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June 2009



The Convergence of Quality and Efficiency and the Role of Information Technology in Healthcare Reform

A photograph of two green street signs crossing each other on a silver pole against a clear blue sky. The top sign is labeled 'QUALITY' and the bottom sign is labeled 'EFFICIENCY ST'. The signs are slightly tilted and overlap in the center.

QUALITY
EFFICIENCY ST



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Meaningful, comprehensive reform of the U.S. healthcare system should include a more efficient and less costly system of access to care and delivery of appropriate services.

Improving efficiency is not the same as cost-cutting; instead, it is the elimination of *waste*. Milliman has defined inefficiency or waste within the U.S. healthcare delivery system as unnecessary, redundant, or ineffective treatment (and the costs associated with such treatment) that is contrary to, or not demonstrably associated with, healthcare quality and outcomes. Looking beyond the care delivery system, inefficiency also includes costs that are not demonstrably associated with a sound approach to enabling full access by everyone to appropriate healthcare coverage. Elimination of waste enables the delivery of care in an efficient manner, thereby reducing costs and improving quality.

Put another way, reducing waste in healthcare is a unique example of how doing the right thing (improving outcomes) can also save money.

How much waste is present that could eventually be removed? Milliman's actuaries have concluded that the amount of waste in the healthcare system is in excess of 25% of total healthcare spending, or more than \$600 billion in 2008.¹

In pursuing the elimination of waste, can the dual objectives of quality care and cost effectiveness be achieved simultaneously? Milliman's clinicians believe that best medical practices lead to this result—that quality and cost effectiveness converge.

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However, realizing even a significant portion of this potential will not be quick, simple, or easy, nor will it be unilateral and one-dimensional. A cohesive framework must be established and implemented—one that is sound clinically, financially, and operationally and is based on demonstrated approaches.

A note on terminology

The term "electronic health record," or EHR, means different things to different people. It is used by the media to describe the larger world of electronic health information. There are also various subsets, including computerized physician order entry (CPOE), clinical decision support (CDS), electronic medical records (EMR), and personal health records (PHR), among others. For the sake of this research report, we are using the broadest possible definition of EHR.

¹ Slipher, C. & Harris, R. Transforming Healthcare: Identifying the failures and unlocking the potential of our current system. Milliman *Insight Magazine*, 2009: Issue No. 8.

RE-EXAMINING QUALITY AND EFFICIENCY

Historically, quality and efficiency in the U.S. healthcare system have been viewed as separate, even mutually exclusive, goals. The thinking was that improving quality would necessarily result in higher costs, and that reducing costs would inevitably lower quality.

But quality and efficiency go hand in hand. While they do not always move in lockstep, the medical literature offers numerous examples of instances in which healthcare quality and efficiency behave symbiotically. As seen by the federal government's 2009 Quality Reform Expansion and Savings Act (QRESA), that perspective is gaining acceptance. QRESA now is leading healthcare reform efforts by coupling the goals of quality and efficiency, recognizing that these goals are, in fact, inseparable.

QRESA assumes that "properly tailored healthcare reforms can lower medical costs and improve quality of care."² This legislation proposes the establishment of a Quality Reform Committee, charged with evaluating and exchanging best practices in healthcare. The legislation creates the role of an independent arbiter of standards of healthcare. It assumes that there is a convergence of both quality and efficiency, and that measures to address inefficiency in healthcare can also improve quality.

Electronic health records (EHRs) are an integral part of the government's plan, because they allow for a more consistent, portable, and efficient system for sharing medical information. But EHRs alone will not solve the problem. What EHRs can do is serve as a mechanism to deliver decision support for high-quality medical care. That is, EHRs can promote "the conscientious, explicit, and judicious use of *current best evidence* in making decisions about the care of individual patients."³

By delivering evidence-based medical guidelines to care providers and others who need them, when they need them, we can begin to develop a more intelligent healthcare system based on a clearer understanding of what is efficient and what provides the best possible care.

Quality and efficiency go hand in hand. While they do not always move in lockstep, the medical literature offers numerous examples of instances in which healthcare quality and efficiency behave symbiotically.

