Health Information Technology in the United States:
Progress and Challenges Ahead, 2014

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Introduction to the 2014 Annual Report

The nation is in the midst of a tremendous investment of money, time, and human capital geared toward increasing the adoption and use of electronic health records (EHRs). The Health Information Technology for Economic and Clinical Health (HITECH) provisions of the American Recovery and Reinvestment Act (ARRA) provide substantial economic incentives for physicians and hospitals to implement and meaningfully use EHRs. Since the passage of HITECH and the Affordable Care Act, the trend in EHR adoption has been clear. National surveys conducted by the federal government and others suggest that EHR adoption has grown steadily among physicians and hospitals. While progress has not been distributed evenly across all groups, it is clear that both hospitals and physicians are making strides toward EHR adoption and implementation. In addition, participation in the Center for Medicare and Medicaid Services EHR incentive programs by hospitals and physicians has been strong, with many attesting to meeting Stage 1 meaningful use criteria or receiving incentive payments to adopt, implement, or upgrade an existing system. However, despite this progress, there is evidence to suggest that certain providers and hospitals are struggling to implement these systems, and whether the current level of participation in the meaningful use program can be maintained is not clear.

In the 2014 report we continue to track progress toward the goal of universal adoption of electronic health records. We use nationally representative survey data to examine rates of EHR adoption among physicians and hospitals. In addition, we include a special focus on hospitals and providers serving vulnerable populations, including federally qualified health centers. Finally, we examine the use of EHRs to optimize care.

Major Content Areas

Chapter 1: Hospital Adoption of Electronic Health Records: Progress and Challenges Ahead

In chapter 1, we examine progress toward adoption of electronic health records in hospitals. We present data on participation in Medicare and Medicaid electronic health record incentive programs and other federally funded efforts under HITECH, and we discuss results from a 2013 survey of hospital electronic health record adoption.

Chapter 2: Physician Adoption and Use of Health Information Technology

In this chapter, we present findings on the adoption of electronic health records in physician practices, and we compare care coordination, patient access, and communication activities among physician practices with and without basic electronic health records. In addition, we discuss physician participation in Medicare and Medicaid electronic health record incentive programs.

Chapter 3: Evidence of a Digital Divide?

In chapter 3, we examine rates of EHR adoption among hospitals and providers caring for the poor. We present data from the American Hospital Association annual survey information technology supplement examining rates of EHR adoption among critical access hospitals and those with a high proportion of poor patients, as well as the characteristics of those hospitals recently adopting such a system. We also use nationally representative survey data from physicians and federally qualified health centers.

Chapter 4: Optimizing Electronic Health Record Use to Drive Performance Improvement

In this chapter, we explore next steps beyond adoption of basic electronic health records and meaningful use criteria, and toward health information technology that can generate high-value, near-term performance improvement in health care delivery. We analyze three key areas, including health information exchange, clinical decision support, and electronic health record data for measurement and monitoring. We examine the current adoption of these advanced capabilities and the role of meaningful use in encouraging their adoption.

Chapter 1: Hospital Adoption of Electronic Health Records: Progress and Challenges Ahead[1]

Introduction

Tracking the progress of EHR adoption among U.S. hospitals continues to be important, as the U.S. government has made a substantial investment in ensuring the adoption and effective use of information technology to support health care delivery. In this chapter, we review recent findings from the American Hospital Association (AHA) Health Information Technology Supplement and data from the Centers for Medicare and Medicaid Services EHR incentive programs and examine progress toward the goal of universal adoption of electronic health records.

The Centers for Medicare and Medicaid Services EHR Incentive Programs

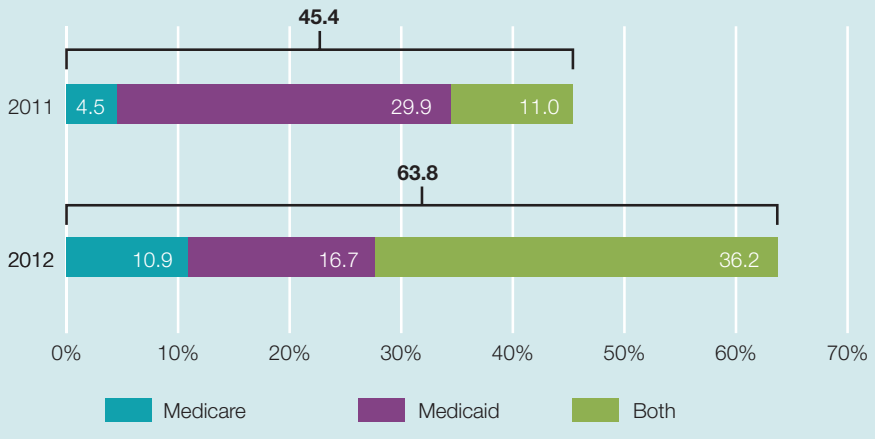
The Health Information Technology for Economic and Clinical Health (HITECH) Act provides $30 billion to promote "meaningful use" of EHRs through the Medicare and Medicaid electronic health record (EHR) incentive programs.[2] The incentive programs provide financial support for hospitals in the form of 1) payments for the meaningful use of health information technology through Medicare; and 2) payments for adopting, implementing, or upgrading an existing EHR through the Medicaid program. In order to qualify for the incentive payments through Medicare, hospitals must meet a set of criteria designed to encourage the meaningful use of health information technology.[3] Hospitals that do not meet the criteria will face financial penalties. The time line for the EHR incentive programs is shown in Exhibit 1.

Exhibit 1: **Meaningful Use Payments and Penalties for Eligible Hospitals**

Source: United States Government Accountability Office. *Participation Has Increased, but Action Needed to Achieve Goals, Including Improved Quality of Care*. GAO-12–207. U.S. Government Printing Office, 2014.

As shown in Exhibit 2, the proportion of hospitals receiving payments through the incentive programs, either for achieving meaningful use or adopting, implementing or upgrading an existing system has grown steadily since 2011. As of December 2013, the most recent data available, 63.8 percent of eligible hospitals received an incentive payment, up from 45.4 percent in 2011, the first year of the program.

Exhibit 2: **Percentage of Eligible Hospitals Receiving Meaningful Use Incentive Payments, 2011–2012**



Source: Centers for Medicare and Medicaid Meaningful Use Incentive Payment Data, 2013

Other Federal Efforts Funded Under the HITECH Act

In addition to financial incentives for meaningful use of EHRs, HITECH resources were directed to complementary programs, such as Regional Extension Centers (RECs) that support specific types of eligible hospitals through the process of selecting, purchasing, and implementing EHRs.[4] In addition, the Office of the National Coordinator (ONC) for Health Information Technology and other federal agencies have invested in several other initiatives to increase the health information technology workforce and increase access to health information technology more broadly for rural and critical access hospitals.[5–7] Beyond the HITECH Act, the Affordable Care Act and other industry changes have created an impetus for organizations to adopt EHRs. Delivery system reforms, such as accountable care organizations, are exceedingly difficult to accomplish without well-functioning EHRs.[8]

As noted in past issues of this *Annual Report*, since the passage of HITECH and the Affordable Care Act, the trend in EHR adoption has been clear.[9] Findings from national surveys suggest that the pace of adoption and use of these systems among U.S. hospitals has risen rapidly, especially since 2010 when the financial incentives were put in place, although the progress had not been evenly distributed, with some groups of hospitals lagging behind.[10] In this chapter, we review the most current data available on EHR adoption among U.S. hospitals in order to assess where the nation's hospitals are making progress and the challenges that remain.

The American Hospital Association Annual Health Information Technology Supplement

A recent *Health Affairs* paper by Alder-Millstein, et al. used data from the AHA Annual Health Information Technology Supplement survey from the period of 2008–2013 to examine rates of EHR adoption among U.S. hospitals. The AHA Annual Supplement survey captures information about the extent of adoption of a set of computerized clinical functions and the ability to meet each of the individual Stage 1 and Stage 2 meaningful use criteria.

Electronic Health Record Adoption

EHR adoption was determined using prior definitions of computerized functions required for *basic* and *comprehensive* EHR systems.[9,11] A hospital with *at least a basic EHR* reported full implementation of the following 10 computerized functions in *at least one clinical unit* of the hospital: patient demographics; physician notes, nursing assessments; patient problem lists, patient medication lists, discharge summaries; laboratory and radiologic reports; diagnostic test results; and order entry for medications. A hospital with *a comprehensive EHR* reported that all basic functions, along with 14 additional functions, were fully implemented in *all major clinical units* of the hospital (Exhibit 3).

Exhibit 3: **Functionalities Required for Comprehensive and Basic EHRs**

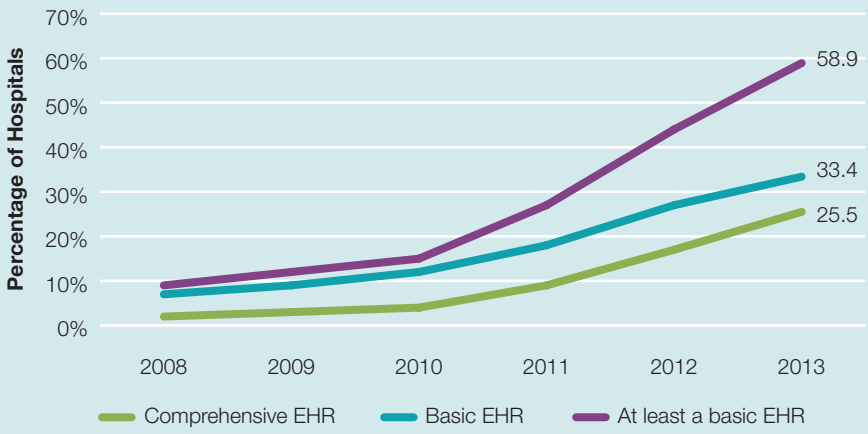
Requirement	Comprehensive EHR	Basic EHR
Clinical documentation		
Demographic characteristics of patients	X	X
Physicians' notes	X	
Nursing assessments	X	
Problem lists	X	X
Medication lists	X	X
Discharge summaries	X	X
Advanced directives	X	
Test and imaging results		
Laboratory reports	X	X
Radiologic reports	X	X
Radiologic images	X	
Diagnostic-test results	X	X
Diagnostic-test images	X	
Consultant reports	X	
Computerized provider order entry		
Laboratory tests	X	
Radiologic tests	X	
Medications	X	X
Consultant requests	X	
Nursing orders	X	
Decision support		
Clinical guidelines	X	
Clinical reminders	X	
Drug-allergy alerts	X	
Drug-drug interaction alerts	X	
Drug-laboratory interaction alerts	X	
Drug-dose support	X	

Notes: A comprehensive EHR was defined as a system with electronic functionalities in all clinical units. A basic EHR was defined as a system with electronic functionalities in at least one clinical unit.

EHR Adoption

In 2013, 58.9 percent of hospitals had adopted at least a basic EHR, quadrupling from 2010 (Exhibit 4). The share of hospitals with a comprehensive EHR, which started from a lower base than the share with a basic system, increased seven-fold between 2010 and 2013 (3.6% in 2010; 25.5% in 2013). The share with a basic EHR effectively tripled over the same period (11.5% in 2010; 33.4% in 2013).

Exhibit 4: **Changes in Adoption of Basic and Comprehensive EHRs, 2008–2013**



Source: Authors' calculations of data from the American Hospital Association Annual Survey Information Technology Supplement

Note: All analyses were statistically weighted for potential nonresponse bias.

EHR Adoption by Hospital Type

Hospitals were more likely to have at least a basic EHR if they were large (72.9%); medium (62.4%); small (53.2%), $p < 0.001$); urban (62.7%), $p < 0.001$); not-for-profit (63.0%); public (55.2%); for-profit (48.3%), $p < 0.001$); and a major teaching hospital (76.6%); minor teaching (64.7%); nonteaching (56.1%), $p < 0.001$) (Exhibit 5).

Exhibit 5: **EHR Adoption by Hospital Characteristics**

	Type of EHR System Adopted		
Characteristic	Comprehensive	Basic	Less Than Basic
All hospitals	25.5%	33.4%	41.1%
Size			
Small	21.1	32.1	46.8
Medium	27.5	34.9	37.6
Large	38.9	34.0	27.1
Hospital region			
Northeast	20.9	36.0	43.2
Midwest	27.3	33.3	39.4
South	25.4	32.2	42.5
West	26.1	34.4	39.6
Teaching			
Major	41.4	35.2	23.3
Minor	30.5	34.2	35.3
Nonteaching	23.0	33.1	44.0
Ownership			
For-profit	14.3	34.0	51.7
Not-for-profit	31.5	31.5	37.0
Public	17.2	38.0	44.8
Location			
Urban	28.6	34.1	37.3
Rural	16.8	31.4	51.8
Critical-access status			
Yes	19.9	33.7	46.5
No	27.7	33.3	39.0
Disproportionate-share hospital quartile			
1 (lowest)	31.4	32.1	36.5
2	25.8	32.5	41.7
3	26.8	33.4	39.8
4 (highest)	26.6	35.3	38.1
Medicaid quartile			
1 (lowest)	25.1	30.8	44.1
2	24.0	35.5	40.5
3	25.1	31.9	43.0
4 (highest)	27.6	35.4	37.0

Source: Authors' calculations of data from the American Hospital Association Annual Survey Information Technology Supplement.

