COMMENTARY

A Conversation with David Bates, MD, MSc, Chairman of the American Medical Informatics Association

Brian Raymond, MPH

A world-renowned physician-researcher, David Bates, MD, MSc, is Chief of the Division of General Medicine at the Brigham and Women's Hospital in Boston, MA, and a Professor at Harvard Medical School and the Harvard School of Public Health, where he is codirector of the Program in Clinical Effectiveness. He is the Medical Director of Clinical and Quality Analysis, Information Systems at Partners HealthCare System, Inc. He is also the former Chair of the National Alliance for Primary Care Informatics (NAPCI) and the Chairman of the American Medical Informatics Association (AMIA). Dr Bates' primary interests are in information technology and how it can be used to improve safety and quality. He has conducted extensive research on medication safety in particular, evaluating the incidence and preventability of adverse drug events. He is the author of over 350 publications in peer-reviewed journals.

David Bates, MD, MSc

Introduction

In this interview Harvard professor of medicine, David Bates, MD, MSc, speaks on recent progress towards widespread health information technology (IT) adoption, why decision-support tools are now more important than ever, and the necessity to develop the next generation of health informatics professionals.

Brian Raymond (BR): Where do we stand seven years after the release of the Institute of Medicine's *To Err is Human*[1] report? Have quality and safety improved?

David Bates, MD, MSc (DB): We have come a reasonably long way in that time, and know much more about safety. Support from the federal government has dramatically increased the amount of patient safety research. But we've made less progress in actually taking the research findings and implementing them. Are we doing better overall with quality and safety? I think we are doing modestly better, though the truth is we can't be certain based on the available data.

The National Quality Forum's *Safe Practices for Better Health Care*[2] represents a very positive development. Hospitals are starting to work on various initiatives to reduce the risk of harm to patients, though it is still in the early days, and we are probably only a little better. A major obstacle is that we don't have the metrics to accurately assess how we're doing with respect to patient safety objectives. And therefore, it's difficult to know for sure how much things have really improved.

BR: Have electronic health records (EHR) enhanced the ability to measure quality and safety?

DB: Absolutely. Using electronic records to detect adverse events is one of the main areas that I've focused on the research front, but I've collaborated with other groups that have used IT successfully to detect falls and nosocomial infections. I believe that in the not-too-distant future it will be possible to build a computerized adverse event monitor that looks for all types of adverse events and delivers a reasonable, reliable assessment of safety levels—useful in a variety of ways. For example, we've used a computerized adverse drug event monitor to determine the impact of computerized prescribing with two different levels of decision support—more reliable and objective than chart review and peer review to assess medication safety.

BR: What do you think of current efforts to use evidence-based clinical guidelines to improve health care quality?

DB: There is a lot of redundant

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effort in guideline development and having a repository of actionable knowledge would be valuable, with guidelines as an important component. However, the repository should also include rules and algorithms.

The National Guidelines Clearinghouse (NGC) is a great resource, though many conflicting guidelines exist for the same condition. Another concern is that most of the guidelines from NGC are not written for direct incorporation into an EHR. That takes a lot of work. Every organization incorporating guidelines into their electronic record system has their own group working on the exact same problem. Sharing guidelines could really advance this work.

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BR: Is it possible for physicians to keep up with the latest guidelines and recommendations?

DB: Physicians are highly motivated and giving them the right information often results in big improvements. But if primary care physicians, in particular, were to do all the things they are supposed to do on the basis of recommended guidelines, it would take them 20 hours to see the patients they now see in 8 hours. We've got to explore some solutions, like previsit lists and engaging patients with health information tools. Also nonphysicians and physician extenders can do many things. If we change the way primary care is delivered, it might again become manageable.

BR: What's being done to get to higher levels of performance in outpatient care?

DB: There are three strategies that are pivotal to improving quality in the ambulatory setting. The first is decision-support tools and resources—but the gains here tend to be modest: on the order of 10% to 15% improvement per measure. The second strategy is registry-based tools—you have to be able to list your patients and determine who is in or out of compliance with the treatment plan, with some method of contacting them, and this should not depend on the physician. Third, you need a team component, including support for outreach to patients who are not coming in as scheduled or who are not in compliance. With those three strategies you can get to very high levels of performance across major indicators, in the high 90s. It's clear that if you create an environment with the right strategies and tools and the right incentives, you can improve care across a broad range of parameters.

BR: What is the future state of quality improvement?

DB: Maximizing computerized decision support will be much more cost effective than alternative approaches that tend to be quite expensive, particularly those that require investments in ancillary personnel. Personal health records (PHRs) will be another important tool, because clinicians and patients can accomplish a lot with online communication tools, as an alternative to office visits. Eventually, patients will go online and get messages from their clinician's team to manage their health. Patient notes and self-reported data in PHRs will help to inform clinicians of patient status. Eventually, I think we'll off load many functions from the primary care clinician and free them to work on other priorities. So the endgame will look quite different than it does today.

BR: Are PHRs being oversold?

DB: Eventually PHRs will be very important. Today, they are being pushed harder than is justified given the evidence available. Some believe that personal health records are the solution for health IT and that we can forego EHRs, but I don't agree.