2 Quality Reform Expansion and Savings Act of 2009. Available at: <http://thomas.loc.gov/cgi-bin/query/z?c111:S.441>. Retrieved March 26, 2009.

3 Sackett, D.L., Rosenberg, W.M., Gray, J.A., Haynes, R.B., & Richardson W.S. Evidence-based medicine: What it is and what it isn't. *British Medical Journal* 1996;312(7023):71-2.

DEFINING INAPPROPRIATE CARE

There are three types of inappropriate care that have a negative impact on quality and efficiency in the U.S. healthcare system: overuse, underuse, and misuse of care.

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Overuse of healthcare services occurs when the risk of providing a service exceeds the benefits of that service. Overuse also occurs when the benefits of additional services do not justify their costs. In the first instance, the services are inappropriate because they are ineffective. In the second, the services may be *comparatively* ineffective—that is, there may be alternative lower-cost services available that yield equal or better benefits. Studies have found that a significant percentage of certain surgeries and diagnostic procedures are performed despite their being clinically inappropriate.^{4,5} This conclusion was based on criteria developed using the available evidence base, supplemented by expert consensus. The overuse noted by the studies has serious negative consequences: overuse of procedures exposes patients to unnecessary risks of complications and increases healthcare costs without providing increased benefits.

Underuse of healthcare services occurs when services that are known to be medically beneficial are not provided. A study examining healthcare quality for acute and chronic conditions, as well as for preventive care, found that patients received about 50% of the recommended services. The explanation for why some recommended services were never received seems to lie in the perception of what medical conditions warranted treatment. The study found little difference in the proportions of recommended services received by category of services, but there was substantial variation depending on the clinical condition. For example, patients received recommended care for alcohol dependence only about 10% of the time, but they received recommended care for cataract nearly 80% of the time.⁶ While underuse of healthcare services presumably costs less in the short term, obviously, correct curative treatment for acute conditions can prevent worsening of such conditions, thus reducing costs over the long term.

Misuse of healthcare services includes patient safety considerations, such as avoidable complications and medical errors.⁷ These include *never events*, such as operating on the wrong side of the body, and complications associated with healthcare, such as infections or pressure ulcers acquired during a hospitalization.

One of the root causes of inappropriate healthcare, resulting in less-than-optimal quality and efficiency, is variation in provider *practice style*. Practice style refers to the unique approach each physician takes when recommending care, especially when there is a lack of consensus about what care is best in a given situation.

One of the root causes of inappropriate healthcare, resulting in less-than-optimal quality and efficiency, is variation in provider *practice style*. Practice style refers to the unique approach each physician takes when recommending care, especially when there is a lack of consensus about what care is best in a given situation. Part of the challenge for today's physician is the sheer amount of scientific information and published articles created each year. Consider the volume of new medical research to emerge in the last 20 years alone. In 1989, the MEDLINE database reported 372,806 new published citations per year and 2,888 journals annually;⁸ in 2006, MEDLINE added 623,000 citations and 5,020 journals.⁹ Even the most conscientious physician could not keep up with such an explosion of new information.

There also are cultural or style influences. Variances from best practices could be embedded in the way an organization dictates change of practice or they can simply be habit—the way physicians have always done things. Whatever the cause, individual variances lead to inconsistency in care decisions, sometimes resulting in inappropriate care.

