

Health Information Technology in the United States:

Better Information Systems for Better Care, 2013



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Introduction

Much has changed in the world of health information technology since our inaugural report in 2006, *Health Information Technology in the United States: The Information Base for Progress*. At that time, there was a dearth of methodologically rigorous data on health information technology adoption, the Office of the National Coordinator for Health Information Technology was relatively small with a limited budget and very few hospitals or physician offices had functional electronic health records. Over the last seven years, two major pieces of legislation have been passed, the Health Information Technology for Clinical and Economic Health provision of the American Recovery and Reinvestment Act and the Affordable Care Act, which have provided unprecedented levels of financial support for health information technology adoption and implementation, primarily in the form of financial incentives for providers, and emphasized the importance of this technology in delivery system reform. We have seen the rate of electronic health record adoption among physicians and hospitals begin to increase more rapidly and the focus has begun to shift from simply turning on the technology to using it in a way that improves the quality and efficiency of care.

In this report we continue to track progress toward the goal of universal adoption of electronic health records. We track the progress of hospitals and physicians, both overall and among those providers serving vulnerable populations; examine the state of health information exchange and mirroring emphasis at the federal level of implementing and using these technologies in a way that improves patient care, and; we examine the use of these tools for population management and patient education.

Major Content Areas

Chapter 1: Progress on Adoption of Electronic Health Records

In the first chapter, we present analyses of 2012 electronic health record adoption data from national surveys of U.S. hospitals and physicians. This chapter presents data on the overall rate of adoption of a basic electronic health record, ability to meet meaningful use stage 1 criteria and readiness for stage 2, and use of computerized systems to manage patient populations.

Chapter 2: Mitigating Disparities in Electronic Health Record Adoption

In the chapter on disparities in electronic health record adoption, we review the most recent hospital-level data, focusing on hospitals that are more likely to be under-resourced or caring for a disproportionate share of elderly poor patients. The analysis focused on rates of adoption of a basic electronic health record and ability to meet stage 1 meaningful use criteria. In addition, we profile the experiences of several state Medicaid programs as they roll out their meaningful use incentive payment programs for Medicaid providers.

Chapter 3: International Comparisons: Benchmarking HIT Adoption and Cross-Country Learning

In Chapter 3, we focus on health information technology adoption internationally, drawing lessons from the implementation experiences of other nations. We first describe the context and motivation for government efforts to develop HIT adoption strategies. We then summarize key efforts to compare HIT strategies and levels of adoption across countries in order to provide the recent estimates of where countries currently stand, as well as review current efforts by the Organisation for Economic and Cooperative Development (OECD), to develop benchmark metrics that can be broadly and consistently measured across countries. Finally, in order to highlight the potential for cross-country learning, we describe selected features of innovative approaches to HIT adoption and use from other countries and suggest key insights that may inform the United States approach, concluding with what we can learn from cross-country comparisons to-date and where the most promising future opportunities for learning lie.

Chapter 4: Health Information Exchange Under HITECH: Progress and Challenges

In this chapter we present recently collected data from a national survey of HIE efforts. The data speak to the overall progress toward nationwide HIE as well as the gaps and barriers. We conclude with a set of policy recommendations for how to ensure that current efforts to promote HIE can thrive and the United States can realize the large anticipated gains from better availability of clinical data.

Chapter 5: Improving Patient Education With Electronic Health Records

In the fifth chapter, we focus on the potential of electronic health records to enhance health care quality by providing patient education materials that are specifically targeted to a given patient's needs, taking into account both the patient's diagnoses and health literacy level. The chapter presents the results of a series of case studies focused on electronic health record systems and health care providers who are making innovative use of this technology to provide patients with tailored educational materials.

Chapter 1: Progress on Adoption of Electronic Health Records¹

Samantha Stalley, MHA and Catherine M. DesRoches, DrPH

Much has changed since the publication of our first annual report, in which we outlined methodological challenges of assessing the rate of EHR adoption, and highlighted the lack of rigorous data to establish a baseline. Since that time, two ongoing, methodologically rigorous survey efforts have collected data on EHR adoption among physicians and hospitals, providing a wealth of data that can be used to assess rates of adoption overall and among subgroups of providers. One of these surveys is the National Ambulatory Medical Care Survey (NAMCS): Electronic Medical Records Supplement, conducted by the National Center for Health Statistics (NCHS); the other is the American Hospital Association (AHA) Health Information Technology Supplement. These surveys are funded by the Office of the National Coordinator for Health Information Technology (ONC). In the following chapter, we review recent findings from these surveys and examine progress toward the goal of universal adoption. Further, because meaningful use (MU) criteria will require physicians to use the data in their electronic health record to measure and assess the care they provide their patient populations, we present data on the usability of EHRs from the Robert Wood Johnson Foundation/Commonwealth Fund National Survey of Physicians.

National Ambulatory Medical Care Survey: Electronic Medical Records Supplement

NAMCS is a nationally representative survey of office-based practicing physicians (excluding pathologists, radiologists, and anesthesiologists) conducted annually by NCHS. Since 2008, NCHS has conducted a supplemental mail survey of physicians focused on the adoption and use of health information technology. In 2012, the survey was sent to 10,302 physicians in office-based practice; the survey had an unweighted response rate of 68 percent. As in prior years, the 2012 survey includes items assessing the adoption of specific health information technology (HIT) functionalities (e.g., electronic order entry, electronic results viewing), type of EHR, and electronic data exchange.

A recent study in *Health Affairs* using the 2012 NAMCS data found that 40 percent of U.S. office-based physicians had adopted a basic EHR, a 4 percentage point increase from 2011 (33.9% in 2011). Levels of EHR adoption varied among physician groups. Primary care physicians were significantly more likely to have a basic EHR compared to specialist physicians (42.5% vs. 34.0%). Practice size and ownership type were strongly associated with EHR adoption. Only 25.6 percent of solo practitioners had a basic EHR compared to 57.7 percent of those in practices of 11 or more physicians. Relative to physician-owned practices, ownership by hospitals or academic medical centers and health maintenance organizations (HMOs) or other health care corporations had significantly higher EHR adoption levels (Exhibit 1). Physicians in rural practices (small metro and non-metro) were more likely to have a basic EHR than those in practices in large urban (central metro) areas. The study findings also show increases in physician adoption of key functionalities required to meet the Centers for Medicare and Medicaid criteria for meaningful use. The absolute percentage point increases ranged from 10 percentage points (viewing laboratory results) to 29 percentage points (send prescriptions to the pharmacy electronically).

