be designed or controlled, but it can be influenced. Effective leaders seek to change the organization by changing the nature of their own participation and the themes they introduce, and they make themselves available to be changed, as well. They listen, track and follow as much as they seek to direct, and they help the organization hold the constructive tension of honest disagreement. This model of management and organizational change may have a familiar ring to students of patient-centered interviewing or relationship-centered care. The values and the methods are exactly the same. The theoretically derived approaches from complexity science and the empirically derived principles of relationship-centered care converge in what we might call Relationship-Centered Administration.[11] How fitting that the process of transforming the health care system should embrace the same values as the practice of healthcare itself! And now, as the IOM and Drs. Ioannidis and Lau have shown us, we have

much work to do. — **Anthony L. Suchman, MD,** *Relationship Centered Health Care, The University of Rochester, Rochester, NY.*

Note: *Readers interested in learning more about complexity science may want to contact the Plexus Institute (a new non-profit organization dedicated to research and education on complexity and health) or visit its website (http://www/plexusinstitute.com) where a sourcebook titled* Edgeware: Insights from Complexity Science for Health Care Leaders[8] *is available free of charge.*

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