- 4 Winslow, C.M., Kosecoff, J.B., Chassin, M., Kanouse, D.E., & Brook, R.H. The appropriateness of performing coronary artery bypass surgery. *Journal of the American Medical Association* 1988 Jul 22-29;260(4):505-9.
- 5 Winslow, C.M., Solomon, D.H., Chassin, M.R., Kosecoff, J., Merrick, N.J., & Brook, R.H. The appropriateness of carotid endarterectomy. *New England Journal of Medicine* 1988;318(12):721-7.
- 6 McGlynn, E.A., et al. The quality of health care delivered to adults in the United States. *New England Journal of Medicine* 2003;348(26):2635-45. DOI: 10.1056/NEJMs022615.
- 7 Committee on Quality of Health Care in America. To Err Is Human: Building a Safer Health System. http://www.nap.edu/openbook.php?record_id=9728&page=R1
- 8 National Library of Medicine annual report of programs and services, Washington, D.C.: National Library of Medicine 1989. Retrieved May 4, 2009, at <http://www.nlm.nih.gov/pubs/reports.html>
- 9 National Library of Medicine annual report of programs and services, Washington, D.C.: National Library of Medicine 2006. Retrieved May 4, 2009, at <http://www.nlm.nih.gov/pubs/reports.html>

HIGHER COSTS AND MORE SERVICES DO NOT LEAD TO BETTER QUALITY

Evidence has accumulated showing that more healthcare expenditures do not always mean better care. In some cases, healthcare interventions do not improve health. In other cases, they may worsen health, even to the point of causing death.

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Clinical examples of this phenomenon abound. For instance, results of one large randomized trial conducted in the United States showed that screening for prostate cancer using blood testing for prostate-specific-antigen (PSA) plus digital rectal examination did not change the death rate from the disease.¹⁰ A European study, published on the same date, concluded that PSA-based screening reduced the rate of death by 20%, but at the cost of significant overdiagnosis.¹¹ What should we take from these seemingly conflicting results? The first study suggests that prostate cancer screening has no benefit in terms of outcomes, and presumably is an inefficient use of healthcare dollars. While the second study may suggest some benefit, the 20% reduction is offset by the accompanying cost and risk of invasive diagnostic testing for men who do not have prostate cancer. Another way of looking at the results of the second study is that, in order to prevent one death, 1,410 men would need to be screened to find 48 additional cases of prostate cancer for treatment.

Spinal fusion surgery provides another example of how increased spending does not necessarily lead to improved outcomes. Randomized controlled trials comparing spinal fusion surgery for chronic low back pain with nonsurgical treatment have shown that surgical patients do better in the initial postoperative period.¹² However, over the long term, surgery makes no significant difference in clinical outcomes.¹³

Percutaneous coronary intervention (PCI, or angioplasty), is a procedure often performed on patients with cardiovascular illness. For many patients it reduces the risk of death, heart attack, or other major cardiovascular events. As an initial management strategy for patients with stable coronary artery disease, however, research indicates that PCI does not reduce the risk of these outcomes when added to optimal medical therapy.¹⁴

Another example of unnecessary treatment is the indwelling intravenous device. Commonly, indwelling intravenous devices are used to deliver medication or fluids; unfortunately, insertion can cause a collapsed lung¹⁵ or bleeding¹⁶ in susceptible patients, while prolonged usage can lead to infection¹⁷ or clotting.¹⁸

Perhaps the most nonintuitive example of a healthcare intervention that does not always improve health, and, in fact, in some cases worsens it, is hospitalization. Hospitalization, even without the use of procedures, can lead to a poor health outcome—that is, some patients actually get sicker when hospitalized. In one analysis