The study examined adoption of computerized capabilities related to MU stage 1 core objectives, finding that all but one, viewing data on quality of care measures (43%), had been adopted by at least 50 percent of respondents. Further, routine use of EHR functionalities relative to their rates of adoption was also high (Exhibit 2). The majority of physicians who had adopted a given capability reported using the capability routinely. For 11 of the 15 capabilities shown in Exhibit 2, routine use rates were at least 84 percent. Providing patients with a copy of their health information had the lowest usage rate (59%). The study found little variation in routine use by physician or practice characteristics. Physicians in larger practice (with at least 6 physicians) were more likely to routinely use all of the functionalities they had adopted than solo practitioners. Similarly, physicians in practices owned by HMOs or other health care corporations were more likely to be routine users than those who working in physician-owned practices.

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

The National Survey of Physicians is a panel survey, with the first round of data collection having taken place from October 19, 2011–March 16, 2012, and the second planned from 2013. The survey focused on adoption of EHR and meaningful use functionalities, as well as the ease of use of computerized functionalities for managing patient populations. Exhibit 3 displays the availability and use of computerized systems for patient population management. Fewer than one-half of physicians reported having a computerized system for generating lists of patients by diagnosis. Approximately one-third or fewer physicians had an electronic system for each of the following: tracking referral completion; generating reports on quality of care; sending patient reminders for preventive or follow-up care; generating lists of patients who have missed appointments or are overdue for care; generating lists of patients by laboratory result; and providing patients with after-visit summaries.

Physicians varied in their perceptions of how easy these computerized systems for patient population management were to use. Approximately half of physicians with the respective computerized systems could not or reported it was very or somewhat difficult to generate the following: lists of patients by lab results; referral tracking; lists of patients who are overdue for care; and reports on quality of care. Physicians with an EHR that met the proxy standard for MU defined in the study were significantly more likely than those not meeting the standard to rate all of the panel management tasks as easy.

American Hospital Association Health Information Technology Supplemental Survey

The American Hospital Association (AHA) Health Information Technology (HIT) supplement to their annual survey was first in the field in 2008. We presented the results from this first survey in our 2009 report *Health Information Technology in the United States: On the Cusp of Change*. In this section, we present the most recent findings from AHA HIT Supplemental Survey in 2012 and examine trends in adoption from 2008 through 2012.

The AHA began adding an HIT supplement to their annual survey in 2008. The annual survey is sent to hospital CEOs, who assign the HIT supplement to the person, often a CIO or a similar position, within the organization most knowledgeable of the hospital's EHR system implementation. The survey requests the respondent to report the implementation of 24 electronic clinical functions.

The 2012 AHA HIT Supplemental Survey was in the field from October 2012 through December 2012. The survey generated a response rate of 62.5 percent (n=2,796) general, acute-care hospitals (Exhibit 1). The results are weighted to account for non-response bias based on differences between hospitals that responded and those that did not.

We first presented an established definition of basic and comprehensive EHR (Exhibit 2) in our report in the 2008 *Report on Health Information Technology in the United States: Where We Stand*. Using this definition, a hospital is considered to have a basic EHR if five specific electronic functions are implemented in at least one major clinical unit: computerized systems for maintaining patient demographics; physician notes; nursing assessments; patient problem lists; laboratory and radiology reports; diagnostic test results; and order entry for medications. A hospital is considered to have a comprehensive EHR if it has a basic EHR plus 14 electronic functions in all major clinical units.

To measure progress toward MU objectives, we developed proxies for MU stage 1 and stage 2 criteria from the AHA HIT supplement (Exhibit 3). In our 2012 report *Health Information Technology in the United States: Better Information Systems for Better Care, 2013*, the proxy for meaningful use stage 1 included 12 of the 14 core functions outlined by CMS. In this report, the MU stage 1 proxy includes survey responses that map to all 14 core functions, adding electronic data exchange and the ability to protect health information from the proxy in the 2012 report. This is the first year we included results using a proxy for MU stage 2. This proxy includes survey responses that map to all 16 of the stage 2 core criteria, which are similar to MU stage 1 with a few key additional objectives.

Electronic Health Record Adoption in U.S. Hospitals

In 2012, 44.0 percent of hospitals reported having at least a basic EHR (Exhibit 4). This proportion increased by more than 17 percentage points from 2011. The proportion of hospitals with at least a basic EHR has nearly tripled since 2010, prior to the start of distributions of financial incentives for EHR implementation. Prior to 2010, basic EHR adoption increased by approximately 3 percentage points per year. Hospitals most likely to have a basic EHR in 2012 are large, major teaching, private nonprofit hospitals located in urban areas and in the Midwest (Exhibit 5). Fewer hospitals (16.7 percent) reported having a comprehensive EHR in 2012. However, in just one year this proportion nearly doubled from 8.7 percent in 2011. The first AHA HIT supplement (2008) found that less than 2 percent of hospitals were able to meet the criteria for a comprehensive EHR.

Readiness for Meaningful Use

Using the proxy for MU stage 1, we found that 42.2 percent of hospitals reported implementing all 14 core functionalities (Exhibit 6). Although it was easier to meet the proxy used in previous years with only 12 core functions, this proportion shows substantial increases from 2010 (4.4 percent) and 2011 (18.4 percent). Much like basic EHR adoption, hospitals most likely to meet the proxy for MU stage one were large, major teaching, private nonprofit hospitals located in urban areas. Unlike EHR adoption, hospitals meeting the MU stage 1 proxy were more likely to be located in the Northeast region.

Using the proxy for MU stage 2 criteria, 5.1 percent of hospitals meet these objectives by reporting implementation of all 16 functionalities (Exhibit 7). Although this is a small proportion of hospitals, 63.3 percent report having 11–15 of the 16 functionalities required for MU stage 2, indicating that these hospitals are close to meeting the required objectives. Characteristics of hospitals likely

to meet all 16 core functions of our stage 2 proxy are similar to those meeting the stage 1 criteria. These hospitals are more often in urban areas and are larger, teaching, private nonprofit organizations. Of the 16 MU stage 2 objectives, hospitals were most likely to have implemented EHR functions to record patient demographics, vital signs, and smoking status (Exhibit 8).

Barriers to Meaningful Use Stage 2

Although 68 percent of hospitals have 11 or more functionalities required for MU stage 2, nearly one-third reported having 10 or fewer of these functions. Twenty-one percent have 6–10 functionalities, while 10 percent have 5 or fewer. The functions least likely to be implemented by hospitals are electronically submitted lab reports, syndromic surveillance data, generating and transmitting summary care record for patient transitions between care settings, and the ability for patients to view, download, and transmit health information (Exhibit 8). These functions require health information exchange and patient access to health information, which appear to be difficult to implement and likely barriers to MU stage 2.