Note: All analyses were statistically weighted for potential nonresponse bias.

Meaningful Use

Alder-Milstein et. al. used a measure of achieving Stage 2 meaningful use that included 15 of CMS' 16 core objectives. These measures are shown in Exhibit 6. While Stage 2 objectives overlap with a subset of Stage 1 objectives, there are several new functions required, such as those focused on patient access to clinical data, data exchange, and care transition processes. The regulations also require that hospitals meet three of six menu objectives, which the authors did not examine.[12]

Exhibit 6: **Functionalities Required for Meeting Stage 1 and Stage 2 Meaningful Use**

Core Measure	Applicable AHA Survey Question: Does your hospital have a computerized system which allows for…	Standard to Meet Proxy	MU 1	MU 2
Use CPOE for medication orders directly entered by any licensed health care professional who can enter orders into the medical record per state, local, and professional guidelines	Computerized provider order entry for medication?	Full implementation in at least one unit	X	X
Implement drug-drug and drug-allergy interaction checks	Decision support for drug allergy alerts; decision support for drug-drug interactions?	Full implementation of both in at least one unit	X	
Record demographics: preferred language, gender, race, ethnicity, date of birth, and date and preliminary cause of death in the event of mortality in the eligible hospital or CAH	Electronic clinical documentation for each of the following: patient demographics, physician notes, nursing notes?	Full implementation of all in at least one unit	X	x
Maintain up-to-date problem list of current and active diagnoses	Problem lists?	Full implementation in at least one unit	X	
Maintain active medication list	Medication lists?	Full implementation in at least one unit	X	
Maintain active medication allergy list	Recording/maintaining medication allergy lists?	Yes	X	
Record and chart vital signs: height, weight, blood pressure, calculate and display BMI, plot and display growth charts for children ages 2–20 years, including BMI	Vital signs?	Yes	X	X
Record smoking status for patients ages 13 years or older	Recording smoking status using a standard format?	Yes	X	X
Implement one clinical decision support rule and the ability to track compliance with the rule	(At least one of the following): clinical guidelines, clinical reminders, drug allergy alerts, drug-drug interaction alerts, drug-lab interaction alerts, drug dosing support?	Full implementation in at least one unit	X	
Report clinical quality measures to CMS or the States	(At least one of the following): automatically generate hospital-specific meaningful use quality measures by extracting data from an electronic health record without additional manual processes; Automatically generate Medicare Inpatient Quality Reporting program measures for a full Medicare inpatient update; Automatically generate physician-specific meaningful use quality measures calculated directly from the EHR without additional manual processes?	Yes on any	X	
Provide patients with an electronic copy of their health information (including diagnostic test results, problem list, medication lists, medication allergies, discharge summary, procedures), upon request	Providing patients an electronic copy of their record within 3 business days?	Yes	X	
Provide patients with an electronic copy of their discharge instructions at time of discharge, upon request	Discharge summaries?	Full implementation in at least one unit	x	
Capability to exchange key clinical information (ex: problem list, medication list, medication allergies, diagnostic test results), among providers of care and patient-authorized entities electronically	Electronically exchanging key clinical information with providers?	Yes	X	

Exhibit 6: **Functionalities Required for Meeting Stage 1 and Stage 2 Meaningful Use** (continued)

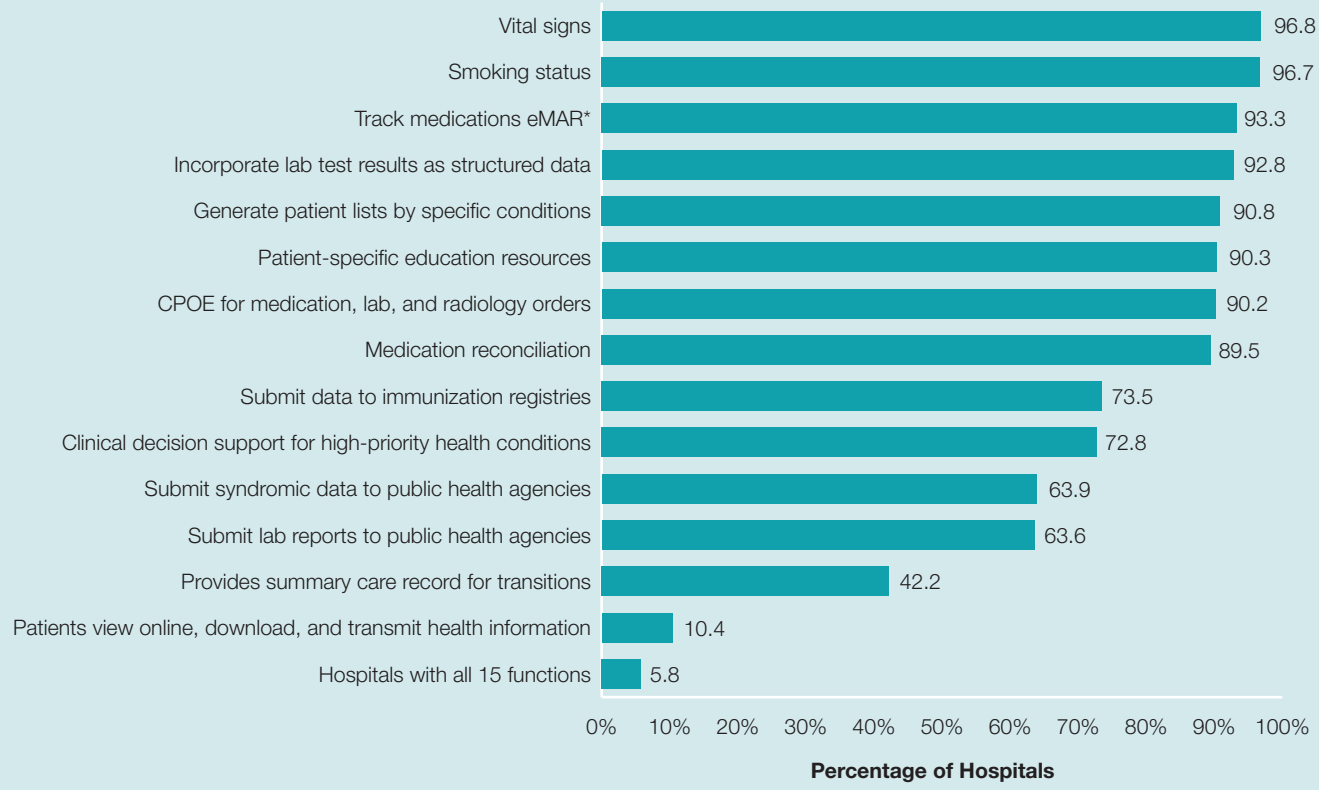
Core Measure	Applicable AHA Survey Question: Does your hospital have a computerized system which allows for…	Standard to Meet Proxy	MU 1	MU 2
Protect electronic health information created or maintained by certified EHR technology through the implementation of appropriate technical capabilities	Conduct or review a security risk analysis and implement security updates as necessary?	Yes	X	X
Use clinical decision support to improve performance on high-priority health conditions	Implementing at least 5 clinical decision support interventions related to 4 or more clinical quality measures?	Yes		X
Provide patients the ability to view online, download, and transmit information about a hospital admission	Patients ability to do both of the following: view information from the health/medical record online? download information from their health/medical record online?	Yes to both		X
Incorporate clinical lab test results into certified EHR technology as structured data	Incorporating as structure data lab results for more than 40 percent of patients admitted to inpatient or emergency departments?	Yes		X
Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, or outreach	Listing patients by condition?	Yes		X
Use clinically relevant information from certified EHR technology to identify patient-specific education resources and provide those resources to the patient	Identifying and providing patient-specific education resources?	Yes		X
The eligible hospital or CAH that receives a patient from another setting of care or provider of care or believes an encounter is relevant should perform medication reconciliation	(All of the following): Comparison of a patient's inpatient and pre-admission medication lists? providing an updated medication list at time of discharge? checking inpatient prescriptions against an internal formulary?	Yes		X
The eligible hospital or CAH that transitions their patient to another setting of care or provider of care or refers their patient to another provider of care provides a summary care record for each transition of care or referral*	Generating summary of care record for relevant transitions of care and exchange clinical summary/care record in any format with hospitals/ambulatory providers outside of your system?	Yes to both		X
Capability to submit electronic data to immunization registries or immunization information systems except where prohibited, and in accordance with applicable law and practice	Submission of electronic data to immunizations registries/information systems per meaningful use standards?	Yes		X
Capability to submit electronic reportable laboratory results to public health agencies, except where prohibited, and in accordance with applicable law and practice	Submitting electronic data on reportable lab results to public health agencies per meaningful use standards?	Yes		X
Capability to submit electronic syndromic surveillance data to public health agencies, except where prohibited, and in accordance with applicable law and practice	Submitting electronic syndromic surveillance data to public health agencies per meaningful use standards?	Yes		X
Automatically track medications from order to administration using assistive technologies in conjunction with an electronic medication administration record (eMAR)	Automatic tracking of medications with an electronic medication administration record (eMARs)?*	Yes		X

* The meaningful use criteria require the use of a barcode for medication administration. The AHA Annual Supplement survey includes only the use of eMAR and does not specifically reference the use of barcodes.

Source: The content of this exhibit has been excerpted from the following article: Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014.]

The authors found that 5.8 percent of hospitals met the proxy measure of Stage 2 meaningful use readiness in 2013. However, the vast majority of hospitals reported currently being able to meet at least some of the Stage 2 criteria. For example, at least 90 percent of hospitals are able to record vital signs, smoking status, and patient demographic characteristics as well as incorporate clinical lab test results as structured data, generate patient lists by specific conditions, provide patient-specific education resources, and track medications using electronic Medication Administration Records (eMars) (Exhibit 7). The smallest proportion of hospitals were able to meet the following objectives: submitting electronic reportable laboratory results to public health agencies (63.9%); submitting syndromic surveillance data to public health agencies (63.6%); providing summary of care records for transitions (42.2%); and providing patients with online access to view, download, and transmit information about a hospital admission (10.4%).

Exhibit 7: **Full Implementation of Individual Meaningful Use Functions in at Least One Major Clinical Unit**



Source: Authors' calculations of data from the American Hospital Association Annual Health Information Technology Supplement survey

* The meaningful use objective requires the use of a barcode for medication administration. We considered hospitals to have this capability if they indicated that they could "Automatically track medications with an electronic medication administration record."

In order to meet the measure of providing patients with online access, hospitals had to have all three of the individual online patient functions. The authors examined rates of adoption for each of these individual functions and found that the largest gap is implementing the transmit function. Only 11.6 percent of hospitals had the transmit function compared to 27.5 percent that enabled patients to download their information and 39.3 percent that had the capability to allow patients to view their information online.

Sustaining Momentum on Meeting Meaningful Use

The HITECH Act and Meaningful Use EHR incentive programs, described as an "escalator moving the health system upward to improved quality and effectiveness" were designed to be long-term solutions.[13] Broken up into three stages, the program is being implemented over several years to provide hospitals time to address the barriers to the greater use of EHRs as tools to improve care. While early results show significant investment and participation among hospitals, sustaining this momentum will be critical. The criteria for meeting Stages 2 and 3 of meaningful use emphasize the use of more advanced features of EHRs and place more demands to hospitals through more stringent requirements and whether hospitals will be able to move successfully from Stage 1 to Stage 2 (and, eventually Stage 3) within the required time line is not known.

Recently available data on CMS payments for meaningful use suggest potential challenges ahead for hospitals moving from Stage 1 to Stage 2. These data show that although participation in the EHR programs has increased overall, a significant proportion of hospitals receiving a payment for attesting to meaningful use in 2011 did not receive a payment in 2012. Specifically, within the Medicaid program (among the 36 states that had completed their determination of which hospitals would receive a payment for the 2012 Medicaid payment year), 36 percent of hospitals that participated in the Medicaid EHR program in 2011 did not continue in 2012. An additional 10 percent of hospitals participating in the Medicare EHR program in 2011 did not participate in 2012. In addition, CMS officials announced on May 6, 2014 that, as of May 1, 2014, seven months into the reporting period (the federal fiscal year begins on October 1) only four hospitals had successfully attested to Stage 2 meaningful use.[14]

Discussion

Five years after the passage of HITECH, CMS data on payments made to hospitals and the AHA Health Information Technology Supplement survey both suggest tremendous activity on the part of the nation's hospitals and rapid adoption of EHR systems, as well as challenges ahead. While EHR adoption increased three percentage points per year prior to the onset of meaningful use incentives, since 2011, the rate of adoption has increased markedly, with 10 to 15 percent of hospitals becoming a new EHR user every year. These findings suggest that hospitals are responding rapidly and vigorously to the incentive program. However, important capabilities, such as providing patients electronic access to their data, or sending summary of care documents, are far from widely adopted, and data from CMS suggest that a relatively small proportion of hospitals will be capable of achieving Stage 2 in 2014. Taken together, these findings represent continuing progress on the part of hospitals in response to the federal incentives, as well as clear indicators of where additional efforts are needed.

