

## Science and patient safety

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Patient safety is proving a challenge in cultural, technical, clinical and psychological terms, and because of its massive scale and heterogeneity. There is general agreement that the targets set in 2000 for reducing harm by 50% were overly ambitious.<sup>1,2</sup> Longitudinal record reviews in the United States<sup>3</sup> and analyses of routine data in the United Kingdom<sup>4</sup> have shown little evidence that safety has improved across health care systems.

One of the largest programs to date, the UK Safer Patients Initiative, engaged some of the acknowledged leaders of patient safety and quality improvement but failed to show any large-scale change on a variety of measures of culture, process and outcomes.<sup>5</sup> Recent papers have identified the many barriers<sup>1</sup> to improving safety, but few have considered a fundamental problem — the need for more science.

Biomedicine assumes that effective interventions are preceded by a solid understanding of the underlying problem. Potential interventions are extensively tested in large, properly resourced trials. In contrast, patient safety has relied heavily on local enthusiasm<sup>6</sup> and the willingness of committed clinicians to find time to understand and improve their systems. This is an essentially 19th century approach to science, largely relying on brilliant amateurs working in isolation. Patient safety now needs to adopt a thorough scientific approach for analyzing underlying problems, developing and testing interventions and more effectively using scientific knowledge in improvement programs.<sup>7</sup> This goal will require stronger collaboration with scientific disciplines other than medicine, in addition to the creation of centres of research and improvement that combine them.

### KEY POINTS

- Improving patient safety needs to be more strongly grounded in basic science.
- A scientific approach to safety will require sustained collaboration with disciplines other than health care.
- Scientific analyses of safety behaviour and interventions are critical to progress.
- Permanent multidisciplinary centres need to be established in all countries to support research and implementation.

### “Lessons from the war on cancer”

The argument for more attention to basic science was powerfully advanced by Richard Cook in his paper “Lessons from the war on cancer: the need for basic research on safety.”<sup>8</sup> Cook recalled that, in 1971, President Nixon announced a \$100 million initiative aimed at “beating cancer.” Forty years — and many billions of dollars — later, we can see that the early optimism was entirely misplaced. Great progress has been made, but it has been through sustained, incremental application of the scientific method with the aim of first understanding the many varieties of cancer rather than moving directly to treatment. Cook argued that most attempts to improve patient safety were blind applications of specific techniques.<sup>8</sup> As with cancer, he suggested that we needed to first understand safety; only then could we achieve sustained improvements.

### A scientific program for safety

What would coordinated scientific research on patient safety look like? Clearly, such a program would require many facets. For example, measurement has been shamefully neglected, denying patient safety its most basic scientific foundation. Record reviews of adverse events were extraordinarily important in showing the overall scale of harm to patients. However, we should now move toward clearly defining and measuring specific types of harm using record reviews and clinical and administrative databases. In addition, rigorous observational studies are required to provide a more direct assessment of error and harm than can be achieved through record review. Finally, we need to monitor harm along entire patient pathways (e.g., to include adverse drug effects in the community).

Many studies have shown that health care professionals are poor at following basic procedures.<sup>9</sup> As with other types of human behaviour, multiple influences are involved. Thus, we need to better understand the circumstances in which people do and do not follow procedures, and the most effective means of supporting adherence to basic safety rules.

Both clinical and executive leadership are

critical to safety. An important challenge in the near future will be to go beyond exhortation to a scientific approach to encouraging specific changes in behaviour using safety-related training, usable procedures and psychological techniques, such as mental rehearsal.