Conclusions

Overall, these results indicate a substantial increase in EHR adoption among hospitals in the past year and especially since 2008. Notably, the increase in adoption over the past two years (2010 to 2012) is substantially larger than the increase from the previous two years (2008 to 2010). The timing of this sharp increase in the rate of adoption by hospitals at the beginning of the EHR Incentive Program payments suggests that the HITECH Incentive Programs are spurring hospital adoption of more comprehensive EHR systems. The increase among physicians was not as large; however, adoption of key functions necessary for meeting meaningful use has increased and routine use of MU functionalities was high.

For hospitals, the progress made since 2008 is encouraging, however these results also suggest important challenges for EHR adoption. More than half of hospitals could not meet the proxy for stage 1 MU, despite stage 2 criteria being finalized. Although adoption has picked up, some hospitals are not progressing to meet MU objectives as quickly. Furthermore, only a small proportion of hospitals could meet our lenient proxy for MU stage 2 objectives. A substantial proportion of hospitals are close to implementing the functions required by MU stage 2; however, nearly one in three hospitals have 10 or fewer of the necessary EHR functionalities. These hospitals have many more functions to implement prior to meeting the MU stage 2 objectives. The functions that appear to be barriers for MU stage 2 suggest that the most difficult requirements to implement require health information exchange.

We see a similar story for physicians. While adoption of a basic EHR continues to grow, although not as rapidly as growth among hospitals, the NAMCS survey highlights important groups where disparities in EHR adoption persist. Small practices continue to lag behind; suggesting continued efforts will be needed to ensure that this group of providers, and the patients they serve, do not fall further behind. Likewise, hospitals that are slower in EHR implementation will likely require targeted efforts and a special focus to increase the adoption of EHR functions. Furthermore, close monitoring of how hospitals are adopting the functions that are currently barriers to meeting MU stage 2 need to be tracked, given that many hospitals require a substantial amount of implementation to meet these MU objectives. These findings suggest that to reach the policy goals

outlined in HITECH, further effort is required to achieve a nationwide health information infrastructure.

Finally, physicians and hospitals alike appear to be adopting EHRs with more sophisticated capabilities that enable improvements in the delivery of care and management of patient populations. However, at least among some physicians, there is evidence that such systems are not easy to use. This suggests an important area for further research. Poor implementation, lack of training, the need to upgrade systems, and complicated procedures (e.g., navigating through multiple screens) can all affect providers' perceptions and use of such systems. As the systems become more widespread, research on the usability and optimal implementation could provide important insights into methods for helping providers move beyond using electronic health records as replacements for paper records to accessing the full potential of these tools.

Exhibit 1: **Percentage of EHR Adoption, by Physician Characteristics, 2010 and 2012**

	Basic EHR adoption rate (adjusted percentage) ^a		Change in basic EHR adoption rate	
	2010	2012 ^b	Absolute change (percentage point)	Relative change (percentage)
All	25.8	38.2	12.4	48.1
Specialty				
Primary care	29.8	42.5	12.7	42.8
Nonprimary care specialty	22.0**	34.0**	12.1	55.0
Age				
Under 45	29.5	40.0	10.5	35.6
45–54 years	26.4	41.3	14.9	56.4
55–64 years	25.1	35.4	10.3	41.1
65 years and over	16.5**	33.3	16.8	101.8
Practice size (number of physicians)				
Solo	11.3	25.6	14.3	127.2
2–5	26.0**	36.6**	10.6	40.6
6–10	29.7**	44.0**	14.3	48.1
11+	45.0**	57.7**	12.6	28.1
Practice ownership				
Physician/physician group	23.5	34.3	10.8	45.9
Hospital/academic medical center	28.4	47.5**	19.1^	67.3
HMO/other health care organization	39.8**	58.4**	18.6	46.8
Community health center	13.5**	32.3	18.8	139.6
Other/unknown	28.6	31.2	2.7	9.4
Region				
Northeast	25.5	41.7	16.2	63.6
Midwest	24.7	39.2	14.5	58.6
South	24.2	36.2	12.0	49.8
West	29.7	36.9	7.3	24.5
Metropolitan status				
Large central	23.4	36.0	12.6	54.0
Large fringe	26.0	35.8	9.8	37.8
Medium	25.0	39.7	14.7	58.8

Exhibit 1: **Percentage of EHR Adoption, by Physician Characteristics, 2010 and 2012 (continued)**

	Basic EHR adoption rate (adjusted percentage) ^a		Change in basic EHR adoption rate	
	2010	2012 ^b	Absolute change (percentage point)	Relative change (percentage)
Small or non-metropolitan	30.8**	43.5**	12.7	41.1
County poverty status				
15% or more of population in poverty	24.9	39.8	15.0	60.2
Less than 15% of population in poverty	26.4	37.2	10.8	41.0

Source: Hsaio C, Jha AK, King J, et al. "Adoption and Routine Use of Electronic Health Records Among U.S. Office Based Physicians." *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org.

Notes:

N=9,211.

** Significantly different from reference category at $p < 0.01$ (0.05). Reference category is the first listed category for each characteristic.

^ Absolute change between 2010 and 2012 was significantly different than change for reference category at $p < 0.05$.

a Basic EHR adoption rates are adjusted percentages based on multivariate logistic regression, including all characteristics listed.

b Basic EHR adoption rate in 2012 was significantly different than 2010 at $p < 0.05$ for each subgroup examined except other/unknown practice ownership.