- 10 Andriole, G.L., et al. Mortality Results from a Randomized Prostate-Cancer Screening Trial. *New England Journal of Medicine* 2009;360(13):1310-1319. DOI: 10.1056/NEJMoa0810696.
- 11 Schroder, F.H., et al. Screening and Prostate-Cancer Mortality in a Randomized European Study. *New England Journal of Medicine* 2009;360(13):1320-1328. DOI: 10.1056/NEJMoa0810084.
- 12 Fritzell, P., Hagg, O., Wessberg, P., & Nordwall, A. 2001 Volvo Award Winner in Clinical Studies: Lumbar fusion versus nonsurgical treatment for chronic low back pain: A multicenter randomized controlled trial from the Swedish Lumbar Spine Study Group. *Spine* 2001;26(23):2521-32; discussion 32-4.
- 13 Fritzell, P., Hagg, O., Nordwall, A., & the Swedish Spine Study Group. 5-10 years follow up in the Swedish Lumbar Spine Study. Presented at the Annual Meeting of the International Society for the Study of the Lumbar Spine. Porto, Portugal, May 30-June 5, 2004.
- 14 Boden, W.E., et al. Optimal medical therapy with or without PCI for stable coronary disease. *New England Journal of Medicine* 2007;356(15):1503-16. DOI: 10.1056/NEJMoa070829.
- 15 Wigmore, T.J., Smythe, J.F., Hacking, M.B., Raobaikady, R., & MacCallum, N.S. Effect of the implementation of NICE guidelines for ultrasound guidance on the complication rates associated with central venous catheter placement in patients presenting for routine surgery in a tertiary referral centre. *British Journal of Anaesthesia* 2007;99(5):662-5. DOI: 10.1093/bja/aem262.
- 16 Kusminsky, R.E. Complications of central venous catheterization. *Journal of the American College of Surgeons* 2007;204(4):681-96. DOI: 10.1016/j.jamcollsurg.2007.01.039.
- 17 Marschall, J., et al. Strategies to prevent central line-associated bloodstream infections in acute care hospitals. *Infection Control and Hospital Epidemiology* 2008;29(Suppl 1):s22-30.
- 18 Kuter, D.J. Thrombotic complications of central venous catheters in cancer patients. *Oncologist* 2004;9(2):207-16.

of over 1,000 falls in an academic hospital, more than 6% resulted in serious injury.¹⁹ Given that people fall frequently in hospitals—the study found 3.1 falls per 1,000 patient days—that 6% is a disturbing number.

Furthermore, the mortality rate of patients who have hospital-acquired pneumonia may be as high as 30% to 70%.²⁰ It is likely that mortality varies widely based on the severity of the underlying condition, but the point remains that hospitalization is not a benign treatment.

Evidence of waste is also visible at a more macro level. Geographic areas with a high consumption of healthcare services incur higher costs but are not necessarily healthier.

Evidence of waste is also visible at a more macro level. Geographic areas with a high consumption of healthcare services incur higher costs but are not necessarily healthier. In recent testimony before Congress, Congressional Budget Office Director Douglas Elmendorf pointed out that per-capita health spending varies widely within the Medicare program but is not correlated with measures of quality of healthcare or of overall health outcomes.²¹

Geographic variation in healthcare costs and utilization in the United States has been noted for many years. For example, in 1987, John Wennberg and colleagues at Dartmouth Medical School observed that expenditures and utilization in Boston substantially exceeded those in New Haven despite the fact that the populations of those communities were demographically similar and that patients received most of their hospital care in university-affiliated hospitals. The researchers noted that most of the additional utilization was due to higher hospital admission rates for medical conditions for which the decision to admit patients to the hospital was discretionary.²² Despite the difference in utilization, the mortality rates in these two regions were nearly identical.²³

Additional studies have confirmed the variation in healthcare costs and utilization noted by Wennberg and his colleagues. These studies have suggested that the degree of geographic variation in treatment patterns is greater when there is less of a consensus within the medical community about the best treatment to use in a given situation. With less of a consensus, the *practice style* of individual physicians becomes a significant factor in what healthcare services are recommended. A recent study showed that physicians in high-spending and low-spending regions were about equally likely to recommend specific clinical interventions when the evidence supporting it was strong. Both groups of physicians also appeared equally likely to recommend interventions that were supported by evidence-based practice guidelines. Differences arose when lack of evidence made consensus difficult. The study found that physicians in higher-spending regions were much more likely than those in lower-spending regions to recommend discretionary services, which thereby increased costs.²⁴

In another, earlier study, researchers at RAND Corporation looked at the appropriateness of indications used for procedures for Medicare beneficiaries. The study aimed to find an explanation for the geographic variation in utilization. While the researchers found generally high levels of inappropriate use of coronary angiography, carotid endarterectomy, and upper gastrointestinal (GI) endoscopy, they noted that this did not explain the geographic variances in usage. That is, while these procedures were often used inappropriately across geographical areas, still, in some regions they were used much more often than in others. This variance meant that in some areas costs were significantly higher than in others.²⁵ These and other studies suggest that *practice style* is one of the root causes of excessive healthcare utilization, and that it is potentially modifiable by emphasizing treatments backed by evidence of appropriateness.

