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## INVITED COMMENTARY

### HEALTH CARE REFORM

# Diagnostic Adverse Events

## On to Chapter 2

For almost 3 decades, researchers have been trying to understand iatrogenic injuries through large-scale review of medical records. Studies in the United States in California, New York, Utah, and Colorado have been followed by similar investigations in Great Britain, Canada, New Zealand, Spain, and now, with the publication of the report by Zwaan et al, the Netherlands. These studies generally use nurse review of explicit criteria followed by multiple physician implicit review. Zwaan et al found that, overall, about 5% of hospital stays result in an AE, ie, a patient injury or a prolongation of the hospital stay, due to medical management as opposed to the disease process.

In 1999, the Institute of Medicine<sup>1</sup> summarized data, pointed to mortality and morbidity associated with extrapolations from the research studies, and gave birth to the safety movement. Since then, investigators have tried to better understand the causes of AEs and suggest ways to prevent them. In particular, medicine has attempted to import methods from professions known for

safety and high reliability and has achieved some real progress.<sup>2</sup>

However, the AE due to a diagnostic error, the subject of the insightful article by Zwaan et al, has proven very difficult to address. The authors found that 6% of all hospital AEs were diagnostic. Most were related to pulmonary embolism, sepsis, myocardial infarction, and appendicitis.

Diagnostic errors and AEs have long been recognized and are now defined as those in which diagnosis was unintentionally delayed (while sufficient information was available earlier), wrong (another diagnosis was made before the correct one), or missed (no diagnosis was ever made) as judged from the eventual appreciation of more definitive information.<sup>3</sup> Prior knowledge about diagnostic errors has, however, been derived from malpractice claims file reviews,<sup>4</sup> autopsy studies,<sup>5</sup> and voluntary reports.<sup>6</sup> We have been hesitant to rely too much on these studies owing to their inherent selection bias: lawsuits, autopsy cases, and physician recall are unlikely to be generalizable. But it now appears that we have corroborating evidence from the

record review conducted by Zwaan et al about the frequency, types, and consequences of diagnostic errors in the hospital setting. Importantly, much less is known about ambulatory diagnostic errors.

Now that a population-based study has reinforced insights into diagnostic errors from less generalizable studies, it is time to close chapter 1—of what may turn out to be a long book—and begin chapter 2: studies on how to prevent inpatient diagnostic errors. Taking the analysis a step further than others have, Zwaan et al applied the Eindhoven criteria<sup>7</sup> to diagnostic errors and found that such errors are likely to be knowledge based, to represent a deviation from rules, and to be independent of patient-related factors. The Dutch investigators also note that lack of knowledge, inappropriate application of knowledge, inadequate information transfer, urgency of decision making, and lack of supervision all contribute to diagnostic errors. While diagnostic errors have both cognitive and system-based origins,<sup>8</sup> in sum, they appear to be a professional problem related to assimilation

lation and processing of information to reach a correct diagnosis.

The identification of organizational factors like transfer of knowledge as important causes of diagnostic errors could lead to the development of prevention strategies. For example, with better health information systems we might get better transmission of information to clinicians when they need it,<sup>9</sup> although that outcome is still unproven. In addition, more supervision, or more resources so as to reduce hectic decision making by overworked professionals, could be useful, but these are unlikely to be implemented in our cost-constrained American health care system.

Two additional paths may lead us to more insights. One is a more serious effort to categorize and understand the nature of diagnostic errors. In an article published in 1989, Kassirer and Kopelman<sup>10</sup> began this process by reviewing a series of 34 clinical reasoning sessions they had published over the previous decade. Drawing on insights from cognitive psychology and clinical experience, they identified key phases of the diagnosis, including triggering, context formulation, information gathering and processing, and verification. Much of this resonates strongly with the error movement in terms of attempting to dissect reasoning and understand how errors occur.

Kassirer et al<sup>11</sup> have now updated these views and integrated more sophisticated information from cognitive psychology into the analysis. They illustrate their concepts through a series of brilliant case studies. This is an excellent approach for students and practitioners—we should be conscious about the reasoning process and realize how errors can occur.<sup>12</sup> Better techniques for diagnostic decision making, facilitated by smarter electronic health records, would seem to be a critical element in avoiding errors. But will it be enough? And are a sufficient number of students and trainees exposed to this approach?

Another approach might be to more fully import simple safety-inducing measures from other professions. Perhaps the best case for this has been made by Gawande,<sup>13</sup> advocating for better use of checklists

in procedural and surgical interventions. Gawande found checklists being used in a variety of professions (eg, engineering, aviation, cooking). More importantly he found that they were being used not only to address simple undertakings (recipes) and complicated ones that have to be broken down into simple steps, but also complex problems where expertise and simple step analysis are not sufficient.

As Kassirer et al<sup>11</sup> make clear, diagnosis is a complex problem. Checklists seem hopelessly simple for the task. But as Zwaan et al make clear, lots of diagnostic problems come from simple oversights and lack of good teamwork. These are similar to the problems that Gawande<sup>13</sup> addresses in surgery, which in many ways are also very complex. Certainly this seems like a fruitful area for consideration.

Finally, though, we should ask whether the health care system will support interventions to reduce diagnostic errors. It has not done so thus far. It would appear that the health care system tolerates some background rate of errors, so long as practitioners or hospitals are not wild outliers. There is little business rationale for improving diagnosis because most of the costs of diagnostic AEs are never uncovered and are absorbed quietly by payers. Money is made in health care by moving forward with ever more costly interventions, not by looking back at errors that could have been avoided.

However, the financial incentives operative in our health care system might change. Faced by a national debate on health reform to increase access, a federal government that will not be able to borrow its way out of overcommitment, and a massive aging of the population, we cannot afford the current system. Accountable health care organizations may develop, and these will be charged with improving and maintaining population health rather than driving revenue through fee for service. As such, they will be accountable for the costs of diagnostic errors and might be more interested in avoiding them.

Chapter 1 on diagnostic errors is closed; we know that diagnostic errors are frequent and important. Now we open chapter 2 and hope (1) that re-

searchers and quality improvement professionals investigate how we can prevent diagnostic errors and (2) that policy makers and politicians create the right environment to enable use of this knowledge to improve care. Some of this is already under way, but we need to do much more.

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