Exhibit 2: **Adoption and Routine Use of Computerized Capabilities Related to Meaningful Use Stage 1 Core Objectives and Basic EHR Functionalities, 2012**

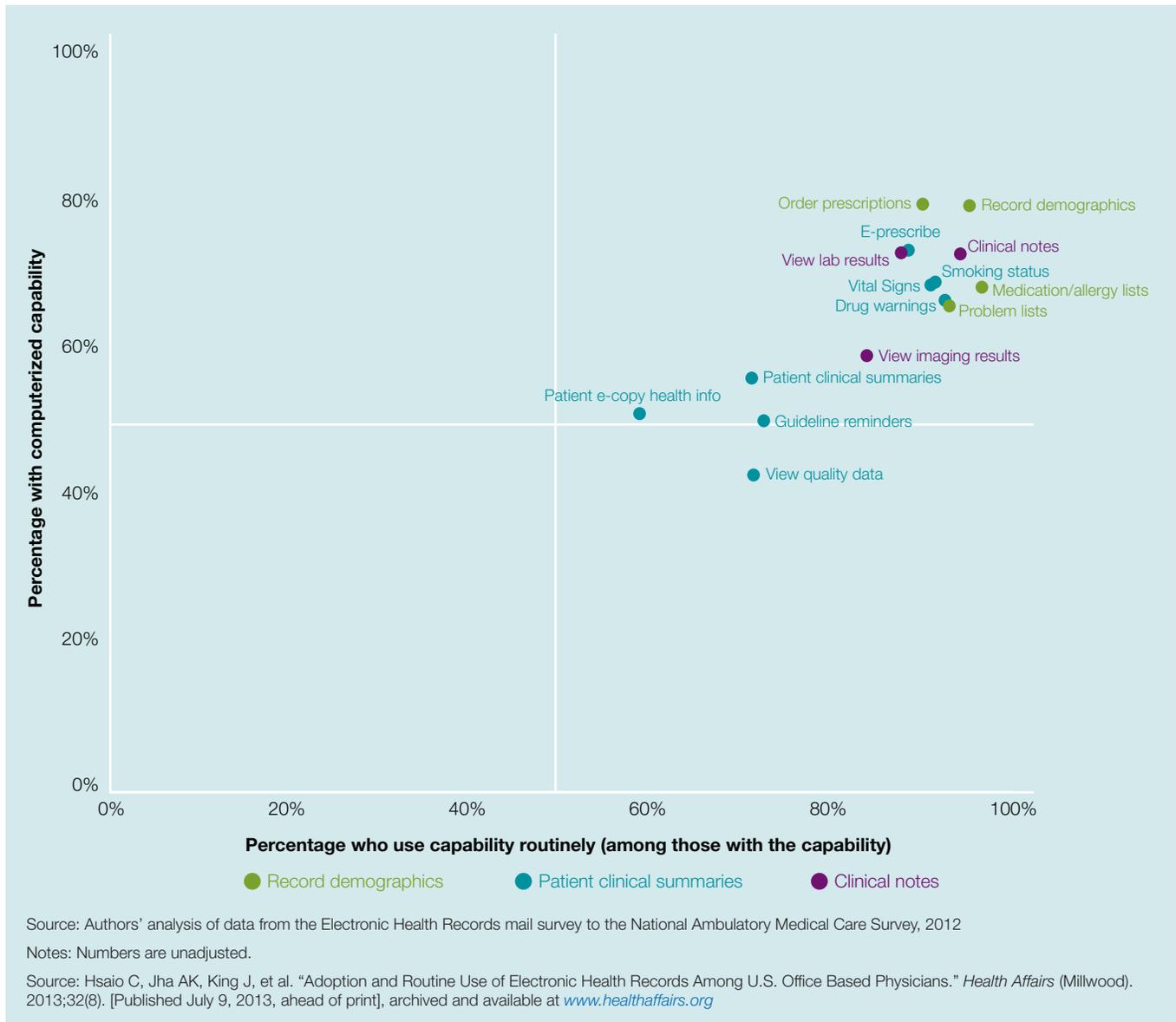


Exhibit 3: **Percentage of Ease of Use of Panel Management Tasks Among Physicians With Computerized Systems**

	Practice has a computerized system	With this system, how easy or difficult is it to do the following?*			
	Total n (%)	Easy	Somewhat difficult	Difficult or cannot generate	Do not know or not applicable
Generate list of patients by diagnosis	808 (44.4)	60.9	25.8	11.8	1.4
Generate list of patients by lab result	571 (31.4)	43.8	29.7	24.7	1.7
Generate a list of patients who are overdue for tests or preventive care or have missed appointments	621 (34.1)	50.9	27.1	20.7	1.2
Generate reports on quality of care measures	571 (31.4)	51.4	29.1	18.1	1.4
List patients' race, ethnicity, or preferred language	617 (33.9)	54.6	24.9	15.6	2.1
Provide patients with an after-visit summary	606 (33.3)	75.7	13.8	9.0	1.5
Track referral completion	520 (28.6)	48.2	29.6	20.5	1.8
Send patients reminders for preventive or follow-up care	576 (31.6)	59.6	22.7	16.5	1.2

*N is equal to the number of physicians reporting a computerized system for the panel management task.

Source: Hsaio C, Jha AK, King J, et al. "Adoption and Routine Use of Electronic Health Records Among U.S. Office Based Physicians." *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org.