Despite the marked increase in EHR adoption, meeting Stage 2 meaningful use objectives will require work for the vast majority of hospitals. Data from the AHA survey of hospitals suggests that functions related to providing summary of care documents across providers and patient access to their health information are critical gaps. While hospitals have put in other challenging features like physician notes and electronic prescribing, they appear to be struggling with online access and transmittal of patient health information and sending information to the next provider of care. This may reflect the lack of EHR system capabilities in this domain; 2014 Certified Edition products are not yet widely adopted and few vendors had these features available in 2013.[15] It is, however, also possible that that in the past, these functions were not priority areas for hospitals, or there was little patient demand for them. It is likely that some combination of such factors explains why hospital capabilities for these objectives lag behind others required for meaningful use criteria.

2014 is an important transition year for the Medicare and Medicaid EHR Incentive Programs. Hospitals that bill the Medicare program and do not meet meaningful use in 2014 will be subject to financial penalties. Given that the penalty phase is approaching, it is critically important that we both understand what is holding hospitals back and what policymakers can do to support hospitals through the EHR adoption process, particularly in the areas where hospitals appear to be facing the biggest challenges. Understanding the structural impediments to implementing these functions will be particularly critical for small, rural hospitals that may have a harder time absorbing the financial losses associated with the penalties. The HITECH Act set out to build a nationwide information technology infrastructure. If we are to achieve this goal, we will need ongoing and deliberate efforts to make it across the finish line.

Endnotes

1. The content of this chapter has been excerpted from the following article: Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014.]
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Chapter 2: Physician Adoption and Use of Health Information Technology

Samantha Stalley, Catherine DesRoches and Karen Donelan

Our first report in 2006 focused on the challenge of developing a method to measure the adoption of health information technology (HIT) in physician practices. Since then, the National Ambulatory Medical Care Survey (NAMCS), conducted by the Centers for Disease Control and Prevention's National Ambulatory Medical Care Survey, has collected data used to examine rates of adoption overall and by physician practice characteristics. This survey is funded by the Office of the National Coordinator for Health Information Technology (ONC) and allows us to track changes in EHR adoption over time. In this chapter, we review the most recent data from NAMCS. In addition, we present data from the National Survey of Practicing Physicians, funded by the Robert Wood Johnson Foundation and The Commonwealth Fund. Here we highlight data on the use of health information technology generally, and EHRs specifically, for care coordination. We highlight key findings from these surveys and discuss progress on adoption in physician practices across the United States. Finally, we review recently released data from the Centers for Medicare and Medicaid Services on the physician participation in the EHR Incentive Programs.

The National Ambulatory Medicare Care Survey: Electronic Medical Records Supplement

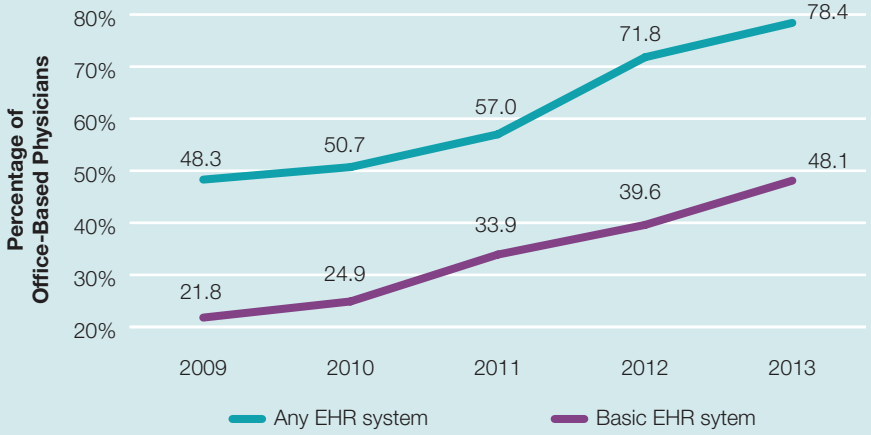
NAMCS EMR supplement has annually collected national representative data on office-based physicians providing direct patient care since 2009. The mail survey includes items about physician adoption of specific EHR functionalities. The 2013 survey was sent to 10,302 physicians and had a response rate of 70 percent. Collected data are used to examine whether physicians have adopted a basic EHR system, can exchange information with other providers, and have the electronic capability to facilitate patient engagement.

A recent *Health Affairs* study examined adoption of a basic EHR system, electronic health information exchange, and computerized capabilities for patient engagement among physicians using 2009–2013 NAMCS EMR supplement survey data.[1] A physician practice was determined to have a basic EHR system if a physician reported their main practice site had a computerized system for each of the following functionalities: an electronic system for recording patient demographics, patient problem lists, patient medications and allergies lists, and clinical notes; using computerized prescription order entry; and viewing laboratory and imaging results. As described in our inaugural report,[2] this definition was developed using a modified Delphi process with guidance from an expert consensus panel.

This study found that nearly half of physicians met the criteria for a basic EHR system in 2013, doubling from 2009 and a 22 percent relative increase from 2012 (Exhibit 8). Rates of basic EHR system adoption varied by physician characteristics. More than half of primary care physicians had a basic EHR system as compared to 43 percent among specialty physicians (Exhibit 9). The proportion of physicians having a basic EHR system increased with practice size from 37 percent of physicians in solo practices to 66 percent in large practices with 11 or more physicians. Practices owned by a health maintenance

organization (HMO) or hospital/academic medical center had significantly higher rates of basic EHR adoption as compared to physician-owned practices.

Exhibit 8: **Office-Based Physicians' Adoption of EHR Systems, by Level of Capability, 2009–2013**



Source: Furukawa MF, King J, Patel V, Hsaio C, Adler-Milstein J, Jha AK. Despite substantial progress in EHR adoption, health information exchange and patient engagement remain low. *Health Affairs*; 33(9). [Online ahead of print, August 7, 2014].

Exhibit 9: **Physician Characteristics Associated With Adoption of Basic EHR Systems, 2013**

	Adoption of Basic EHR System (N=10,302)
Specialty	
Primary care	53.3
Nonprimary care	42.9****
Age	
Under 50	49.9
50 years and over	46.9
Practice size	
1 physician	37.1
2–5 physicians	44.2**
6–10 physicians	59.8****
11+ physicians	65.6****
Practice type	
Single specialty	44.5
Multispecialty	58.6****
Ownership	
Physician or physician group	45.6
Hospital or academic medical center	53.6**
HMO or other health care organization	69.5****
Community health center	36.5*
Other or unknown	39.1
Region	
Northeast	43.5
Midwest	53.5***
South	47.2
West	48.9
Metropolitan statistical area	
Yes	48.2
No	46.7

Source: Authors' analysis of data from the 2013 Electronic Health Records Survey.

Notes: Basic EHR adoption rates are adjusted percentages based on multivariate logistic regression that controlled for physician specialty and age; practice size, type and ownership; region; and metropolitan state. Practice size refers to the location where the physician saw most ambulatory care patients. The first variable listed in each category is the reference group. Significance denotes difference from the reference category. HMO is health maintenance organization. *p<.10; ** p<.05; ***p<0.01; ****p<0.001.

Focusing on electronic exchange, this study found that activity was limited and varied significantly by physician and practice characteristics. In 2013, 38.9 percent of physicians reported the ability to exchange electronic health information with other providers overall (Exhibit 11). Primary care physicians were more likely than specialists to have electronic exchange activity. Physicians in large, multispecialty practices owned by hospital/academic medical centers or HMOs/other health care organizations had higher odds of electronic exchange activity in comparison to solo, single specialty, and physician-owned practices. Electronic exchange also

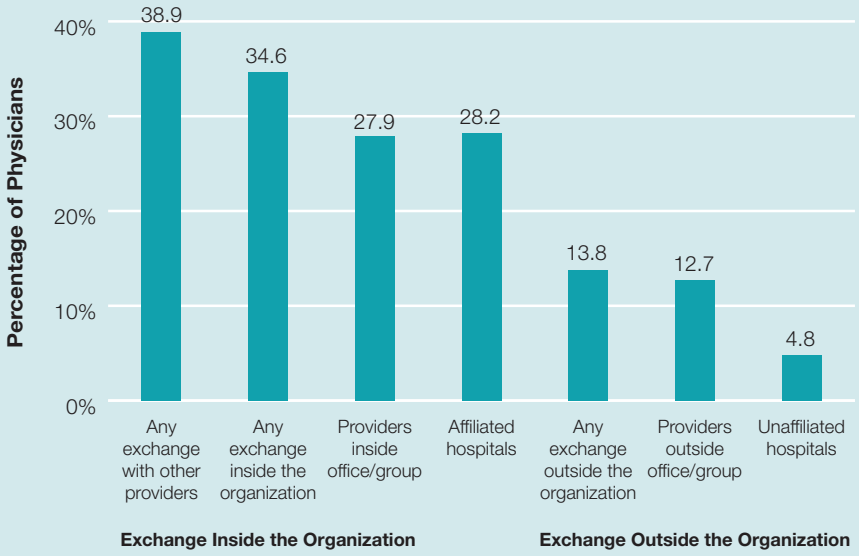
varied by the type of exchange partner. About one in three physicians electronically exchanged information inside the organization, with only 13.8 percent of physicians electronically exchanging information outside the organization (Exhibit 11). Similar to overall exchange activity, electronic exchange within the organization varied by physician specialty, practice size, practice type, and practice ownership. Physicians least likely to exchange information outside the organization were in practices owned by community health centers in non-metropolitan areas.

Exhibit 10: **Physician Characteristics Associated With Electronic Health Information Exchange With Other Providers, 2013**

	Health information exchange with any other providers (N=10,302)		Health information exchange inside the organization (N=10,302)		Health information exchange outside the organization (N=10,302)	
Specialty						
Primary care	ref.		ref.		ref.	
Nonprimary care	0.66**	[0.54, 0.81]	0.60**	[0.48, 0.74]	0.77	[0.58, 1.02]
Age						
Less than 50 years	ref.		ref.		ref.	
50 years and over	1.10	[0.89, 1.36]	1.15	[0.93,1.43]	1.13	[0.85, 1.49]
Practice size						
Solo or two physicians	ref.		ref.		ref.	
2–5 physicians	1.46**	[1.13, 1.89]	1.55**	[1.19, 2.02]	1.10	[0.77, 1.56]
6–10 physicians	1.36*	[1.03, 1.81]	1.62**	[1.21, 2.18]	0.95	[0.64, 1.41]
11+ physicians	1.99**	[1.37, 2.88]	2.63**	[1.80, 3.85]	1.28	[0.79, 2.07]
Practice type						
Single specialty	ref.		ref.		ref.	
Multispecialty	2.10**	[1.62, 2.71]	2.08**	[1.60, 2.70]	1.34	[0.97, 1.86]
Ownership						
Physician	ref.		ref.		ref.	
Hospital or academic medical center	2.46**	[1.90, 3.18]	3.01**	[2.32, 3.90]	1.37	[0.99, 1.91]
HMO or other health care organization	2.85**	[1.89, 4.31]	3.17**	[2.09, 4.81]	1.50	[0.92, 2.43]
Community health center	0.53*	[0.31, 0.91]	0.57*	[0.33, 0.99]	0.47*	[0.24, 0.91]
Other or unknown	1.05	[0.68, 1.61]	1.11	[0.70, 1.75]	0.69	[0.36, 1.31]
Region						
Northeast	ref.		ref.		ref.	
Midwest	1.15	[0.88, 1.50]	1.16	[0.88, 1.53]	1.33	[0.92, 1.92]
South	0.71*	[0.54, 0.92]	0.67**	[0.51, 0.88]	0.82	[0.56, 1.20]
West	1.19	[0.84, 1.70]	1.02	[0.71, 1.46]	1.38	[0.86, 2.21]
Metropolitan status						
MSA	ref.		ref.		ref.	
Non-MSA	0.83	[0.65, 1.07]	0.84	[0.64, 1.10]	0.68*	[0.49, 0.94]

Source: Authors' analysis of electronic health records mail survey to the National Ambulatory Medical Care Survey, 2013
Notes: Adjusted odds ratios from multivariate logistic regression. 95% confidence intervals in brackets.
* Significant at $p<0.05$
** Significant at $p<0.01$

Exhibit 11: **Office-Based Physicians' Electronic Exchange of Clinical Data With Other Providers, by Organizational Affiliation, 2013**



Source: Furukawa MF, King J, Patel V, Hsaio C, Adler-Milstein J, Jha AK. Despite substantial progress in EHR adoption, health information exchange and patient engagement remain low. *Health Affairs*; 33(9). [Online ahead of print, August 7, 2014.]

This study also examined the routine use of patient engagement capabilities, including electronic after-visit summaries, patient-specific education resources, secure messaging with patients, and ability for patients to view online, download, or transmit their record online. Among physicians, these capabilities ranged from 68.4 percent electronically providing after-visit summaries to 41.5 percent having the ability for patients to view, download, or transmit their record online (Exhibit 12). Although physicians have these capabilities, relatively fewer physicians routinely use them. For example, some 62 percent of physicians with secure messaging capability routinely use this function.