19 Fischer, I.D., et al. Patterns and predictors of inpatient falls and fall-related injuries in a large academic hospital. *Infection Control and Hospital Epidemiology* 2005;26(10):822-7.

20 Guidelines for the management of adults with hospital-acquired, ventilator-associated, and healthcare-associated pneumonia. *American Journal of Respiratory and Critical Care Medicine* 2005;171(4):388-416.

21 Elmendorf, D.W. Options for controlling the cost and increasing the efficiency of health care. Testimony before the Subcommittee on Health, Committee on Energy and Commerce, U.S. House of Representatives, March 10, 2009. Available at <http://www.cbo.gov>. Retrieved March 25, 2009.

22 Wennberg, J.E., Freeman, J.L., & Culp, W.J. Are hospital services rationed in New Haven or over-utilised in Boston? *Lancet* 1987;329(8543):1185-9.

23 Wennberg, J.E., Freeman, J.L., Shelton, R.M., & Bubolz, T.A. Hospital use and mortality among Medicare beneficiaries in Boston and New Haven. *New England Journal of Medicine* 1989; 321: 1168-73.

24 Sirovich, B., Gallagher, P.M., Wennberg, D.E., & Fisher, E.S. Discretionary decision making by primary care physicians and the cost of U.S. Health care. *Health Affairs* 2008 May-Jun;27(3):813-23. DOI: 10.1377/hlthaff.27.3.813.

25 Chassin, M.R., et al. Does inappropriate use explain geographic variations in the use of health care services? A study of three procedures. *Journal of the American Medical Association* 1987;258(18):2533-7.

APPROPRIATE CARE LEADS TO BETTER OUTCOMES

In contrast to how inappropriate care often leads to worse healthcare outcomes, there is evidence that appropriate healthcare leads to better outcomes. An examination of the use of tonsillectomy is a good example of the positive relationship between appropriateness and efficacy. Tonsillectomy is the most common surgical procedure performed in children, and a randomized, controlled trial has demonstrated its efficacy in decreasing the incidence of throat infection.²⁶ These results justify the choice of tonsillectomy for children who met the very stringent eligibility criteria of clinical trials.

A subsequent clinical trial, conducted by the same researchers, considered children who were less severely affected by throat infections. This study found that both the control and surgical groups had relatively low rates of severe infection. And of those children treated surgically, nearly 8% had complications.²⁷

In analyzing the results of the two studies together, one can conclude that the efficacy of tonsillectomy was higher when it was more appropriate, and that the reduced efficacy and increased risk in the groups where tonsillectomy was not appropriate supported reserving surgical intervention for those children who met the stringent eligibility criteria.

A study of GI endoscopy provides another example of how better outcomes result from appropriate care. The study looked at whether the diagnostic yield of upper GI endoscopy would be increased by the application of detailed and explicit appropriateness criteria (a designation of *appropriate*, *equivocal*, or *inappropriate* based on detailed clinical situations). The study found that upper GI endoscopies performed for appropriate indications detected significantly more clinically relevant lesions than did those performed for inappropriate indications. Importantly, no upper GI endoscopy that resulted in a diagnosis of cancer had been performed for an inappropriate indication.²⁸ That is, the use of appropriateness criteria could improve patient selection for diagnostic upper GI endoscopy, thus enhancing both the quality and efficiency of healthcare.

In contrast to how inappropriate care often leads to worse healthcare outcomes, there is evidence that appropriate healthcare leads to better outcomes.

26 Paradise, J.L., et al. Efficacy of tonsillectomy for recurrent throat infection in severely affected children. Results of parallel randomized and nonrandomized clinical trials. *New England Journal of Medicine* 1984;310(11):674-83.