Exhibit 4: **Hospital Adoption of Electronic Health Records, 2008–2012**

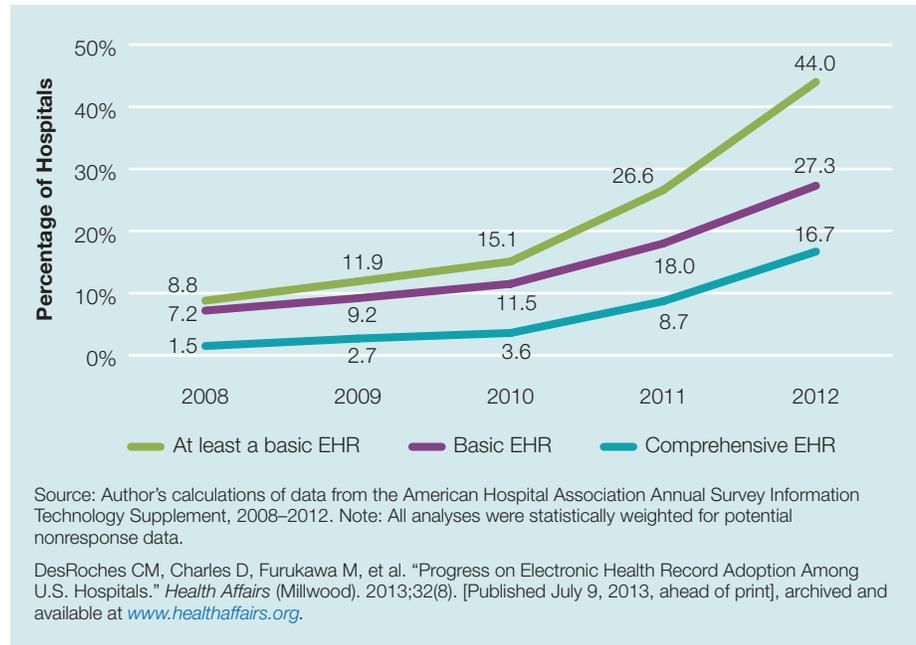


Exhibit 5: **Percentage of Relative Change in EHR Adoption, 2008–2012**

	Hospital has at least a basic EHR					Relative Change 2010–2012
	2008	2009	2010	2011	2012	
Size						
Small	6.1	8.3	10.7	20.8	38.3	257.1%
Medium	9.8	13.0	17.8	29.8	46.5	161.1%
Large	18.5	24.1	25.7	43.0	61.9	140.8%
Region						
Northeast	10.0	12.2	16.1	26.9	44.4	176.2%
Midwest	8.3	11.6	16.5	29.7	49.2	197.8%
South	8.7	10.0	12.4	24.8	38.7	212.6%
West	8.9	15.7	18.0	25.1	46.2	157.1%
Profit status						
For-profit	6.5	8.1	7.8	16.7	29.8	282.1%
Private nonprofit	9.9	13.9	17.6	31.0	49.6	181.3%
Public	7.5	9.2	13.7	23.2	39.0	185.0%
Teaching status						
Major	21.1	31.6	40.9	55.1	68.6	67.9%
Minor	13.0	15.0	18.2	33.9	50.8	179.1%
Not Teaching	6.9	9.6	12.4	22.7	40.4	225.0%
Location						
Rural	4.6	7.9	9.8	19.4	33.5	240.6%
Urban	10.3	15.0	17.0	29.1	47.7	180.1%

Source: DesRoches CM, Charles D, Furukawa M, et al. "Progress on Electronic Health Record Adoption Among U.S. Hospitals." *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org Note: All analyses were statistically weighted for potential nonresponse bias.

Exhibit 6: **Percentage of Hospitals Meeting Proxy Measure of Stage 1 Meaningful Use, by Hospital Characteristics***

Hospital Characteristic	No Meaningful Use	Meaningful Use	P-value
	(N=1,573)	(N=1,223)	
All hospitals (weighted)	57.80	42.20	
Size			
Small	63.60	36.40	0.000
Medium	55.20	44.80	
Large	39.60	60.40	
Region			
Northeast	51.50	48.50	0.018
Midwest	56.10	43.90	
South	59.70	40.30	
West	60.80	39.20	
Ownership			
For-profit	71.80	28.20	0.000
Private nonprofit	52.10	47.90	
Public	63.20	36.80	
Teaching			
Major	36.60	63.40	0.000
Minor	48.80	51.20	
Not teaching	61.60	38.40	
Location			
Rural	67.90	32.10	0.000
Urban	54.30	45.70	

* The meaningful use proxy variable includes all 14 of the stage 1 core criteria.

Source: DesRoches CM, Charles D, Furukawa M, et al. "Progress on Electronic Health Record Adoption Among U.S. Hospitals." *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org

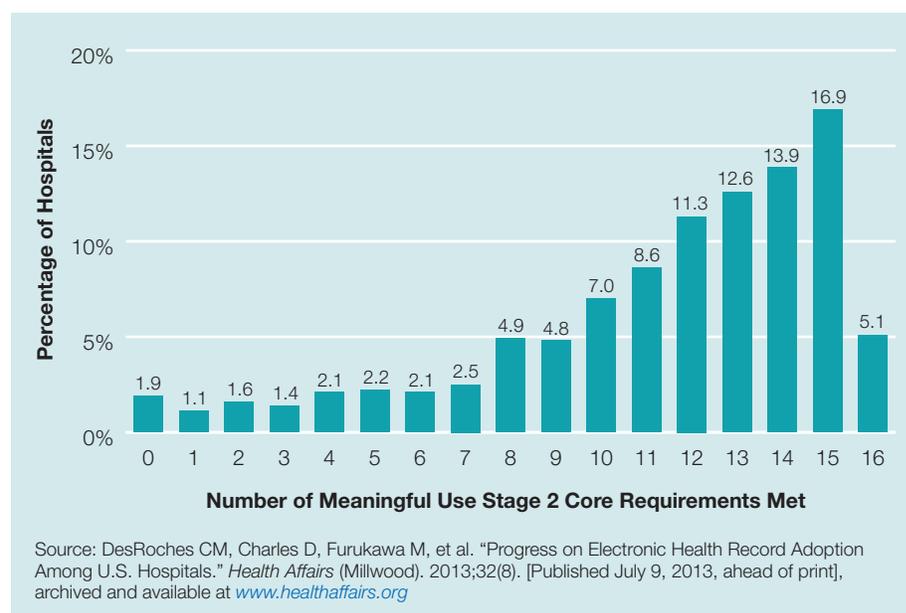
Exhibit 7: Percentage of U.S. Hospitals Meeting Stage 2 Meaningful Use Requirements

Exhibit 8: **Percentage of Hospitals With Full Implementation in at Least One Unit**

	All Hospitals	Number of Meaningful Use Stage 2 Core Requirements Met*			
		0–5	6–10	11–15	16
Percentage of Hospitals		10.20	21.30	63.30	5.10
CPOE for Medication, Lab, and Radiology Orders	69.50	7.90	50.70	83.30	100.00
Patient Demographics	84.40	26.90	75.40	95.40	100.00
Vital Signs	92.10	38.30	93.70	99.60	100.00
Smoking Status	92.30	38.10	94.10	99.80	100.00
Clinical Decision Support for High-Priority Health Conditions	62.60	1.90	26.20	81.70	100.00
Patients View Online, Download, and Transmit Info	13.30	0.80	3.10	11.70	100.00
Protect Electronic Health Information	81.70	15.60	67.00	95.90	100.00
Incorporate Lab Test as Structured Data	88.90	35.20	85.40	97.90	100.00
Generate Patient Lists by Specific Conditions	88.90	39.00	83.50	97.90	100.00
Patient-Specific Education Resources	82.70	18.50	70.90	95.60	100.00
Medication Reconciliation	75.90	7.20	52.50	93.00	100.00
Provides Summary Care Record for Transitions	43.50	0.40	10.30	57.10	100.00
Submit Data to Immunization Registries	63.00	7.10	25.60	81.70	100.00
Submit Lab Reports to Public Health Agencies	57.00	6.80	23.80	72.90	100.00
Submit Syndromic Data to Public Health Agencies	54.60	6.00	21.10	70.00	100.00
Track Medications eMAR**	84.50	23.10	73.50	96.80	100.00

*The stage 2 meaningful use proxy variable includes all 16 of the stage 2 core criteria.