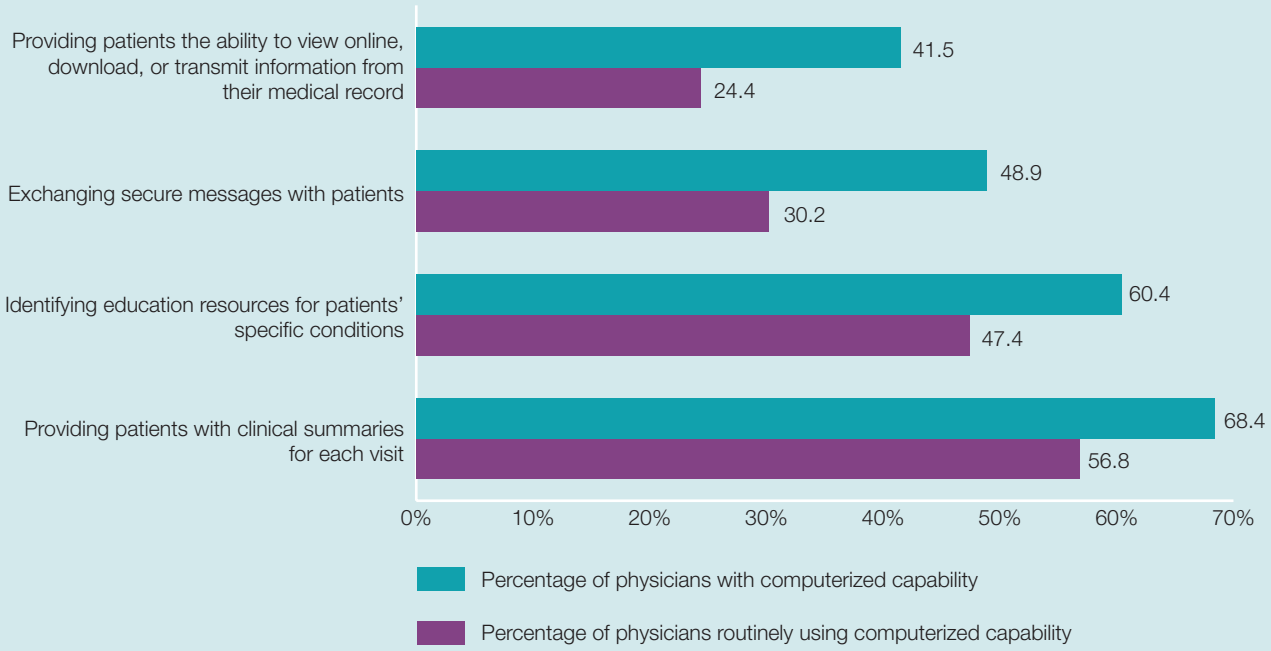
Routine use of patient engagement functionalities among physicians with these capabilities varied significantly by practice size, practice type, and ownership. Physicians in large practices with 11 or more physicians were significantly more likely to routinely use three of the four computerized tools for patient engagement than those in smaller practices (Exhibit 13). Similarly, physicians in practices owned by HMOs or other health care organizations and those in multispecialty practices were more likely than those in other types of practice organizations to routinely use at least two of the computerized tools for patient engagement.

Exhibit 12: **Adoption and Routine Use of Computerized Capabilities Related to Selected Meaningful Use Objectives and Basic EHR Systems**

	Percentage of physicians with capability	Percentage routinely using capability (among those with capability)
Improving quality of care, safety, and reducing health disparities		
Electronic clinical information		
Recording patient history and demographic information	83.0	96.4
Recording clinical notes	78.7	96.4
Recording lists of patient medications and allergies	77.1	98.0
Recording and charting vital signs	76.2	93.9
Recording patient smoking status	76.1	93.4
Recording patient problem lists	74.8	95.2
Order entry & results management		
Ordering prescriptions	82.6	92.5
Sending prescriptions electronically to pharmacy	78.7	93.0
Viewing lab results	76.6	90.3
Ordering lab tests	68.9	87.2
Viewing imaging results	60.7	85.9
Automatically graphing a specific patient's lab results over time (incorporate lab results as structured data)	47.5	82.2
Clinical decision support and care management		
Providing warnings of drug interactions or contraindications	73.8	93.8
Reconciling lists of patient medications to identify the most accurate list	73.6	93.7
Generating lists of patients with particular health conditions	57.7	69.7
Providing reminders for guideline-based interventions or screening tests	56.8	73.8
Engaging patients and families		
Providing patients with clinical summaries for each visit	68.4	83.0
Identifying education resources for patients specific conditions	60.4	78.4
Exchanging secure messages with patients	48.9	61.8
Providing patients the ability to view, download, or transmit information from their medical record	41.5	58.8
Improving population and public health		
Electronic reporting to immunization registries	39.1	67.0

Source: Authors' analysis of electronic health records mail survey to the National Ambulatory Medical Care Survey, 2013
Note: Numbers are unadjusted.

Exhibit 13: **Availability and Use of Computerized Tools for Patient Engagement**



Source: Furukawa MF, King J, Patel V, Hsaio C, Adler-Milstein J, Jha AK. Despite substantial progress in EHR adoption, health information exchange and patient engagement remain low. *Health Affairs*; 33(9). [Online ahead of print, August 7, 2014.]

The Robert Wood Johnson Foundation/Commonwealth Fund National Survey of Practice Physicians

The National Survey of Practice Physicians is a panel survey conducted in 2011 and again in 2103. In this chapter, we review findings from the first round of data collection conducted from October 19, 2011 to March 16, 2012. The survey was sent to 3,333 primary care physicians and specialists and had a response rate of 60 percent. Collected data were used to compare timeliness of care coordination and patient access and communications activities of physicians with and without a basic EHR. Care coordination activities included specialty referrals, emergency visits, hospitalization, patient referral tracking, medication changes, and laboratory results. Patient access and communications activities included appointments off hour and electronic communications.

As shown in Exhibit 14, the majority of physicians reported that communication about consultations, medications, hospitalizations, and emergency department visits occur "sometimes" rather than "always." Examining physician reports of care coordination activities by EHR adoption, these data show that both primary care and specialist physicians with basic EHRs are more likely than those without basic EHRs to report always receiving timely communication about patient referrals, emergency department visits, and hospitalizations. For example, 33 percent of primary care physicians with a basic EHR reported always receiving timely information from specialists about clinical care and results of tests, as compared to 22 percent without a basic EHR (Exhibit 14). However, primary care physicians with a basic EHR were less likely to report personal communication with the patient and family after a specialty consultation than those without a basic EHR. This suggests that adopting a basic EHR does not necessarily improve the likelihood that these functionalities will be used to interact with patients.

Exhibit 14: **Communication About Patient Referrals and Hospitalizations**

	All Physicians				Primary Care			Specialist		
	Total	Basic EHR	No Basic EHR	p-value	Basic EHR	No Basic EHR	p-value	Basic EHR	No Basic EHR	p-value
N=	1,820	792	1,028		522	642		270	386	
Communications About Physician Consultation and Referrals										
How often do you receive timely information from specialists about clinical care and results of tests for your referred patients?										
Always	25%	30%	20%	0.0002	33%	22%	<0.0001	NA	NA	
Sometimes	64%	60%	66%		64%	71%		NA	NA	
Rarely	1%	2%	6%		2%	6%		NA	NA	
Never	0%	0%	0%		0%	1%		NA	NA	
After your patient has seen a specialist, how often do you talk with the patient or the patient's family members about the results of that visit?										
Always	31%	28%	34%	0.0991	30%	36%	0.0505	NA	NA	
Sometimes	54%	58%	50%		62%	53%		NA	NA	
Rarely	8%	7%	9%		7%	9%		NA	NA	
Never	0%	0%	0%		0%	1%		NA	NA	
How often do you receive timely information about changes the specialist has made to the patient's medication?										
Always	18%	21%	15%	NA	23%	16%	0.0018	NA	NA	
Sometimes	63%	62%	63%		66%	68%		NA	NA	
Rarely	11%	10%	13%		10%	14%		NA	NA	
Never	1%	0%	1%		0%	2%		NA	NA	
When you see a patient referred to you by the PCP, how often do you receive timely information about the patient's medical history and main reason for the consultation?										
Always	23%	29%	19%	0.0025	NA	NA		30%	19%	0.0018
Sometimes	56%	55%	57%		NA	NA		55%	57%	
Rarely	18%	14%	20%		NA	NA		14%	20%	
Never	1%	1%	2%		NA	NA		1%	2%	

Exhibit 14: **Communication About Patient Referrals and Hospitalizations** (continued)

	All Physicians				Primary Care			Specialist		
	Total	Basic EHR	No Basic EHR	p-value	Basic EHR	No Basic EHR	p-value	Basic EHR	No Basic EHR	p-value
Hospital and Emergency Room Communications										
When your patients go to the hospital how often do you receive:										
Notification that your patient is in the emergency department?										
Always	26%	31%	23%	<0.0001	36%	26%	0.0033	21%	17%	0.0032
Sometimes	45%	46%	45%		43%	46%		50%	43%	
Rarely	17%	15%	18%		11%	16%		21%	22%	
Never	7%	4%	8%		5%	6%		4%	12%	
Notification that your patient is going to be admitted?										
Always	37%	39%	34%	<0.0001	47%	40%	0.0109	25%	24%	0.0123
Sometimes	38%	39%	38%		36%	38%		45%	38%	
Rarely	13%	13%	13%		10%	10%		20%	18%	
Never	7%	4%	9%		2%	6%		6%	13%	
Notification that your patient is being discharged?										
Always	29%	33%	25%	<0.0001	40%	31%	<0.0001	21%	15%	0.0113
Sometimes	40%	41%	39%		41%	41%		42%	37%	
Rarely	17%	16%	18%		12%	14%		24%	24%	
Never	8%	4%	11%		2%	7%		9%	17%	
A discharge summary within one week of discharge that is helpful for managing the patient's follow-up care?										
Always	27%	34%	22%	<0.0001	40%	27%	<0.0001	24%	13%	0.0002
Sometimes	43%	43%	43%		43%	44%		42%	40%	
Rarely	17%	14%	19%		10%	15%		23%	25%	
Never	7%	3%	10%		2%	7%		7%	15%	

Source: Authors' analysis of the National Survey of Physicians, 2012

Results from analyses examining patient access to and communication with physician practices by EHR adoption are shown in Exhibit 15. Physicians with basic EHRs were more likely than those without basic EHRs to be accepting Medicaid patients (71 percent and 56 percent) and Medicare patients (75 percent and 71 percent). However, physicians with basic EHRs were slightly less likely to be accepting new patients overall as compared to physicians without basic EHRs. In terms of patients requesting appointments, physicians with basic EHRs were less likely to report seeing patients on the same day as the request almost all of the time (38 percent). However, these physicians were more likely to have formal coverage arrangement for patients when the practice is closed.

Exhibit 15: **Patient Access**

	All Physicians							Primary Care			Specialist		
	Total	PCP	Specialist	P-value	Basic EHR	No Basic EHR	P-value	Basic EHR	No Basic EHR	P-value	Basic EHR	No Basic EHR	P-value
N=	1,820	1,164	656		792	1,028		522	642		270	386	
Are you accepting new patients?													
Yes	91%	88%	96%	<0.0001	90%	91%	0.2051	86%	89%	0.1389	97%	95%	0.5202
No	8%	11%	3%		9%	7%		12%	9%		3%	4%	
Are you accepting new Medicare patients?													
Yes	72%	60%	93%	<0.0001	75%	71%	0.0004	64%	57%	0.0004	93%	92%	0.3132
No	8%	11%	3%		5%	10%		6%	14%		2%	4%	
Do not see Medicare patients	20%	29%	5%		21%	19%		30%	29%		5%	5%	
Are you accepting new Medicaid patients?													
Yes	63%	60%	66%	0.0597	71%	56%	<0.0001	67%	55%	0.0002	76%	59%	<0.0001
No	28%	30%	24%		22%	32%		24%	35%		18%	28%	
Do not see Medicaid patients	10%	10%	10%		7%	11%		8%	11%		6%	13%	
What proportion of your patients who request a same day appointment can get one?													
Almost all (> 80%)	41%	51%	23%	<0.0001	38%	43%	0.0468	47%	54%	0.0518	20%	25%	0.2842
Most (60 - 80%)	21%	23%	17%		23%	19%		26%	20%		17%	18%	
About half (~50%)	9%	7%	12%		10%	8%		8%	7%		14%	11%	
Some (20 - 40%)	9%	6%	14%		10%	7.8%		7%	5%		16%	12%	
Few (< 20%)	14%	5%	30%		15%	14%		6%	5%		31%	29%	
Don't Know	4%	4%	2%		3%	4.2%		3%	5%		1%	3%	
Does your practice have any formal arrangement for patients needing care when your practice is closed, other than directing them to their local hospital emergency department?													
Yes	55%	59%	48%	<0.0001	61%	51%	0.0002	65%	55%	0.0017	53%	45%	0.0915
No	42%	37%	50%		37%	45%		33%	41%		45%	53%	

Source: Authors' analysis of the National Survey of Physicians, 2012

Participation in the Centers for Medicare and Medicaid Services EHR Incentive Programs

As discussed in chapter 1, the EHR incentive programs provide financial support for physicians and other eligible providers to adopt and meaningfully use EHRs. In order to qualify for the incentive payments through Medicare, eligible providers must meet a set of criteria that were designed to encourage physicians to use their EHRs in a way that improves care. Physicians and other eligible providers who do not meet the criteria will face financial penalties in the form of reduced Medicare payments. The timeline for the EHR incentive programs is shown in Exhibit 16.