27 Paradise, J.L., Bluestone, C.D., Colborn, D.K., Bernard, B.S., Rockette, H.E., & Kurs-Lasky, M. Tonsillectomy and adenotonsillectomy for recurrent throat infection in moderately affected children. *Pediatrics* 2002;110(1 Pt 1):7-15.

28 Froehlich, F., et al. Is the diagnostic yield of upper GI endoscopy improved by the use of explicit panel-based appropriateness criteria? *Gastrointestinal Endoscopy* 2000;52(3):333-41. DOI: 10.1067/mge.2000.107906.

DELIVERING BEST-PRACTICE GUIDELINES

Tools such as evidence-based guidelines exist to deliver the evidence to providers so they can easily use the information in clinical practice. Such guidelines can reduce the variation in care generated by differences in practice style, especially when uncertainly about the best treatment approach exists.

Clearly, acquisition of high-quality evidence is essential to improving the quality of healthcare and reducing costly errors. Tools such as evidence-based guidelines exist to deliver the evidence to providers so they can easily use the information in clinical practice. Such guidelines can reduce the variation in care generated by differences in practice style, especially when uncertainly about the best treatment approach exists.

Independently developed, evidence-based guidelines can standardize the delivery of healthcare to best practices. This means that only efficacious treatments and tests are recommended, and only for patients likely to benefit from them. It also means that patients are treated in hospitals only for as long as needed, reducing the hazards of infections, falls, and medication errors. By recommending care for which there is evidence of appropriateness, and dissuading care that the evidence shows is inappropriate, providers can improve quality and efficiency at the same time.

Of course, acceptance of guidelines and wide implementation depend on providers' confidence that the guidelines are developed by truly independent arbiters of what defines appropriate healthcare. To date, unfortunately, acceptance has been slow to develop. Thus, the promise of guidelines to influence *practice style* and change providers' behavior has not been realized.

One reason for lack of acceptance is that the evidence base is incomplete, and multiple competing standards exist, leading at times to uncertainty about best care practices. A natural question to ask, then, is, "Are there 'standards for the standards'?" How can policymakers, payors, and providers determine which guidelines and standards should be adopted? In response, guideline developers have created a set of standards, the AGREE instrument, by which to judge the quality of healthcare guidelines. (See sidebar.)

Setting standards for the standards

The Appraisal of Guidelines Research & Evaluation (AGREE) instrument consists of 23 items organized into six domains, each of which captures a separate dimension of guideline quality.²⁹ The domains are scope and purpose, stakeholder involvement, rigor of development, clarity and presentation, applicability, and editorial independence.

The intent of AGREE is to determine the quality of clinical guidelines. Determining that a guideline is of high quality means that potential biases have been adequately addressed, that the recommendations are valid, and that the guidelines are feasible for practice. The assessment includes judgment about the methodology of guideline development, the content of the final recommendations, and factors that may operate to influence guideline uptake. The assessment does not address the impact of the guideline on patient outcomes, although some guidelines may include this information.

A critical element of the AGREE score for guideline development is editorial independence— independence from vested interests, including provider groups (e.g., medical specialty societies or hospital consortia) and payors (e.g., health plans or CMS). Healthcare reform proposals do—and must—require that the arbiters of standards of care be independent. Many organizations that develop guidelines endorse the AGREE instrument: The World Health Organization (WHO) endorses it in policy papers, the U.K.'s National Institute for Health and Clinical Excellence (NICE) adheres to the AGREE principles in developing guidelines, and the American College of Surgeons uses the AGREE instrument in support of guidelines for surgical care.

29 The AGREE Collaboration. The Appraisal of Guidelines for Research & Evaluation (AGREE) Instrument. Available at http://www.agreetrust.org/docs/AGREE_Instrument_English.pdf. Retrieved March 25, 2009.