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

Source: DesRoches CM, Charles D, Furukawa M, et al. "Progress on Electronic Health Record Adoption Among U.S. Hospitals." *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org

Endnote and References

1. The content of this chapter has been excerpted from the following articles: Hsaio C, Jha AK, King J, et al. “Adoption and Routine Use of Electronic Health Records Among U.S. Office Based Physicians.” *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org.
2. DesRoches CM, Charles D, Furukawa M, et al. “Progress on Electronic Health Record Adoption Among U.S. Hospitals.” *Health Affairs* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org.
3. DesRoches CM, Audet AM, Painter MP, et al. “Meeting Meaningful Use and Managing Patient Populations: Findings From a National Survey of Practicing Physicians.” *Annals of Internal Medicine*. 2013;158(11), archived and available at www.annals.org.

Chapter 2: Mitigating Disparities in Electronic Health Record Adoption

Vanessa Oddo, MPH; Samantha Stalley, MHA; and Catherine DesRoches, DrPH

It is widely believed that health information technology has the potential to help health professionals improve the safety, efficiency, and effectiveness of care. The 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act authorized nearly \$30 billion to increase adoption and contained provisions to ensure that rural communities, the uninsured, and medically underserved populations benefit from these technologies. These include incentives through state Medicaid programs for eligible providers and hospitals to adopt, implement, and upgrade their EHR systems prior to attesting to meaningful use. Further, Regional Extension Centers (RECs), funded under HITECH to assist eligible providers and hospitals with EHR adoption, are required to prioritize assistance for individual and small practices, practices lacking resources to implement and maintain EHRs, and those providing primary care services in public and critical access hospitals, community health centers, and other settings that mostly serve those who lack adequate coverage or medical care. Tracking the effect of these investments is critically important to ensuring that all Americans can receive the benefits of electronic health records, no matter where they receive care.

In our inaugural report in 2006¹ *Health Information Technology in the United States: The Information Base for Progress*, we reviewed the state of knowledge regarding EHR adoption among providers caring for underserved populations. In this chapter, we return to this issue and review the most recent data on adoption of EHRs among hospitals caring for vulnerable populations and present results from a series of case studies focused on the implementation of the meaningful use incentive program in state Medicaid programs.

Rates of EHR Adoption Among Small, Rural Hospitals and Those Caring for Vulnerable Populations

As discussed in Chapter 1, the most recent survey data on EHR adoption among hospitals in the United States suggests a substantial increase in the pace at which these institutions are adopting and implementing these technologies.² Earlier data suggested that the increases in adoption seen during the first year of the HITECH incentive program were concentrated among larger, urban, and teaching hospitals, with smaller, rural hospitals falling further behind.³ Provisions of the HITECH Act were structured to help mitigate this emerging problem and tracking progress in solving the “digital divide” continues to be a policy priority.⁴

A recent study in *Health Affairs*, using data from the 2012 American Hospital Association’s Annual Survey Information Technology Supplement suggests reasons to be optimistic that the provisions of the HITECH Act—designed to ensure that the gap between hospitals with sufficient resources to adopt and those without does not widen—are working as intended.⁵ For example, while rural hospitals were still less likely than urban hospitals to have a basic EHR, they appear to be making progress in narrowing that gap. Between 2010 and 2012, the proportion of rural hospitals with at least a basic EHR increased from 9.8 percent to 33.5 percent, for a relative change of 257 percent. The corresponding relative change among urban hospitals was 180 percent (percentage of urban hospitals with at least a basic

EHR increased from 17.0% in 2010 to 47.7% in 2012). We see similar trends when comparing teaching to nonteaching and large to small hospitals.

In addition to examining EHR adoption by hospital size and location, we also assessed the rate of adoption among hospitals that care for primarily poor patients. There are no national data on the proportion of patients served by a given hospital who are poor. Therefore, we used a hospital's Medicare disproportionate share hospital (DSH) index as a proxy measure.⁶ Each hospital is assigned an index by the Centers for Medicare and Medicaid Services (CMS) based on a combination of its fraction of elderly Medicare patients eligible for Supplemental Security Income (SSI) and its fraction of nonelderly patients with Medicaid coverage. The CMS uses this formula to identify hospitals eligible for additional Medicare payments for caring for the poor. We used the 2011 Impact File compiled by CMS to obtain each organization's DSH index. A higher disproportionate share index score indicates that a hospital provides care for a higher proportion of poor patients.

Rates of EHR adoption were fairly uniform across disproportionate share index quartiles. On average, after adjusting for hospital size, region of the country, profit status, and location (urban vs. rural), there was a 5 percentage point difference between rates of adoption of at least a basic EHR between the lowest disproportionate share index hospitals (51.3%) and the highest (46.5%). As shown in Exhibit 9A, there has been substantial progress on EHR adoption across hospitals since 2008, the first year in which the AHA systematically assessed the rate of adoption. The rate of adoption of at least a basic electronic health record by the lowest disproportionate share hospitals increased from 11.5 percent to 51.3 percent, an increase of approximately 40 percentage points or a 345 percent relative increase. Similarly, the rate of adoption among hospitals in the highest DSH quartile grew from 9.7 percent to 46.5 percent, for a relative increase of 378 percent.

Medicaid EHR Incentive Program Background

The Medicaid Electronic Health Record (EHR) Incentive Program was adopted under the Health Information Technology for Economic and Clinical Health (HITECH) Act in 2009. Each state's Medicaid agency voluntarily administers the Medicaid EHR Incentive Program for eligible professionals and hospitals in their state. Providers who serve a certain proportion of Medicaid patients are eligible for the Medicaid EHR Incentive Program.

In the first year of program participation, eligible professionals and hospitals can qualify for payments by adopting, implementing, or upgrading (A/I/U) to certified EHR technology. Beyond the first year, providers must demonstrate meaningful use of their EHR technology through meeting a certain number of core objectives, choosing from a menu of other objectives, and producing certain clinical quality measures outlined by the Centers for Medicare & Medicaid (CMS). Eligible professionals and hospitals have different objectives to meet within this structure. While eligible professionals can receive up to \$63,750 over six years of participation, state Medicaid agencies determine how hospital incentives are paid throughout the length of the program.

In the following section, we review implementation of the Medicaid EHR Incentive Program in six states: Alaska, Colorado, Delaware, Massachusetts, New York, and Texas. In particular, we discuss the states' experiences regarding: (1) overall program progress; (2) payment distribution; and (3) the utilization of resources as states begin paying meaningful use incentive payments to eligible professionals and hospitals.

Qualitative data collection and analysis offer an opportunity to provide a rich description of the context in which the states operate and to explore commonalities and differences across the states' programs. Data sources include in-depth interviews with Medicaid staff and website review. We conducted half-hour interviews with each state between January and February 2013. We used semi-structured interview guides to indicate the type of information to collect, while allowing for flexibility across states in terms of respondent-specific questions asked. We synthesized the qualitative data using a semi-structured template organized by topic. Although the results reported cannot necessarily be generalized, these case studies provide a realistic characterization of how Medicaid EHR Incentive Programs are affecting the adoption of EHRs at the state level.