A PHR will work best if it's linked to an EHR because that's where much of the information patients care about resides. Much more research is required on PHRs, and the business case needs to be sorted out. Organizations like Kaiser Permanente and Partners HealthCare Systems have made big investments in PHRs. But smaller clinician groups are really conflicted about investing in consumercentric technologies because they are not reimbursed for nonvisit care. The most important research question in the near term is: "How can PHRs be used most efficiently to improve care for patients with chronic conditions?" This is important both because of the high costs of these conditions, and because decision support hasn't been as effective for many conditions, compared to its performance in preventive care.

BR: The infrastructure to translate evidence-based guidelines and decision-support tools into positive clinical outcomes requires a significant investment that many clinicians in the fragmented US health care system cannot afford. How do we deal with this reality?

DB: We need a federally funded clearinghouse for decision support that is clinically actionable, providing information that clinicians could plug into an EHR system. Until we have that, we won't realize much of the value of EHRs that research tells us is possible. The modeling that we've done at the Center for Information Technology Leadership (CITL) suggests that you only get financial benefit if you use sophisticated decision support. In fact, CITL models also suggest that an EHR without decision sup-

port is not even cost-effective. But that's the direction the industry is headed. A national infrastructure for clinical decision support is one of the most important things to address in the next few years, if we're going to achieve benefit. There are several proposals on the table about this, and AMIA has made clinical decision support one of its centerpiece issues.

BR: What are some of the most promising IT innovations emerging in care delivery today?

DB: There are many exciting and important innovations right now. I'll list them: 1) in hospitals, computerized order entry that should be used universally soon; 2) bar coding appears to make a big difference; 3) smart pumps—intravenous infusion pumps that know what drug is being given and can warn a nurse if there is a problem—are very promising and will probably have a big impact; 4) computerized adverse drug event monitoring; 5) smart monitoring, not just for adverse events but more broadly in the inpatient setting; 6) it often takes an unacceptably long time to perform medical reconciliation—information technology will be improving the process; 7) tools that facilitate hand-offs between clinicians; 8) tools to better manage critical test results; and 9) in the outpatient setting, computerization of prescribing with decision support, tools for managing critical test results and tools for monitoring of patients with chronic diseases are very promising.

BR: What are the most important things to understand today about clinical decision support?

DB: It's important to learn what works, particularly for treating chronic conditions. Many recent trials in this area have been negative. We also need to understand how decision-support effectiveness varies by condition. You might expect that because we have figured out how to use decision support for one condition that we could apply it to all conditions—it doesn't play out like that. We also need to learn how to use data mining techniques to get key pieces of information about patients like their current symptom status to aid decision support. That's a particular challenge for conditions like congestive heart failure.

BR: How can decision support be used to improve diagnostic processes?

DB: This is an important and relatively understudied question. Many of the decision-support tools that were designed in the late 70s and 80s focused on diagnostic support and those tools, as good as they became, were never used very much. It's now become clear that one of the important categories of error that harms patients is the diagnostic error—and yet we don't really know how to prevent it. Clinical IT tools that help practitioners avoid diagnostic errors are one of the important frontiers in patient safety. Those diagnosis support tools that are available today are useful in certain circumstances—taking a constellation of findings and providing a differential diagnosis—and they do that reasonably well. Examples are tools like Dxplain, QMR, and Iliad. I use those when I encounter a patient with complex constellation of findings (and I can't come up with a unified diagnosis) largely to decrease the likelihood that I've missed something. But overall, diagnosis support tools are used very little in the physician community. When physicians make most diagnostic errors, they generally don't know they are errors and they tend to make an early diagnosis, for example pneumonia when a patient actually has a pulmonary embolism. They have to recognize their uncertainty if they are to utilize a freestanding tool. The future here may be diagnostic tools that "think along" with the clinician and make suggestions at appropriate times.

BR: What are the barriers that keeps the clinician from moving more rapidly toward EHR information exchange?

DB: The biggest issue is lack of incentives. There's little incentive for a delivery system—that's made a large investment in a clinical information system—to share their information with others in their market who have not—they'd lose a competitive advantage. Although health information exchange will benefit the individual and society, the incentives are mixed from the delivery system perspective. Standards have been another barrier. We now have good standards for all types of clinical data but many vendors are still not using them, in part because they haven't been asked to by their customers. Issues around privacy and security are very important and we need to have a societal dialogue about the benefits of health information exchange. Most people are willing to have their information exchanged electronically, but there's a vocal minority that are strongly resistant to it. As a society, we haven't decided how we want to manage that.

BR: Are health care purchasers becoming a more explicit part in the health IT reimbursement equation?

DB: It's absolutely pivotal because health care payers and purchasers are actually the ones who benefit the most economically when EHRs and clinical data exchange are

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implemented. In Massachusetts, one of the main reasons we've been successful is that we were able to bring all the main players to the table. But in many other states, the payers in particular have not been engaged. And purchasers are often fragmented. In most markets there is no entity like the Pacific Business Group on Health, which has been so effective in bringing employers together. Most of the attention of the purchasers has been on pay-for-performance, which is clearly important, though other issues like who should pay for health IT also need to be addressed.