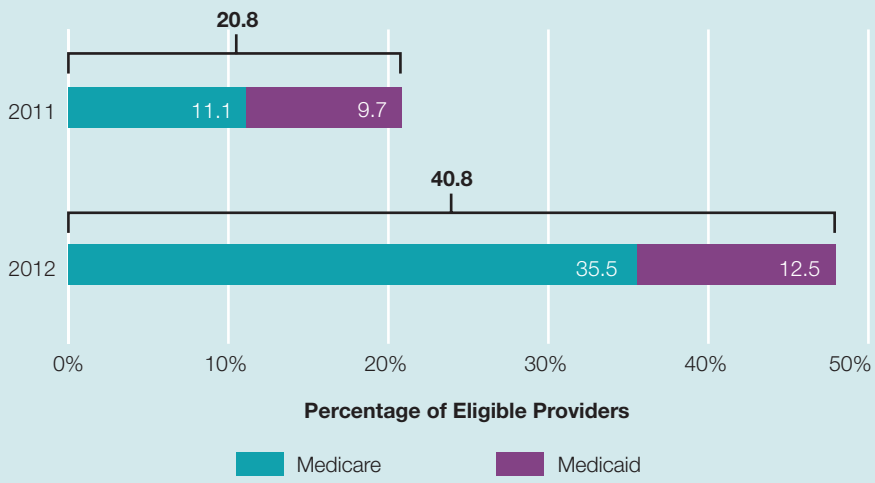
Exhibit 16: **Meaningful Use Payments and Penalties**

Source: United States Government Accountability Office. *Participation Has Increased, but Action Needed to Achieve Goals, Including Improved Quality of Care*. GAO-12–207. U.S. Government Printing Office, 2014.

As shown in Exhibit 17, eligible providers' participation in the EHR incentive programs has grown substantially since 2011, the first year the financial incentives were available. Approximately 21 percent of eligible providers received incentive payments in 2011; by 2012, that percentage doubled to about 41 percent.[3]

However, whether this progress on meaningful use continues is still an open question. To continue to participate in the EHR incentive programs and avoid financial penalties, eligible providers must meet a set of increasingly challenging meaningful use criteria. Early data on providers meeting the Stage 2 requirements, with their greater emphasis on advanced care processes, electronic exchange of patient health information, and data standardization, indicate that for many providers, meeting Stage 2 will be a challenge. A recent report from the Government Accountability Office finds that 16 percent of providers receiving a payment for meaningful use from the Medicare program in 2011 did not receive a payment in 2012. Among physicians receiving incentive payments through Medicaid, 61 percent of those receiving a payment in 2011 did not receive one in 2012.[4] Additionally, in a recent report to the Office of the National Coordinator Health Policy Committee, CMS reported that by May 1, 2014, 225 eligible professionals attested to meaningful use in the 2014 (the reporting year ends September 30, 2014). Of these, only 50 attested to meeting the Stage 2 criteria.[5]

Exhibit 17: **Percentage of Eligible Providers Receiving Meaningful Use Incentive Payments, 2011–2012**



Source: Centers for Medicare and Medicaid Meaningful Use Incentive Payment Data, 2013

Discussion

The nation has made substantial investments through Health Information Technology for Economic and Clinical Health (HITECH) as part of the American Recovery and Reinvestment Act of 2009 (ARRA) to encourage adoption of EHR systems and use of health information exchange in an effort to improve health care delivery. Findings thus far suggest that EHR incentive programs are encouraging physicians to implement EHR functionalities. Nonetheless, findings also suggest that considerable work is ahead and challenges that will require ongoing attention.

Specific EHR functions appear to be implemented more slowly than others. Adoption of electronic health information exchange with other providers both inside and outside the organization remains low. Similarly, few physicians routinely use online capabilities for patient engagement even among the physicians that have this capability. These functionalities are particularly important in implementing health information technology has the potential to result in better care, improved care coordination, and access for patients.

Initial findings from the National Survey of Practicing Physicians suggest that physicians with basic EHRs report more timely care coordination activities. However, less than the majority of physicians report timely care coordination activities occur "always" regardless of EHR adoption status, suggesting more work needs to be done to improve timely care coordination. Furthermore, these results show that having the capability to communicate with patients electronically does not necessarily improve the likelihood that the capability will be used to interact with patients. This is demonstrated by no significant differences in communicating with patients about the outcome of a consultation between physicians with and without a basic EHR. Focus on utilizing EHR system functionalities is critical to improving care coordination and patient access.

The studies reviewed in this *Annual Report* suggest that EHR adoption and use continues to grow. However, half of physicians do not have at least a basic EHR system, and disparities in the types of practices implementing EHR technology persist. Physicians in small, independent practices continue to lag behind other physicians in implementing basic EHR systems. These physicians may not have access to the technical and financial support necessary to select, adopt, and maintain EHR. While the federal government has invested in Regional Extension Centers (RECs) charged with assisting providers through the adoption process, groups such as Primary Care Information Project, a REC, have noted that physicians in small practices require extensive support when selecting, implementing, and maintaining a system.[6] It is unknown if the RECs have adequate resources to provide this assistance to all practices that need it.

As EHR incentive programs continue, growth in EHR adoption is encouraging. However, the data also point to challenges ahead. Very few physicians can meet the Stage 2 meaningful use criteria and CMS data shows a substantial drop off in physicians receiving incentive payments through the Medicaid program between 2011 and 2012. Understanding the barriers faced by these physicians is increasingly important as the penalty phase of the meaningful use program draws closer. Finally, monitoring adoption and use of specific functionalities, including electronic health information exchange, online patient engagement functionalities, and care coordination activities will be particularly important in ensuring EHR adoption results in better patient care and improved care coordination. Overcoming these disparities in physician practice types and encouraging the adoption of specific functionalities will be vital to achieving broad HIT adoption to facilitate and transform the health care delivery system.

Endnotes

1. The content of this chapter has been excerpted from the following article: Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014.]
2. Blumenthal D, DesRoches CM, Donelan K, et al. *Health Information Technology in the United States: The Information Base for Progress*. Princeton, NJ: The Robert Wood Johnson Foundation, 2006.
3. *Participation Has Increased, but Action Needed to Achieve Goals, Including Improved Quality of Care*. GAO-14–207: Published: Mar 6, 2014. Publicly Released Mar 6, 2014. Retrieved from *www.gao.gov/assets/670/661399.pdf*
4. ibid.
5. *Medicare and Medicaid EHR Incentive Programs*: HIT Policy Committee. May 6, 2014.
6. Primary Care Information Project. *www.nyc.gov/html/doh/html/hcp/pcip.shtml*. Accessed February 12, 2014.

Chapter 3: Evidence of a Digital Divide?

Catherine M. DesRoches

The inaugural edition of this report included a special focus on the issue of the "digital divide." Prior to the passage of HITECH, there was a significant level of concern among policymakers and researchers that physicians and hospitals caring for a disproportionate share of vulnerable patient populations would fall behind providers and institutions serving more well-off patients as EHR adoption became more commonplace. EHR adoption requires considerable resources, including the up-front costs of selecting, purchasing and implementing an EHR, as well as ongoing costs associated with maintaining such a system. Policymakers and researchers were concerned that financially constrained institutions such as safety-net hospitals, and physicians serving vulnerable populations would not have the necessary financial resources to implement, and the patients served by these hospitals and providers would not receive the benefits of this technology.

Early work on EHR adoption among providers serving vulnerable populations (including federally qualified community centers) did not uncover disparities in EHR adoption between these clinicians and those practicing in better-resourced practices.[1] However, later research on acute-care hospitals found an emerging digital divide when examining rates of EHR adoption by the disproportionate share index.[2] Each hospital in the United States is assigned an index by the Centers for Medicare and Medicaid Services based on a combination of its fraction of elderly Medicare patients who are eligible for Supplemental Security Income (SSI) and its fraction of nonelderly patients with Medicaid coverage. CMS uses this formula, called Disproportionate Share Hospital (DSH) Index, to identify hospitals eligible for additional Medicare payments for caring for the poor. This study found small but consistent differences in the implementation of key electronic functions between U.S. hospitals with a high DSH index and those with a low DHS index. These were primarily concentrated in the areas of electronic clinical documentation and view of results.

Concerns about this potential emerging digital divide led to the creation of a distinct path to EHR adoption for hospitals and eligible providers caring for poor patients. Hospitals and providers with a high proportion of Medicaid patients may choose to receive meaningful use incentive payments through their state's Medicaid program. The structure of this program varies from the Medicare program in three distinct ways.[3] First, eligible providers and hospitals do not need to attest to meaningful use in their first year of program participation. Rather, they are eligible for incentive payments for adopting, implementing, or upgrading an existing system. Second, eligible providers and hospitals participating through Medicaid are given six years to move from attesting to Stage 1 to Stage 3, while those participating through Medicare have five years to achieve this goal. Finally, hospitals and eligible providers that do not bill Medicare are not subject to financial penalties for failing to achieve meaningful use.

Given that HITECH developed a distinct path to EHR adoption, accompanied by a more flexible incentive structure for hospitals and eligible providers that care for poor patients, understanding how these safety-net institutions are faring is of particular interest. In this chapter we examine the issue of the digital divide, review findings from a recent paper in *Health Affairs,* as well as recent data from the National Panel Survey of Practicing Physicians, and the Commonwealth Fund's National Survey of Federally Qualified Health Centers.[4,5]

Hospitals Serving Poor Patients

As discussed in chapter 1, Adler-Milstein et al. used American Hospital Association annual survey data to examine rates of EHR adoption among acute-care hospitals in the United States.[6] Three proxy measures were used to assess adoption among safety-net hospitals. First, the authors examined critical access hospitals, which provide the majority of care in rural areas, especially in areas where poverty is high and access to care is limited. Second, they used the Medicare DSH index described above. The authors segmented hospitals into quartiles, with hospitals in the top quartile representing those with the highest DSH index. Finally, they used each hospital's proportion of inpatient days paid for by Medicaid as our third proxy measure, again segmented into quartiles.

Critical access hospitals, which are small and located in rural or frontier areas, were no less likely than noncritical access hospitals to have adopted a basic EHR; however, they were significantly less likely to meet the criteria for a comprehensive EHR (19.9% adoption compared to 27.7% adoption among noncritical access hospitals, p-value across categories of EHR adoption < 0.001, Exhibit 18). In addition, they found only small, statistically insignificant differences by DSH quartile (Exhibit 18). About 35 percent of hospitals in the highest DSH quartile had a basic EHR compared to 32.1 percent of those in the lowest quartile. However, those in the highest DSH quartile did have somewhat lower rates of comprehensive EHR adoption (26.6% compared to 31.4% in the lowest quartile). The authors repeated this analysis using quartiles of the proportion of hospital days paid for by Medicaid and found similar results.

Exhibit 18: **EHR Adoption Among Hospitals Caring for the Poor**

		Comprehensive EHR	Basic EHR	No Basic EHR
		25.5%	**33.4%**	**41.1%**
Critical Access Hospital	Yes	19.9%	33.7%	46.5%
	No	27.7%	33.3%	39.0%
Disproportionate Share Hospital Quartile	Lowest	31.4%	32.1%	36.5%
	2nd lowest	25.8%	32.5%	41.7%
	3rd lowest	26.8%	33.4%	39.8%
	Highest	26.6%	35.3%	38.1%
Medicaid Quartile	Lowest	25.1%	30.8%	44.1%
	2nd lowest	24.0%	35.5%	40.5%
	3rd lowest	25.1%	31.9%	43.0%
	Highest	27.6%	35.4%	37.0%

Note: The content of this exhibit has been excerpted from the following article: Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014.]

Stage of EHR Implementation

In addition to examining hospital EHR adoption by hospital characteristics, the authors segmented the responding hospitals into three groups: early adopters, recent adopters, and those not yet adopted. The purpose of this analysis was to determine whether new adopters resembled early adopters (large, academic hospitals in urban areas) or whether adoption was beginning to increase among smaller, nonacademic institutions. In order to conduct this analysis, the sample was restricted to the 2,087 hospitals that also responded to the American Hospital Association health information technology survey in 2012. Early adopters were those that reported having at least a basic EHR in both 2012 and 2013 American Hospital Association survey data. Recent adopters did not have at least a basic EHR in 2012, but had at least a basic EHR by 2013. Not yet adopted hospitals were those that did not have at least a basic EHR in both 2012 and 2013.

Stage of Implementation

Some 24.4 percent of hospitals newly adopted at least a basic EHR between 2012 and 2013 (Exhibit 20). These hospitals were significantly less likely than early adopters to be large (60.3% of early vs. 18.1% of new adopters; $p < 0.001$), not-for-profit (46.1% of early vs. 22.3% of new adopters $p < 0.001$), and a major teaching hospital (65.3% of early vs. 15.7% of new adopters; $p < 0.001$). New adopters were more likely to be located in rural areas rather than urban areas (27.6% rural vs. 23.4% urban; $p < 0.001$) and be a critical access hospital (29.2% vs. 22.7%; $p < 0.001$). Among the hospitals that have not yet adopted at least a basic EHR, small, for-profit, rural, critical access, and public hospitals were over-represented (Exhibit 19).