RESISTANCE TO BEST-PRACTICE GUIDELINES

Unfortunately, even when guidelines score well using the AGREE instrument, providers may still view them negatively. One example of this is an examination of guidelines conducted by researchers at RAND. One of the questions within the AGREE rigor-of-development domain requires that experts in both clinical content and guideline methodology who are external to the organization that has developed the guidelines review them, but it does not provide detailed specifications for the review. RAND researchers examined a set of guidelines for common, expensive diagnostic testing and treatment for musculoskeletal disorders of the spine and extremities. The researchers gave these guidelines high scores using the AGREE instrument. Then they asked a panel of providers (recommended by their specialty societies as leaders in their clinical field) to rate the relevance of the guidelines to common clinical situations and consistency with clinical understanding of existing evidence and expert opinion. The expert panelists thought that the guidelines did not address common clinical situations, and reported that they often disagreed with the experts' interpretation of published evidence and clinical experience.³⁰ In the face of findings of this nature, it is not surprising that guideline adherence in real-world situations may be imperfect, or that implementation of guidelines in healthcare systems may be met with resistance.

This can partly explain the low rate of adoption in the United States of clinical decision support (CDS) tools in the care of patients, even though they have been clearly established as a critical component in the delivery of the most up-to-date and effective care. CDS tools consist of physician order sets, electronic alerts, reference materials, reports related to patient data, and clinical guidelines. These tools provide access to current evidence-based clinical content, which will promote best practices at the point of care as well as allow for the evaluation of health outcomes.

In 2001, the Institute of Medicine made a strong case for the adoption of such tools with its publication *Crossing the Quality Chasm: A New Health System for the 21st Century*. One of the recommendations put forth in that publication was that the secretary of the U.S. Department of Health and Human Services be responsible for the establishment of a program for making evidence-based clinical information readily available. The program was to include the development of CDS tools that would aid the application of that evidence to all clinical practice.³¹ Though widely accepted, there has been a surprisingly low rate of adoption of such tools in actual clinical settings.

All of this brings us to the present push for electronic health records (EHR—a term that has come to encompass the digitizing of health information, including CDS, computerized physician order entry [CPOE], and a variety of other health information technology subsets). To date, EHR adoption rates by U.S. hospitals have been extremely variable. The federal government and the Robert Wood Johnson Foundation recently financed a survey of hospitals in an attempt to better understand variability in the use of the EHRs and CDS tools. The study aimed to help the government analyze the state of the healthcare industry as it plans for the future under the American Recovery and Reinvestment Act (ARRA). The results of that survey, which were recently published in the *New England Journal of Medicine (NEJM)*,³² found that only 1.5% of the hospitals surveyed had comprehensive EHRs, while an additional 17% had basic EHRs, implemented at least partially. Forty-seven percent of the hospitals surveyed had no present plans to implement clinical decision support. The percentage was slightly lower for clinical decision support related to drug-to-drug interactions and abnormal lab value results.³³ This low rate of adoption of support tools suggests the existence of major barriers to acceptance.

30 Nuckols, T.K., et al. Rigorous development does not ensure that guidelines are acceptable to a panel of knowledgeable providers. *Journal of General Internal Medicine* 2008;23(1):37-44. DOI: 10.1007/s11606-007-0440-9.

31 Institute of Medicine. *Crossing the Quality Chasm: A New Health System for the 21st Century*. Washington, D.C.: National Academy Press; 2001. Available at http://www.nap.edu/catalog.php?record_id=10027. Retrieved April 4, 2009.

32 Mandl, K.D. & Kohane, I.S. No small change for the health information economy. *New England Journal of Medicine* 2009;360(13):1278-81. DOI: 10.1056/NEJMp0900411.

33 Jha, A.K., et al. Use of Electronic Health Records in U.S. Hospitals. *New England Journal of Medicine* 2009;DOI: 10.1056/NEJMs0900592

BARRIERS TO THE ADOPTION OF CLINICAL DECISION SUPPORT TOOLS

One of the major barriers identified in the *NEJM* study was physician resistance. In the hospitals surveyed, 36% of those who did not have an EHR stated that physician resistance was a barrier.³⁴ Physicians resist the use of CDS tools for a variety of reasons, but the main reason is the belief that the use of an EHR and CDS tools will decrease clinical productivity and affect financial reimbursement. Other reasons range from not wanting a computer system to infringe on their decision making to something known as *alert fatigue*. Alert fatigue is when physicians have been exposed to poorly implemented EHRs that warn them continuously of possible problems as they access the system. Moreover, many of the CDS tools used today have been developed without clinician input, increasing resistance to their use. But if guidelines can be used to fine-tune EHR, and EHR can inform the creation of more user-efficient guidelines, what can emerge is a usability feedback loop that results in a self-improving system that avoids the dynamic of alert fatigue.