BR: Have we made progress to address the barriers to widespread adoption of EHRs over the past decade?

DB: We have made a great deal of progress since 2001. Today, the integrated delivery systems in this country have for the most part adopted EHRs. We've also had progress on the standards and there is now a standard for most key types of clinical data. However, in many instances that standard is not yet widely used. Progress is likely to continue to accelerate. The Certification Commission for Healthcare Information Technology (CCHIT) also represents an important new development. CCHIT is now certifying EHR products. The process of deciding what system elements will be certified is extremely important. Many commercial systems made it through CCHIT's first round of certification, but the bar is going to be raised in the next round. The CCHIT will be important in reducing barriers to adoption. In the past, clinicians worried that IT vendors might go out of business and they'd be stuck with a system based on proprietary data structures that didn't represent data in a standardized way. CCHIT addresses this concern. It reduces the likelihood that a systems investment will become obsolete in the near term and it ensures that all the key elements that should be in a system are present. The standards work done by a variety of organizations including the Health Information Technology Standards Panel (HITSP) has also been fundamentally important.

BR: What about incentives for physicians in small or individual practices to adopt EHRs?

DB: That's one of the biggest outstanding issues. The fundamental issue is financial and it has not been resolved. For an individual physician or a small group practice, the costs of health IT are still really high. Some approaches to addressing this problem haven't been implemented. For example, improving access to low-cost systems would be helpful for clinicians who have capital issues—so would paying clinicians more if they adopt and making available low-interest or forgivable loans. Also, if they buy a medical record system, it may not have the decision-support tools they really need.

BR: You suggest that access to a low-cost technology for clinicians is a potential solution. But is free even cheap enough?

DB: Free is too cheap. EHRs don't need to be free for clinicians to adopt them. When something is free, the user tends not to take it seriously enough. Furthermore, even if EHRs were free, someone is paying for them—in Australia, the pharmaceutical industry pays for records and they are using the record to deliver real-time, diagnosis-specific drug advertisements to physicians.

BR: As you look at recent research results on the use of IT in health care, what gives you the most hope and what concerns are worth noting?

DB: We now have a considerable amount of research suggesting that care will be better if clinical information systems are used, particularly on the quality and patient safety fronts. Examples relating to quality include: reminders for preventive measures; decision support for drug dosing; computerization of prescribing; and implementation of bar coding in the pharmacy. But, there is still controversy about even the most effective health IT interventions. For example, there is debate in the literature about how much benefit you get from a particular intervention and if the results can be replicated across institutions. There are also concerns of unintended consequences with technologies like computerized physician order entry (CPOE)—and some of these concerns are valid and important to consider. Introduction of any technology can create new errors, and it is important to track these errors and to introduce strategies to reduce their frequency.

BR: What are the key research questions yet to be answered?

DB: There are lots of unanswered questions. For example, what decision-support tools make the most difference with CPOE? Are the effects of clinical IT interventions the same in community hospitals as they are in academic hospitals? Testing needs to be done for a variety of understudied interventions like systems to manage critical test results. More information about the relative benefits of specific interventions from both the clinical and economic perspectives would be helpful for administrators who need to prioritize. There's a lot more work

to be done, both inside the hospital and in outpatient settings where there has been relatively little research.

BR: What is the imperative for medical informatics training?

DB: There is clearly a major shortage in the number of people who understand medical informatics in the US. I get e-mails every day asking for job candidates skilled in this area. Health care institutions are starting to recognize that they don't just need one person, but probably multiple people in their organization that understand both medicine and informatics—and there are far too few people with formal training in both areas.

Medical informatics is going to be important in all of the major clinical disciplines. It's important to have physicians, nurses, and pharmacists who all understand informatics. Today, students studying health sciences do not have medical informatics sufficiently high on their radar screen. Most curricula in all major disciplines do not include enough about health IT. That's certainly true in medical schools, but it's also true in nursing and in pharmacy schools.

One effort addressing this is the American Medical Informatics Association's 10x10 initiative. It's a call to train 10,000 people in clinical informatics by 2010. That's necessary, but it's not sufficient. It won't result in enough people being trained at the right levels. We need more people being trained at the doctoral level and at the master's level, and we need people positioned as implementation and practice leaders. If we are going to achieve the expected benefits of health IT, many, many people will need to understand at least the basics of medical informatics.

BR: Where do you think informatics is going more broadly?

DB: It is an incredibly exciting time for informatics and health care IT. There are two big things that are about to transform health care: genomics, which will make fundamental changes, and health IT. Although health IT is just a tool, it is a very powerful one. It has the potential to enable a revolution in quality and in safety measurement and improvement. ❖

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Only a Boy

I do not know what I may appear to the world;
but to myself I seem to have been only like a boy playing on the seashore,
and diverting myself now and then finding a smoother pebble
or a prettier shell than ordinary,
whilst the great ocean of truth lay all undiscovered before me.

— Sir Isaac Newton, 1642-1727, English physicist, mathematician, astronomer, theologian, natural philosopher, and alchemist