Practicing Physicians

The National Panel Survey of Physicians is a panel survey conducted in 2011 and again in 2013. In this chapter, we report on physicians who responded to both waves of the survey. The questionnaire includes several alternative measures for examining rates of EHR adoption among physicians serving vulnerable populations. Specifically, the survey asks practicing physicians the following series of questions: "Approximately what percentage of your patients in your *main* practice site...are African-Americans or black; are Hispanic or Latino; Have a primary language other than English?" Response options were "less than 10%", "10% to less than 25%", "25% to less than 50%", or "50% or more."

Very few physicians reported serving a patient population that was more than 50 percent African-American or black, Hispanic or Latino, or having a primary language other than English. In order to ensure enough cases for analysis, we combined the 50 percent or more and 25 percent to 50 percent groups. Thirty-six percent of physicians reporting that 25 percent or more of their patient population was African-American or black did not have a basic EHR in 2013, as did 35 percent of those with fewer African-American patients. We see a very similar pattern when we look at EHR adoption by the percentage of patients who were Latino or Hispanic (37% among physicians with less than 25% of patients identified as Latino or Hispanic; 36% among those with more than 25%). The only area where we see a difference in rates of EHR adoption is among physicians serving a large percentage of patients with a primary language other than English. Forty-four percent of physicians reporting that more than 25 percent of their patient population had a primary language other than English had not adopted a basic EHR, compared to 35 percent of physicians with fewer such patients.[7]

The Commonwealth Fund National Survey of Federally Qualified Health Centers

Federally qualified health centers (FQHC) provide comprehensive primary care, behavioral health, dental care, and other services to patients regardless of their insurance state or ability to pay for care. As such, they serve an important role as part of the health care safety net, providing care to millions of Americans. The patients served by these centers are disproportionately poor, minority, and speak a primary language other than English.[8] Since 2009, the federal government has provided a significant amount of financial support through the HITECH Act and the Affordable Care Act to FQHCs to encourage them to build their health information technology infrastructure and use EHRs in a way that improves care. The Commonwealth Fund has been tracking the progress of FQHCs on EHR adoption, fielding surveys of these health centers in 2009 and 2013.[9] In the following section, we review findings from the recently released 2013 data.

Between 2009 and 2013, the proportion of FQHCs reporting the availability of an EHR more than doubled, from 40 percent in 2009 to 93 percent in 2013 (Exhibit 20). In 2013, over 80 percent of FQHCs were able to electronically generate the following types of information about individual patients or a panel of patients: lists of patients by diagnosis (98%); lab results (90%), as well as lists of medications each patient is taking (86%); and patient overdue for tests or preventive care (83%) (Exhibit 21).

FQHCs also made significant gains in the use of computerized provider order entry (CPOE) between 2009 and 2013. As shown in Exhibit 21, more than three-quarters of FQHCs routinely access patients' lab results (86%) and order lab tests (87%) and medications electronically (91%). Ninety-two percent routinely enter clinical notes electronically and 77 percent electronically track all lab tests until the results reach clinicians.

Computerized decision support functions appear to continue to pose a challenge to FQHCs. While 83 percent reported that providers routinely receive electronic alerts or prompts about potential dose or drug interactions while prescribing, far fewer (55%) receive alerts or prompts to provide patients with test results. Finally, approximately one-third of FQHCs are able to electronically send patients reminder notices for regular preventive or follow-up care. The adoption of this function was the only one that did not increase between 2009 and 2013. Finally, 85 percent of FQHCs have advanced HIT capabilities–defined as at least nine of the computerized functions shown in Exhibit 21–up from 30 percent in 2009 (a relative increase of 183%).

FQHCs appear to be participating enthusiastically in the CMS EHR incentive programs. In 2013, 41 percent of FQHCs reported having an EHR that met Stage 1 meaningful use criteria and an additional 51 percent reported being able to meet Stage 2. Fully 93 percent of centers had either already "applied" to the incentive program (82%) or were planning to apply (11%). Finally, 42 percent of FQHCs reported receiving a meaningful use incentive payment in 2011; 79 percent received a payment in 2012; and 56 percent had received one at the time the survey was fielded in 2013.

Discussion

Despite early concerns about a digital divide, whereby hospitals and providers serving poor patients would be unable to adopt EHR systems to the same extent as their better-resourced counterparts, we find little evidence of this divide in the most recently available data. The lack of a digital divide between safety-net providers and others is remarkable, given that these hospitals and clinicians usually struggle with expensive and complex changes. Policymakers' concern about the potential for differential adoption rates helped to create a separate incentive structure for these care providers, allowing them access to incentive dollars for "adopting, implementing, or upgrading" an EHR.[10] These provisions of the HITECH Act appear to have had the desired effect of helping these institutions and providers keep up with their better-resourced counterparts.

However, the remaining gap in EHR adoption between small, rural, and critical access hospitals and other institutions suggests that while the current Regional Extension Center (REC) efforts to help these institutions is clearly having some benefit, it may not be enough. Regional Extension Centers may simply not have the capacity to assist all of the hospitals that need help. There are several things that policymakers could do that would be potentially helpful. First, they could ensure that RECs and other federal efforts have the resources to help their targeted institutions and providers select, purchase, and implement, and successfully use these systems to both participate in the incentive programs and new care delivery and payment models, such as accountable care organizations. Additionally, policies and programs for technical assistance could be tasked with assisting all small hospitals and practices, not only those located in rural regions of the country.

However, it is also possible that the adoption gap is the result of inadequate EHR systems to meet the unique needs of small hospitals and provider practices within the necessary price range. Policymakers could devote specific attention to understanding whether these "supply-side" challenges exist and whether efforts like changes in certification or incentive policies might help mitigate the gap.

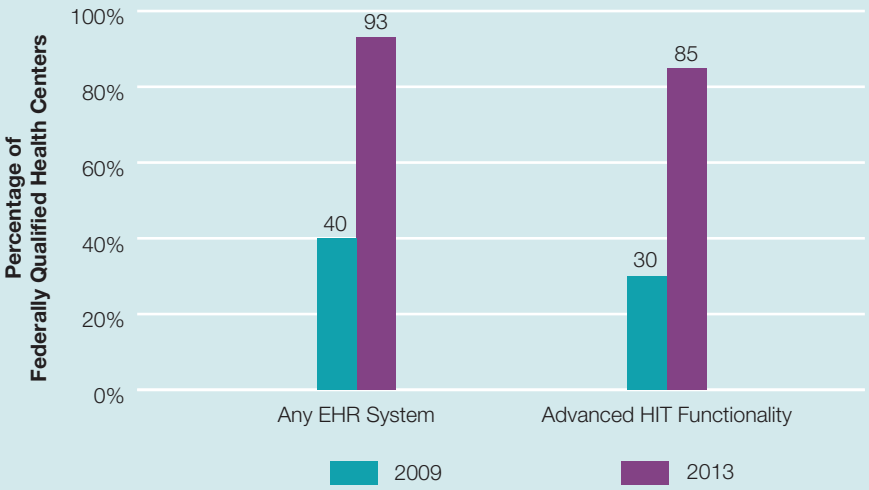
In addition to significant progress among U.S. hospitals, the nation's FQHCs continue to move rapidly toward both the adoption of EHRs and the use of such systems in a way that has the potential to improve care. The federal funding targeted toward these safety-net providers appears to have played a significant role in the implementation of EHRs and advanced health information technology systems. These gains, coupled with those made by the nation's hospitals, and physicians to a slightly lesser extent, bode well for patients receiving care from these providers, and for progress toward the goal of a nationwide health information technology infrastructure.

Exhibit 19: **Stage of EHR Adoption by Hospital Characteristics**

		Early Adopter	Recent Adopter	Not Yet Adopted	p-Value
		40.4%	24.4%	35.2%	
Hospital Size	Small	34.2	23.9	42.0	< 0.001
	Medium	42.1	26.7	31.1	
	Large	60.3	18.1	21.5	
Hospital Region	Northeast	41.5	21.7	36.8	0.037
	Midwest	44.5	21.3	34.2	
	South	36.3	26.6	37.1	
	West	39.9	28.3	31.9	
Teaching Status	Major Teaching	65.3	15.7	18.9	< 0.001
	Minor Teaching	46.5	25.5	27.9	
	Nonteaching	36.3	24.9	38.7	
Ownership	For-Profit	20.2	32.6	47.3	< 0.001
	Not-for-Profit	46.1	22.3	31.6	
	Public	36.6	25.4	38.0	
Urban	Urban	44.7	23.4	31.9	< 0.001
	Rural	27.0	27.6	45.4	
Disproportionate Share Hospital Quartile	Lowest	48.8	21.6	29.6	0.099
	2nd Lowest	45.5	18.3	36.2	
	3rd Lowest	40.2	25.2	34.6	
	Highest	42.1	26.0	31.9	
Medicaid Quartile	Lowest	37.3	23.9	38.9	0.189
	2nd Lowest	41.1	24.0	34.8	
	3rd Lowest	40.8	22.3	36.9	
	Highest	42.2	27.2	30.6	
Critical Access Hospital	Yes	30.1	29.2	40.7	< 0.001
	No	44.1	22.7	33.2	

Note: The content of this exhibit has been excerpted from the following article: Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014.]

Exhibit 20: **Trends in HIT Capacity in Federally Qualified Health Centers, 2008–2013**



Source: Ryan J, Doty M, Abrams M, et al. *The Adoption and Use of Health Information Technology by Community Health Centers, 2009–2013*. The Commonwealth Fund pub 1746, v. 10. 2014.

Exhibit 21: **EHR Adoption and Advanced HIT Capacity Among Federally Qualified Health Centers, 2009–2013**

	Total 2009	Total 2013	Absolute Change	Relative Change
Percentage distribution	100%	100%		
Unweighted N	795	679		
Currently using EHRs	40	93	53	133%
Ability to generate patient and patient information electronically				
Can generate list of patients by diagnosis	80	98	18	23%
Can generate list of patients by lab result	59	90	31	53%
Can generate list of patients overdue for tests or preventive care	46	82	35	74%
Routinely use electronic lists of medications taken by patient	38	86	48	126%
Computerized provider order entry				
Routinely order lab tests electronically	45	87	42	93%
Routinely prescribe medication electronically	35	91	56	160%
Electronically track all lab tests until results reach clinicians	36	77	41	114%
Routinely electronically enter clinical notes, including medical history and follow ups	38	92	53	136%
Routinely electronically access patients' lab results	57	86	29	51%
Computerized decision support				
Providers receive alerts or prompts to provide patients with lab results	28	55	27	96%
Providers routinely receive electronic alerts or prompts about potential dose/drug interactions	38	83	45	118%
Patients sent reminder notices for regular preventive or follow-up care	34	35	1	3%
Advanced HIT capacity				
Low (0–3 of the above items)	39	4	-34	-89%
Medium (4–8 of the above items)	31	10	-22	-69%
High (9–13 of the above items)	30	85	55	183%

Source: Ryan J, Doty M, Abrams M, et al. *The Adoption and Use of Health Information Technology by Community Health Centers, 2009–2013*. The Commonwealth Fund pub 1746, v. 10. 2014.

Endnotes

1. *Health Information Technology in the United States: Where We Stand 2008*. Princeton, NJ: The Robert Wood Johnson Foundation 2008.
2. Jha AK, DesRoches CM, Shields A, Miralles PD, Zheng J, Rosenbaum S, Campbell EG. Evidence of an emerging digital divide among hospitals that care for the poor. *Health Affairs.* 2009;28(6):1160–1170.
3. Centers for Medicare and Medicaid Services. "Meaningful Use." May 12, 2014. Available at: *www.cms.gov/regulations-and-guidance/legislation/EHRIncentivePrograms/meaningful_use.html*. Accessed May 23, 2014.
4. Adler-Milstein J, DesRoches CM, Furukawa MF, Worzala C, Charles D, Kralovec P, Stalley S, Jha AK. More than half of U.S. hospitals have at least a basic EHR, but stage 2 criteria remain challenging for most. *Health Affairs*. 2014;33(9). [Online ahead of print. August 7, 2014].
5. Ryan J, Doty M, Abrams M, et al. "The Adoption and Use of Health Information Technology by Community Health Centers, 2009–2013." The Commonwealth Fund, pub 1746, v. 10. 2014.
6. Adler-Milstein et al.
7. Authors' analysis of the National Panel Survey of Physicians, 2013.
8. Medicare Payment Advisory Commission. "Medicare and the Health Care Delivery System." Report to Congress. June 11, 2011.
9. Ryan J et al.
10. "Health Information Technology for Economic and Clinical Health (HITECH) Act, Title XIII of Division A and Title IV of Division B of the American Recovery and Reinvestment Act of 2009 (ARRA)," Pub. L. No. 111–5, 123 Stat. 226 (February 17, 2009), codified at 42 U.S.C. 300jj *et seq.*; 17901 *et seq.*

Chapter 4: Optimizing EHR Use to Drive Performance Improvement

Julia Adler-Milstein, PhD and Ashish K. Jha, MD MPH

Introduction

Three years ago, the U.S. government began implementing the Health Information Technology for Economic and Clinical Health (HITECH) Act, a federal initiative with the ambitious goal to convince all physicians and hospitals to adopt electronic health record systems (EHRs) and then use them in ways that improve the quality and efficiency of care. The policy was motivated by the low levels of physician and hospital use of EHRs with at least a basic set of key functions, such as computerized provider order entry, along with the realization that an IT-enabled health care system was likely decades away.[1] The Act authorized financial incentives to "eligible providers" (physicians, nurse practitioners, and others) as well as hospitals who meaningfully use EHRs. Meaningful use comes in stages–beginning with basic EHR functions and progressing to sophisticated use that evidence suggests should improve health care delivery. The results have been striking. Just 9 percent of hospitals had even a basic EHR in 2008, a number that rose to only 15 percent by 2010, the last year prior to the onset of incentives. Starting in 2011, as the incentives began, the proportion of hospitals with a basic EHR climbed quickly, tripling to 59 percent by 2013.[2]

Coupled with the steadily rising adoption figures is, however, a growing sense that our collective investment in EHRs may not pay off. While early studies promised that EHRs could transform health care delivery, more recent evidence suggests that current approaches to EHR use are not generating real value for the health care system.[3,4] This raises the critically important question: What else do we need to do, beyond just adopting this new technology, to produce real, near-term performance improvement in the delivery of health care?