Cost is another significant barrier to EHR adoption. The initial cost of purchasing an EHR system is compounded by the implementation costs. Once the system is implemented, hospitals incur ongoing costs related to maintaining the system as well as keeping current the evidence-based clinical knowledge that is accessed by the CDS tools. All of the people using the EHR system require extensive training, further affecting the productivity of the provider.

The expenses related to EHR have made it seem to many a losing proposition. Indeed, there has been a clear lack of proven return on investment (ROI) for the implementation of organization-wide EHRs. Anecdotal estimates range from \$1 million to more than \$80 million for the purchase and multi-year implementation of an EHR. The wide range of these figures and the history of failed attempts at implementing tools such as CPOE have discouraged hospitals with limited funds from implementing EHRs. Another anticipated barrier to the adoption of EHRs is the tight time frame recently stipulated for implementation by the federal government in the HITECH Act section of the stimulus bill. The bill states that physicians and hospitals must demonstrate *meaningful use* of a *certified* EHR in order to receive financial incentives, starting in 2011. These two terms, *meaningful use* and *certified*, have yet to be defined. The determination of these definitions will require that the two committees responsible for defining them, the Health Information Policy Committee and the Health Information Standards Committee, be established. Once the terms are defined, vendors will be required to implement any changes required to meet the standards, including interoperability between systems. It is questionable whether any organization without some kind of an EHR system already in place will meet the initial timeline.

Given the difficulty of meeting the EHR implementation deadlines specified in the HITECH Act, it seems even less likely that providers will have the time and resources needed to bring evidence-based guidelines to bear in their EHR strategy. Thus we are presented with a catch-22: EHRs may be necessary to bring about the systemic movement toward evidence-based medicine, yet the pace at which EHRs have been mandated may not allow for the inclusion of evidence-based medicine in their implementation. Will a new wave of *alert fatigue* undermine the good intentions of the HITECH Act?

The barriers are high, but the payoff could be significant. EHRs are not merely a delivery mechanism for guidelines—they are also potentially a valuable source of data that can provide new information about quality outcomes and practice styles, and even result in new and improved guidelines. EHRs can help identify inconsistencies in utilization of care that compromise quality and they can help standardize care and minimize quality disparities. In this manner, EHRs can empower a research feedback loop that helps turn American healthcare into a self-improving system.

Of course, there is a catch. The research potential posed by EHRs is countered by concerns over patient privacy. Despite the presence of HIPAA, there remain questions over how new entrants like Google and

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34 Mandl, K.D. & Kohane, I.S. No small change for the health information economy. *New England Journal of Medicine* 2009;360(13):1278-81. DOI:

Microsoft will be regulated. And as people gravitate toward digital health records, the potential volume and severity of medical identity theft increases.

A practical concern also exists: How do we make all these systems interoperable? How do we avoid creating a kind of technical Tower of Babel that reinforces the existing information silos?

THE DIRECTION OF HEALTHCARE REFORM

So far, EHRs have gotten most of the press, but they are only part of the larger goal: an automated engine of quality and efficiency that can minimize disparities in care across the entire U.S. system. Creating this engine certainly poses a challenge for policymakers, but the necessity of the final destination is clear.

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Infusing the healthcare system with the intelligence supplied by clinical evidence can empower the dual goals of better quality and improved efficiency, and EHRs are the delivery mechanism needed to make this intelligence pervasive. With \$600 billion of wasteful spending at stake, not to mention an unsustainable healthcare cost trend³⁵ that doubles the rate of inflation and exacerbates the problem, incentives abound to build toward the convergence of quality and efficiency empowered by guidelines and electronic health records.



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