Decision support is widely held to be a potentially powerful means of improving both safety and efficiency. Safety may be degraded by poor decision-making, but adaptive decision-making may sometimes provide a critical element of resilience in health care systems.<sup>8</sup> We need to determine when we can and should rely on human judgment and decision-making, and when we should defer to algorithms and computers. In health care, this can be partly determined by context, but should be framed by what is already known about the strengths and limitations of human judgment and decision-making.<sup>10</sup>

Finally, we need to understand the reasons why some interventions succeed and others do not, as well as why apparently similar interventions may succeed in one context but not in another. The unpredictable nature of complex organizational interventions that evolve and change over time is particularly challenging. However, recent studies address, from a theoretical perspective, the contextual influences on large-scale change and the implicit theories of change underlying the interventions that are developed.<sup>11</sup>

## Building safer systems

If we really want to achieve system-level change, we should rethink how interventions are developed and tested. Many important interventions are either not tested at all or are only subject to a cursory evaluation in a relatively short time.<sup>4</sup> Major interventions will need to be underpinned and tested in projects in which an entire service is studied, assessed for vulnerabilities and engaged in a systematic program of improvement for 3–5 years. Instead of always adapting to the frantic pace of health care, we should be willing to deliberately slow a service to maximize its reliability and precisely understand and implement what is needed to deliver safe care. Once the new system is in place, ordinary clinical practice can resume. The resources necessary for such an endeavour might seem considerable, but they are modest when compared with those for developing and testing a new drug.

## Learning from climate change

To adequately address the scientific problems described here will require sustained collabora-

tion with disciplines other than health care. For example, psychology, sociology, human factors engineering and organizational behaviour are critical to providing the necessary understanding of psychological and social issues surrounding patient safety.<sup>12</sup> Here again we should draw inspiration from other sciences. A critical and relatively rapid response to the challenge of climate change was the creation of “centres of climate change,” where experts from diverse disciplines come together to address the problem.<sup>13</sup> Such centres have been deliberately and carefully structured to combine the relevant range of disciplines in long-term collaboration. Similarly, if we are to improve the safety of health care, funders must move beyond single projects to develop an international network of established centres that can bring the necessary science and practical experience to bear on patient safety. Permanent multidisciplinary centres need to be established in all countries to provide sustained inspiration, research, training and practical support for implementation and innovation.

## References

1. Kohn LT, Corrigan JM, Donaldson MS, editors. *To err is human: building a safer health system*. Washington (DC): National Academies Press; 1999.
2. Wachter RM. Patient safety at ten: unmistakable progress, troubling gaps. *Health Aff (Millwood)* 2010;29:165-73.
3. Landrigan CP, Parry GJ, Bones CB, et al. Temporal trends in rates of patient harm resulting from medical care. *N Engl J Med* 2010;363:2124-34.
4. Vincent C, Aylin P, Franklin BD, et al. Is health care getting safer? *BMJ* 2008;337:a2426.
5. Benning A, Dixon-Woods M, Nwulu U, et al. Multiple component patient safety intervention in English hospitals: controlled evaluation of second phase. *BMJ* 2011;342:d199.
6. Burnett S, Benn J, Pinto A, et al. Organisational readiness: exploring the preconditions for success in organisation-wide patient safety improvement programmes. *Qual Saf Health Care* 2010;19:313-7.
7. Straus SE, Tetroe J, Graham I. Defining knowledge translation. *CMAJ* 2009;181:165-8.
8. Cook RI. Lessons from the war on cancer: the need for basic research on safety. *J Patient Saf* 2005;1:7-8.
9. Carthey J, Walker S, Deelchand V, et al. Breaking the rules: understanding non-compliance with policies and guidelines. *BMJ* 2011;343:d5283.
10. Kahneman D. *Thinking, fast and slow*. London (UK): Allen Lane; 2011. p. 499.
11. Dixon-Woods M, Bosk CL, Aveling EL, et al. Explaining Michigan: developing an ex post theory of a quality improvement program. *Milbank Q* 2011;89:167-205.
12. Wears RL, Perry SJ, Sutcliffe KM. The medicalization of patient safety. *J Patient Saf* 2005;1:4-6.
13. Vincent C, Batalden P, Davidoff F. Multidisciplinary centres for safety and quality improvement: learning from climate change science. *BMJ Quality & Safety* 2011;20(Suppl 1):i73-8.

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