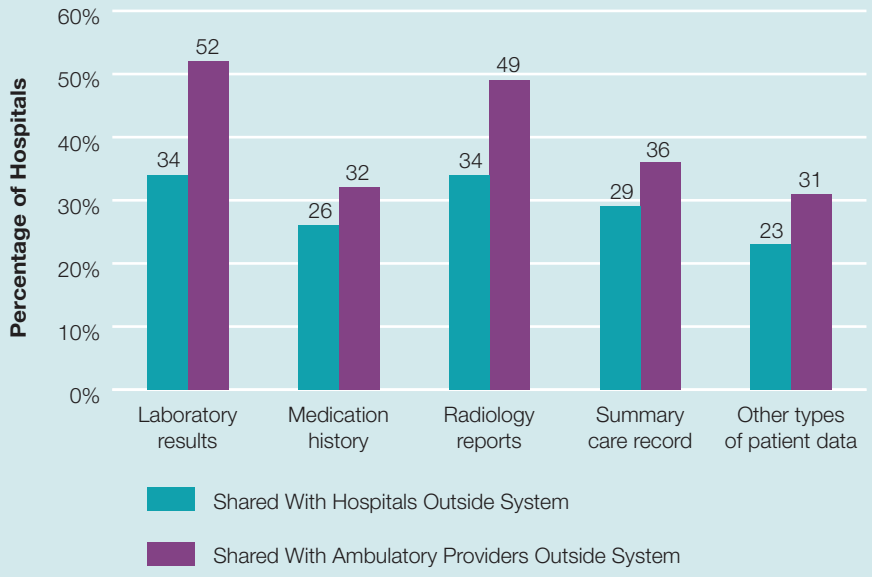
In this chapter we discuss three of the most promising areas: greater health information exchange, smarter clinical decision support, and using EHR data to generate learning. We focus on these three areas for two reasons: first, they are largely within the control of health care delivery organizations and second, there is reasonably good evidence that each can rapidly generate substantial value if they are done well. To better understand these areas, we use data from the most recent American Hospital Association (AHA) Annual Health Information Technology Supplement survey to assess where we stand today with respect to use of EHRs in these advanced ways. We also discuss key challenges to further uptake. Though none of these will be easy, they are likely to be necessary for making high-value health care a near-term reality.

Health Information Exchange

In our highly fragmented health care delivery system, lack of clinical data exchange leads to care that is duplicative, inefficient, and error-prone. Physicians are hamstrung in their ability to make good clinical decisions when they lack critical information about care that might have occurred in other settings (such as knowing what happened to your patient when he or she was in the emergency room last week). And coordinating care for expensive and complex patients is particularly difficult when their information is trapped in the EHRs in different settings where they receive care.

So where do we stand today with the ability to share information electronically between health care settings? Among the 2,610 nonfederal, general medical and surgical, acute-care hospitals that responded to the 2013 AHA HIT Supplement survey, electronic health information exchange (HIE) was not yet widespread. Even for the most common type of clinical data shared by hospitals electronically–laboratory results–only 34 percent of hospitals shared this data with external hospitals and 52 percent did so with external ambulatory providers (Exhibit 22). Medication history was the least common type of clinical data shared electronically with external hospitals and ambulatory providers, with 26 percent of hospitals sharing medication history electronically with external hospitals and 32 percent of hospitals sharing with external ambulatory providers (Exhibit 22). This suggests that enabling clinical data to follow patients between care delivery settings is still not the norm, which undoubtedly interferes with realizing cost and quality gains from EHRs.

Exhibit 22: **Health Information Exchange Among U.S. Hospitals**



Source: Authors' analysis of the 2013 American Hospital Association Health Information Technology Supplement survey

There are several reasons HIE is difficult[5]. For example, there are a multitude of issues related to data privacy and security. Health information is particularly sensitive and we lack an established approach to ensure that only authorized care providers gain access. In addition, when health care organizations agree to share their data electronically, there is uncertainty about the legal ramifications of a data breach or unauthorized access, making organizations wary to engage in HIE.

A second challenge is that physicians and hospitals are concerned about the competitive implications of sharing their data, which may make it easier for patients to seek care from rival institutions. Hospitals view clinical data as "a key strategic asset, tying physicians and patients to their organization."[6] While competition leads to many good outcomes in health care, increasing electronic exchange of health information does not appear to be one of them. Right now, too many organizations view data as a competitive advantage and their decisions about with whom to share data are driven by strategic, rather than patient-centered, factors.[7] As the technological barriers to sharing come down, organizations that really want to get value out of their EHRs have to engage with

other providers to share their information.

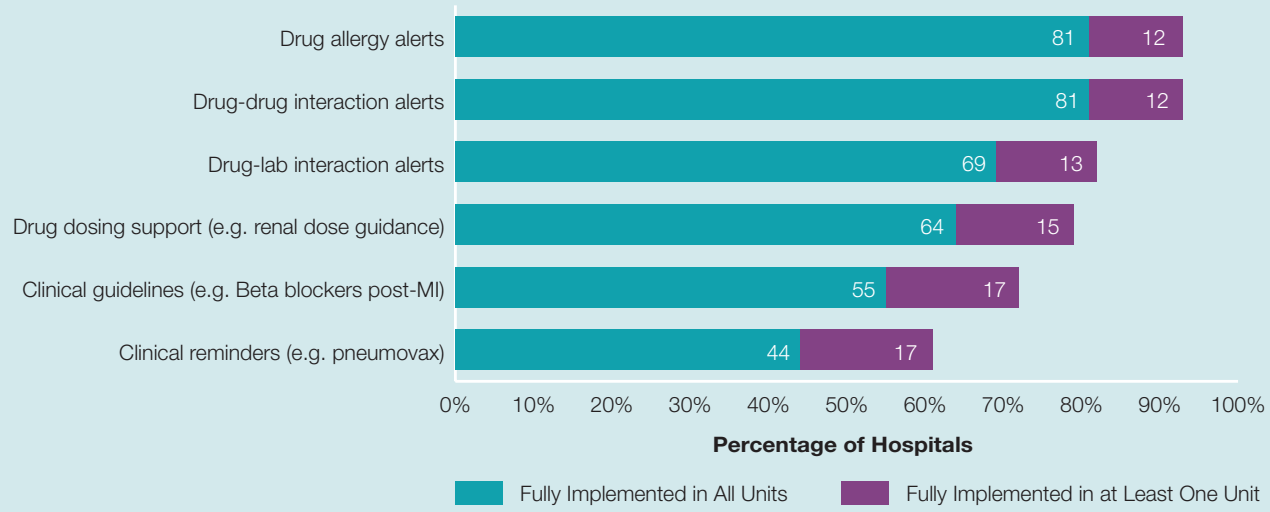
Perhaps the most critical challenge to broad-based HIE is convincing clinicians to demand these data and use them when they are available. Physicians are accustomed to making clinical decisions with incomplete information and the notion that they would be responsible for reviewing patient data from all past clinical encounters is daunting. Smart analytic tools that sift through the terabytes of data that HIE will generate and present what is valuable to clinicians at the point-of-care are not yet ready for primetime. Until these, and other challenges, to broad-based HIE are addressed, it is likely that data will largely remain within the EHRs of individual health care delivery organizations, limiting the potential value from the large national investment in EHRs.

Clinical Decision Support

The second area where EHRs could generate substantial near-term value is through a smarter, more flexible approach to clinical decision support, or CDS. These decision tools, when embedded in the EHR, can be very powerful. Computers are exceptional in their ability to follow rules, and, by extension, ensure that those who use them follow rules. When two drugs should never be prescribed together, a programmed hard-stop can ensure it doesn't happen, an action that is effectively impossible on paper. CDS can also be used to promote adherence to comprehensive care protocols. For example, to improve care for heart bypass surgery, Geisinger Health System created "a bundle of 40 evidence-based practices, developed an improved workflow process[…], and worked to hardwire each element of the bundle into the EHR through templates, order sets, and reminders."[8] This approach reduces unnecessary and often wasteful variation, and improves care for the majority of patients for whom there is a clear right decision or course of treatment.

So how widely adopted is clinical decision support? The most recent AHA HIT Supplement survey data suggests that certain types of decision support–in particular, CDS related to medication safety–are widely adopted. However, clinical decision support that promotes evidence-based care lags behind. In the sample of 2,610 nonfederal, general medical and surgical, acute-care hospitals, drug-allergy interaction alerts were the most widely adopted–with 81 percent of hospitals reporting full implementation across all units, and an additional 12 percent of hospitals reporting that these alerts were fully implemented in at least one unit (Exhibit 23). Drug-drug interaction alerts were in place at a similar level: 81 percent of hospitals had them fully implemented and 12 percent of hospitals had them implemented in at least one unit. Less common was clinical decision support focused on clinical guidelines and clinical reminders. Fifty-five percent of hospitals had clinical guidelines implemented in all clinical units and an additional 17 percent had them implemented in at least one clinical unit. Similarly, 44 percent of hospitals had clinical reminders implemented in all clinical units and an additional 17 percent had them implemented in at least one clinical unit (Exhibit 23). This suggests that current clinical decision support should improve patient safety and result in avoided costly adverse drug events. However, there is opportunity for broader use of clinical decision support to promote adherence to evidence-based care, which will drive additional gains from EHRs.

Exhibit 23: **Clinical Decision Support Function Adoption Among U.S. Hospitals**



Source: Authors' analysis of the 2013 American Hospital Association Health Information Technology Supplement survey

One of the challenges to widespread clinical decision support is that clinicians argue that patient preferences and individual clinical needs mean that few rules apply in 100 percent of cases. For example, there are important instances when two drugs that might have significant interactions might still need to be given. Worse, many current CDS tools are inflexible, creating frustration and incentivizing clinicians to stop using them altogether. Organizations should pursue smarter clinical decision tools that help guide physicians to provide evidence-based, standardized care, but leave room to customize care for the individual patient. It is also critical that decision support tools be easily updatable. Clinical knowledge changes rapidly and so must the tools working to promote the application of this knowledge. For many organizations, this will require putting pressure on EHR vendors to improve the CDS that comes built into the system, or to make it easier to incorporate external CDS software. There has been substantial work to create scalable CDS[9], but until this is widely available, it will be difficult to realize the full potential value of CDS across all care settings.

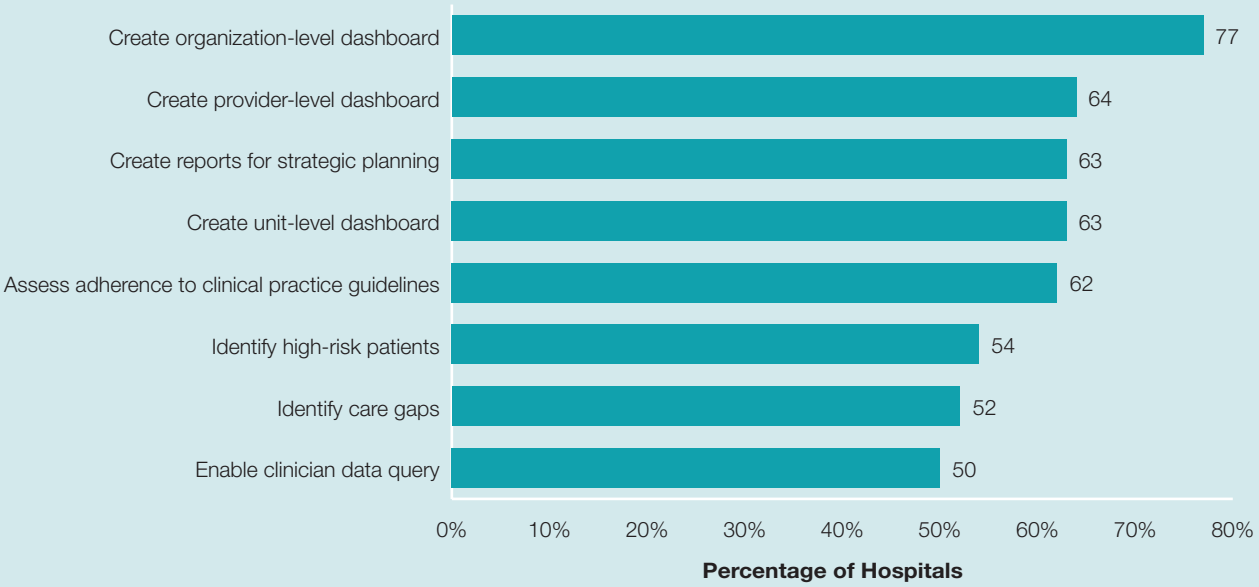
EHR Data for Learning

The third and arguably the biggest area of opportunity for organizations is the use of EHR data for learning through performance measurement, monitoring, and improvement. One of the major impediments to improvement in health care has been the lack of reliable, timely performance data. Clinicians have little information about how their own patterns of care differ from those of other clinicians, or from broader norms. EHRs offer timely, clinically rich data that can be analyzed in real-time to assess performance and identify opportunities for improvement. Such opportunities become particularly important for managing the care of high-cost, complex patients. This becomes yet more powerful when individuals, teams, or even entire organizations experiment with new approaches to care delivery and use real-time measures to assess the impact. This virtuous cycle of measurement, experimentation, feedback, and refinement could transform practices and hospitals into data-driven, learning organizations. Most importantly, this systematic and data-centric approach to care delivery could dramatically

improve the quality of care that patients receive. As the broader delivery system moves toward paying for value (as opposed to just paying for more health care services), EHRs have the potential to become an indispensable tool to help organizations learn what they do well, where they can improve, and how.