Program Planning and Implementation

Our analysis has identified three key features shared by the states regarding their program planning and implementation, including: (1) the utilization of partner organizations or stakeholders; (2) their recruitment strategies; (3) the types of eligible providers recruited thus far.

All of the states interviewed collaborate with partner organizations and stakeholders to plan and implement their program. States communicated the importance of these partnerships as they allowed states to leverage resources. In particular, states noted their partnerships with Regional Extension Centers; Colorado serves as an illustrative example of this planning and implementation strategy. The Colorado REC is supported by six partner organizations, which are located statewide. Partner organizations include the Primary Care Physicians Association, the Federally Qualified Health Center association, and the Rural Health Association, among others. In Colorado, REC staff helped Colorado Medicaid develop their state plan and ensured that they had broad stakeholder input throughout the planning process. Colorado also reported that they actively collaborated with other states. Similarly, states indicated that interagency collaboration was an important aspect of their planning and implementation process. Notably, Delaware formed a steering committee to facilitate the planning and implementation of their EHR program, which includes representatives from the state health information technology (HIT) department, the program integrity unit, and the policy unit, among others. In addition, New York made a concerted effort to promote the program for both Medicaid and Medicare in order to integrate resources. They have had ongoing biweekly calls among the various stakeholder agencies to discuss ways in which they can improve the distribution of dollars and reduce barriers for providers.

Largely, states have similar recruitment strategies, relying on established organizations to recruit providers. Often, states present at various organizational meetings, with nearly all states noting that they are working with hospital associations. Several states rely on the RECs to recruit providers. For example, Texas utilizes the RECs to recruit selected clinician subspecialties, including those providing care for patient chronic diseases and heart disease.

Several states reported that it has been easier to recruit hospitals, as compared to eligible professionals. In particular, Colorado and Massachusetts reported a slower uptake among eligible professionals. New York has recruited more hospital-based practitioner groups as compared to smaller practices. Several factors may contribute to a slower uptake among eligible professionals including: (1) awareness of the EHR incentive program and (2) the difficulty in transitioning to HIT. States believe that awareness is not a barrier among hospitals, while it may be for

professionals. Hospitals may be more aware of the program as many hospitals have already attested through the Medicare EHR. Eligible professionals must choose whether to participate in the Medicare or Medicaid EHR Incentive Program. Unlike hospitals, they are only able to participate in one of these programs. Although anecdotal, states believe that the transition to HIT represents a culture shift for many eligible providers. There is some confusion regarding the definition of meaningful use and not every provider knows how to use the technology. For example, Alaska reported that the anticipated change in business process is not well received by providers; some providers reported they would rather retire than move to an electronic system. Massachusetts heard from providers that many are still unsure how to incorporate HIT into their practice. Further, Texas noted that providers have shown some confusion regarding the standards for meaningful use stage 2 and are hesitant to implement systems until the criteria are more defined; some providers are “holding-back to wait and see” rather than be early innovators.

Program Participation and Payments

Eligible providers began receiving Medicaid EHR Incentive Program payments in January 2011 in states that had implemented the incentive program. Through February 28, 2013, nearly 80,000 eligible professionals and 3,000 hospitals received payments through adoption, implementation, or upgrade (A/I/U) of EHR technology (Exhibit 10). These providers received more than a combined \$4.2 billion in just over two years of the program. Fewer eligible professionals (8,187) and hospitals (1,197) have attested to meaningful use stage 1, receiving payments totaling more than \$820 million (Exhibit 10). As states continue to implement and expand their incentive programs, the number of eligible professionals and hospitals receiving payments for both A/I/U and meaningful use is expected to continue to increase.

Eligible providers in all of the six states we interviewed (Alaska, Colorado, Delaware, Massachusetts, New York, and Texas) received payments for both A/I/U and meaningful use through February 2013. As shown in Exhibit 10, most hospitals receiving incentive payments in these states participate in both the Medicare and Medicaid EHR Incentive Programs for A/I/U (504) and meaningful use (182). Few hospitals participate in only the Medicaid EHR Incentive Program for A/I/U (16) and meaningful use (6). Eligible professionals are moving to stage 1 meaningful use at a slower pace as compared to hospitals. Of those who have attested to A/I/U nationally, 36 percent of hospitals have attested to stage 1 meaningful use, as compared to 10 percent of eligible professionals.⁷ Notably, Massachusetts was the only state we interviewed where the same number of hospitals received payments for A/I/U as for meaningful use stage 1, while fewer than half received incentives for meaningful use as A/I/U in the other states we interviewed. Unlike the other states we interviewed, Colorado has yet to pay incentives to eligible professionals for meaningful use, despite paying incentives to more than 1,000 eligible professionals for A/I/U. This is likely due to the fact that states have the option to participate and when to implement the program. Colorado adopted the program later than the other states we interviewed.⁸

All states believe that the payments are going toward providers that treat vulnerable populations. In addition, they believe that most hospitals and providers are using the payments to upgrade their technology (that is, upgrading from a noncertified EHR to a certified EHR). It is also possible that some safety-net and/or critical access hospitals are relying on A/I/U payments to help them stay within budget and retain staff that they might have had to otherwise let go.

Utilization of Resources

All of the states view the RECs as valuable resources, whereby staff are accustomed to providing one-on-one assistance. States rely on the REC staff to be their on-the-ground liaison with providers, as many indicated they do not interact with providers directly. Delaware and New York are illustrative examples of how states utilize the resources available. The Delaware REC assists providers with the decision-making process regarding system components, trouble-shooting technological issues, and meeting system requirements for meaningful use. New York's REC staff has been instrumental in doing on-the-ground outreach with eligible providers, which is facilitated by Medicaid supporting the RECs with data and being available to answer questions. Their REC staff assists with adoption support, providing one-on-one technical assistance, and conducting outreach to providers.

Challenges and Successes

The states interviewed identified two primary barriers to implementing the EHR incentive program: (1) the availability of resources and (2) adapting to CMS guidance. States reported that they are constantly assessing and prioritizing resources. For example, during the beginning of the program implementation, providers were transitioning to 5010 claims format, and now providers are preparing to update to ICD-10 coding. Alaska noted that the program was cost prohibitive, given their limited resources; the software and hardware costs, along with staff time to implement the changes is not always covered by the incentive payment. Similarly, Colorado's primary challenge was their limited amount of resources. Colorado noted that the EHR program has been politically sensitive because of budget restraints and their overall financial condition.