When we examined the proportion of hospitals with at least a basic EHR system in place[10] that reported in the AHA HIT Supplement that they used EHR data for key performance measurement and monitoring activities, we found high levels of adoption. The vast majority (77%) had created a dashboard with measures of organizational performance using EHR data (Exhibit 24). Approximately two out of every three hospitals used EHR data for creating dashboards at a more granular level–either for hospital units (63%) or individual providers (64%). In addition, EHR data was used to create reports for strategic planning purposes (63%) and to assess adherence to clinical practices guidelines (62%). Just over half of hospitals (54%) used EHR data to identify high-risk patients, which would enable targeted intervention to potentially avoid a hospitalization or other costly care. A similar proportion (52%) used EHR data to identify gaps in care, which again could serve to facilitate proactive outreach and management.

Exhibit 24: **Proportion of Hospitals Using EHRs/EHR Data in Key Performance Improvement Domains**



Source: Authors' analysis of the 2013 American Hospital Association Health Information Technology Supplement survey

Finally, half of hospitals reported that they enable clinicians to query EHR data. Giving clinicians the ability to query EHR data could allow them to not only support individual-level care but explore trends and patterns in clinical data that could lead to new insights. Such big data approaches can be used to identify correlations that can then be studied more rigorously to better understand causality. For example, a clinician at the University of Michigan Health System uncovered a relationship between cat bites and depression using data from the electronic health records of around 1.3 million patients seen by the university's health system.[11] This has informed the investigation of Toxoplasma gondii, a parasite cats can get from eating infected animals, which is believed to increase the risk of serious psychological issues in humans, including schizophrenia and suicidal behavior.

While advanced uses of EHR data are relatively common in hospitals, few EHRs offer these functions automatically. Instead, organizations must invest time and resources in developing dashboards, and working to create measures using EHR data. These resources may not be available in all hospitals, which could lead to a disparity in the types of hospitals that see improved performance after adopting an EHR and those that do not. When we examined if certain types of hospitals were more likely to report engaging in advanced uses of EHR data, we found some differences (Exhibit 25). Urban hospitals were significantly more likely than rural hospitals to engage in all of the data use domains examined (with use of EHR data for identifying high-risk patients as the exception in which the difference between urban and rural hospitals was not significant).

There were few differences based on hospital teaching status, a somewhat surprising finding given that teaching hospitals are traditionally known for more advanced uses of EHRs. However, major teaching hospitals were more likely than minor teaching hospitals and nonteaching hospitals to use EHR data to identify care gaps, identify high-risk patients, and create reports for strategic planning (Exhibit 25). The picture was similarly mixed based on hospital size. Large hospitals–those with 400+ beds–were more likely than small (<100 beds) and medium (100–399 beds) hospitals to create all three types of dashboards (organization, unit, and provider), but were less likely to create reports for strategic planning.

Exhibit 25: **Use of EHR Data in Performance Improvement Domains by Key Hospital Characteristics**

	Hospital Size				Teaching				Location		
	Small	Med	Large		Major	Minor	No		Urban	Rural	
	Proportion			P	Proportion			P	Proportion		P
Create organization-level dashboard	73.0%	81.7%	84.9%	<.001	81.2%	79.8%	78.7%	0.813	80.8%	70.6%	<.001
Create unit-level dashboard	55.1%	69.1%	74.2%	<.001	72.0%	62.8%	64.6%	0.169	67.2%	53.1%	<.001
Create provider-level dashboard	61.2%	68.6%	72.3%	0.008	70.8%	68.2%	65.1%	0.371	68.2%	57.4%	0.001
Enable clinician data query	50.2%	50.6%	56.0%	0.372	55.3%	52.4%	50.3%	0.555	54.8%	35.0%	<.001
Assess adherence to clinical practice guidelines	61.0%	64.8%	69.5%	0.131	68.4%	66.7%	62.5%	0.232	65.3%	58.1%	0.022
Identify care gaps	51.8%	55.3%	51.0%	0.295	68.2%	50.7%	51.7%	0.001	55.2%	43.4%	<.001
Create reports for strategic planning	66.5%	64.5%	55.8%	0.046	77.7%	61.0%	62.6%	<.001	65.2%	57.2%	0.012
Identify high-risk patients	52.5%	57.4%	54.4%	0.189	65.4%	54.9%	53.4%	0.047	55.6%	52.3%	0.323

Source: Authors' analysis of the 2013 American Hospital Association Health Information Technology Supplement survey

Concerns about disparities in EHR-driven performance improvement are perhaps most critical for safety-net hospitals because of the disproportionate care for poor patients that they deliver. Exhibit 26 reports the level of hospital use of EHR data in performance improvement domains based on three proxy measures of safety-net status–the Medicare disproportionate-share hospital (DSH) index, the proportion of discharges from Medicaid patients, and critical access status. We found few differences in the extent to which safety-net institutions used EHR data in advanced ways, particularly for the latter two proxy measures.

Critical access hospitals were somewhat less likely than noncritical access hospitals to create unit-level dashboards, but were otherwise indistinguishable in the domains in which they use EHR data. Similarly, hospitals in the highest quartile of proportion of Medicaid admissions were less likely than hospitals in the other three quartiles to create an organization-level dashboard. (Exhibit 26).

However, those in the highest DSH quartile (which are commonly thought of as safety-net institutions) were less likely than nonsafety-net hospitals to create organization- and provider-level dashboards. They were also less likely to assess adherence to clinical practice guidelines. This suggests that safety-net hospitals may not realize the same degree of performance gains from their EHR and may need specific help pursuing more advanced uses of EHRs.

Exhibit 26: **Use of EHR Data in Performance Improvement Domains by Safety-Net Characteristics**

	DSH Quartile					Medicaid Quartile					Critical Access Hospital		
	Lowest	2nd	3rd	Highest		Lowest	2nd	3rd	Highest		Yes	No	
	Proportion				P	Proportion				P	Proportion		P
Create organization-level dashboard	83.1%	84.9%	84.1%	76.4%	0.010	80.6%	81.5%	80.9%	74.5%	0.012	71.1%	81.1%	0.250
Create unit-level dashboard	65.5%	69.1%	68.8%	68.2%	0.669	66.0%	63.9%	68.4%	62.3%	0.166	49.0%	68.8%	0.049
Create provider-level dashboard	67.1%	72.9%	72.2%	64.0%	0.015	70.0%	65.8%	66.9%	64.1%	0.243	66.0%	66.6%	0.945
Enable clinician data query	48.7%	56.6%	57.1%	54.4%	0.056	47.6%	51.9%	53.4%	51.7%	0.345	40.0%	54.4%	0.138
Assess adherence to clinical practice guidelines	68.4%	74.8%	64.7%	61.0%	<.001	69.0%	62.2%	64.9%	61.7%	0.059	70.6%	62.3%	0.327
Identify care gaps	55.9%	60.0%	54.9%	54.5%	0.391	52.2%	54.3%	54.8%	51.7%	0.674	54.4%	52.9%	0.872
Create reports for strategic planning	68.8%	65.1%	65.4%	68.5%	0.528	64.3%	61.9%	63.2%	66.1%	0.484	67.2%	63.0%	0.624
Identify high-risk patients	60.1%	59.3%	58.8%	51.9%	0.091	50.8%	56.7%	56.0%	55.5%	0.252	45.3%	57.5%	0.201

Source: Authors' analysis of the 2013 American Hospital Association Health Information Technology Supplement survey

Using EHR data for performance improvement and learning represents a broad shift in the industry toward data-driven management, and a focus on outcomes and value. Recent forces–in particular, experimentation with new value-based payment models promoted by the Affordable Care Act–are causing many health care delivery organizations to realize that they need to move in this direction. Specifically, in order for organizations to succeed under risk-based contracting, they must understand their current performance and have the ability to assess whether they are improving over time. Our data suggests that many hospitals are doing this, but it may take some time before tools like dashboards with measures derived from EHR data are part of a routine cycle of measurement, experimentation, feedback, and refinement that results in continuous learning.

The Role of Meaningful Use

Our data suggest that hospitals are engaging in three areas of EHR use expected to promote performance gains. This is particularly true for clinical decision support as well as use of EHR data for performance measurement and monitoring. For health information exchange, the majority of hospitals are not yet sharing basic clinical data with external ambulatory providers and hospitals. This is a critical gap that must be addressed–both because complete clinical data is necessary in order for clinicians to make optimal decisions, and because it seems likely that the lack of HIE is interfering with the realization of gains from EHRs. That is, without complete patient data, other key advanced uses of EHRs, such as CDS and performance monitoring, cannot be fully effective. This suggests that particular emphasis on HIE may be required to see large performance gains from EHRs.

Going forward, much of the progress toward more advanced EHR use is likely to be shaped by the evolving meaningful use criteria. While early stages of meaningful use targeted capture of basic structured clinical data in the EHR, demonstrated improvements in outcomes are expected in the third stage. A draft of the Stage 3 requirements will be released in the fall of 2014, and final guidance is slated for early 2015. Not surprisingly, health information exchange, clinical decision support, and performance measurement feature prominently in the proposed criteria. Specifically related to HIE, the criteria focus on care coordination. Providers and hospitals will be required to send and receive a summary of care records when patients are transitioned between care settings, including referrals. These summaries include core clinical data–such as medications and diagnoses, and may also include at the discretion of the provider, (1) a synopsis of current care and expectations for transition or the results of a consult, (2) overarching patient goals and/or problem-specific goals, (3) patient instructions, (4) suggested interventions for care during transition; or (5) information about known care team members (including a designated caregiver). However, this information only needs to be provided electronically for 10 percent of transitions, and the requirement does not specify that the data arrive in a structured format. This means that while more information will move electronically, it may not become a routine part of care, and when information does arrive, it may not be able to be easily captured in EHRs in a structured format (and therefore used for key activities like CDS and performance measurement). Thus, in perhaps the most critical area, it is not likely that meaningful use is going to drive robust HIE that leads to large performance gains.

Clinical decision support features more prominently in the Stage 3 measures. Eligible providers–both professionals and hospitals–must demonstrate use of multiple CDS interventions that apply to quality measures in at least four of the six National Quality Strategy priorities. Recommended intervention areas

include (1) preventive care; (2) chronic condition management (e.g., diabetes, coronary artery disease); (3) appropriateness of lab and radiology orders (e.g., medical appropriateness, cost-effectiveness, high-cost radiology); (4) advanced medication-related decision support (e.g., renal drug dosing, condition-specific recommendations); (5) improving the accuracy/completeness of the problem list, medication list, drug allergies; and (6) drug-drug and drug-allergy interaction checks. These will push most organizations beyond CDS focused on medication management, and if new CDS domains are well-received by clinicians, this could help address important gaps in care and drive performance gains.

Finally, performance measurement and monitoring is promoted by ensuring that EHR systems that meet federally specified certification criteria can create clinical quality measures (CQMs) electronically. Beginning this year, eligible professionals must select and report on nine of a possible list of 64 approved CQMs for the meaningful use program. The quality measures selected must cover at least three of the six available National Quality Strategy domains, which represent the Department of Health and Human Services' NQS priorities for health care quality improvement. The six domains are: Patient and Family Engagement, Patient Safety, Care Coordination, Population and Public Health, Efficient Use of Health Care Resources, and Clinical Processes/Effectiveness. Ensuring that quality measures can be created from EHR data is an important first step to allowing organizations to monitor and improve performance.

Discussion

Beyond meaningful use criteria, using EHRs and the resultant electronic data in valuable ways requires that health care delivery organizations choose to effectively apply these tools to the goal of performance improvement. Until recently, we have known little about whether they are doing so in three key domains in which there is reasonably good evidence that each can rapidly generate substantial value if they are done well. Now, it is clear that progress is well underway in two of the three domains. More work is needed to ensure that broad-based HIE becomes a reality, and this will likely need to go beyond the bar set by the meaningful use criteria. Growing pressure from new payment models to improve performance is likely to help—both to promote HIE as well as to ensure that CDS and performance measurement are not simply processes that occur, but produce performance improvement. Ultimately, adopting EHRs is simply the first step in a long and complex journey to an IT-enabled health care system in which technology is effectively leveraged to address ongoing cost and quality challenges.

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Notes

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