States continue to adapt and refine their program as they are required to operate the program both within their distinct state political and fiscal environments, as well as within the federal environment. But states noted the challenges in doing so. For example, the iterative process and procedural changes from CMS has made it difficult for Alaska to plan and implement. Delaware and Massachusetts reported some concerns regarding timing. After CMS publishes the final rules, states have limited time to: (1) implement the rules and (2) disseminate the information to hospitals and providers. Ideally, they would like to give providers a full year to implement updated meaningful use criteria and have adequate time to update their information technology systems. Subsequently, Delaware noted they did not have any meaningful use applications in quarter 1 and cited timeliness as the driving factor. In addition, Texas reported that more information on program specifics would be helpful, particularly regarding transitioning from stage 1 to stage 2 meaningful use.

Two additional barriers were identified by Colorado and New York, including: (1) verification of patient volume; and (2) identification of Medicaid patients, which drives the former. Colorado reported that many providers registered for the program, but found it challenging and even prohibitive to verify patient volume. Similarly, New York initially faced challenges with regard to the Medicaid Patient Volume requirement validation. New York chose an additional Medicaid patient volume methodology, which allows providers to attest based on their patient panel. The various methodologies and limitations in Medicaid and provider data have made it challenging to validate the providers' attestation regarding patient volume. In New York and Texas, providers had issues identifying who their Medicaid patients were. The EHR incentive program does not necessarily

align with past programs or policies that are in place which make it difficult to identify Medicaid Managed Care (MMC) versus private Managed Care patients. Thus, providers were not aware which patients were MMC and the EHR program requires that they be correctly identified.

Despite challenges, many states reported successful collaboration, both internally and externally. In addition to the aforementioned interagency and stakeholder collaboration, Massachusetts highlighted the external partnerships that have enabled the program to work effectively. In particular, they reported that CMS and the Office of the National Coordinator for Health Information Technology (ONC) have been extraordinary partners. CMS provides very timely feedback and they described their working relationship as “extremely easy.” They also reported that CMS is supportive, reactive, prompt, and very generous with funding.

Colorado

Colorado had not yet opened up attestation for stage 1 meaningful use at the time of our interview. In 2012, Colorado paid 741 eligible professionals (EPs) and 32 hospitals for a total of \$36,827,558. As of early January, hospital participation has risen significantly. Colorado estimated they will have made 1,400 A/I/U payments in 2012 and projections suggest they will have made 1,200 A/I/U payments by the end of February 2013. Only nine hospitals received meaningful use payments in 2012; all of these hospitals were dually eligible for the Medicare and Medicaid Incentive Programs and had already met the meaningful use criteria for the Medicare Incentive Program.

Initially, it was difficult for Colorado to obtain the resources that were needed to plan and implement their program. In particular, the EHR Incentive Program began when states were facing considerable financial stress (for example, Colorado was in a hiring freeze). Although they received sufficient funding from CMS to adequately staff their program, they were not allocated full-time staff (FTEs). Subsequently, the program was implemented through borrowed staff time for the first two years of the program. Recently, Colorado has developed a team around the program and has several half-time staff to handle day-to-day operations.

Despite their resource constraints, Colorado has leveraged resources exceptionally well. Colorado relied (and continues to rely) heavily on their REC for stakeholder recruitment and support. Their REC is supported by six partner organizations which are located statewide. The REC helped Colorado develop their state plan and ensured that they had broad stakeholder input throughout the planning process. Colorado also collaborates with large hospital organizations to recruit providers and believes that their grassroots outreach strategy has been very effective, perhaps even more so than an outreach effort spearheaded by the state. In addition, Colorado chose ASC/XEROX as their fiscal agent and leveraged that connection and their work with other states in order to get their portal up and running. They continue to communicate with other states, participating in biweekly state-users calls.

Staff believes that Colorado providers are largely using the incentive payments to upgrade their technology, though there are some providers acquiring new technology because of availability of the incentive program. Although anecdotally reported, Colorado has heard that some safety-net and critical access hospitals are relying on A/I/U payments to help them retain staff and stay within budget.

Massachusetts

Massachusetts launched their EHR Incentive Program in October 2011 and has been issuing payments for the last one and a half years. Currently, they are moving into meaningful use stage 2. As of January 2013, approximately 4,500 EPs and 68 hospitals have enrolled in the program; of 74 acute hospitals in Massachusetts, 62 are participating in the program. Four children's hospitals have also attested. Incentive payments for A/I/U were distributed to 54 hospitals and 3,026 EPs. Massachusetts hospitals are making progress transitioning to meaningful use, however, providers are slower-paced in terms of moving to stage 1 meaningful use. MassHealth has heard from providers that they have competing priorities.

The Massachusetts EHR program is facilitated by extensive interagency involvement. The structure is such that MassHealth oversees the EHR program and contracts with the Massachusetts eHealth institute (MeHI), which facilitates the majority of the operational functions. MassHealth serves as the liaison with CMS regarding policy guidance, while MeHI is responsible for helping providers adopt health information technology (HIT). MeHI receives applications from providers and serves as the on-the-ground liaison, talking with providers and building those relationships in order to assist providers along the continuum. Currently, Massachusetts uses provider and claims files from MassHealth in order to identify eligible providers. Subsequently, they work closely with various stakeholders (for example, the Massachusetts Medical Society and Massachusetts Medical Association) to formally recruit hospitals and providers.

Massachusetts noted that the Medicaid dollars they have received have catalyzed the implementation (and success) of this program. Further, they reported that CMS and ONC have been extraordinary partners. They are very dedicated to the program (and HIT, more generally) and are attempting to look at this program in a comprehensive manner. In particular, the state legislature set aside funding for education to help providers meet a new requirement for licensure. In Massachusetts, physicians wanting to renew their license will need to demonstrate stage 1 meaningful use by 2015. By 2017, providers must be using EHR and connected to the Massachusetts health information exchange.

Conclusions

Data on the state of EHR adoption among hospitals caring for vulnerable or underserved populations offer several reasons for optimism. The state of adoption among rural hospitals is particularly worth highlighting, with one in eight such institutions moving from having less than a basic EHR to a basic EHR in just 2012 alone. By the end of 2012, 33.5 percent of rural hospitals had at least a basic EHR, remarkable progress from 2008, when just 4.6 percent of rural hospitals met these criteria. Further, the rate of EHR adoption among rural hospitals increased faster than among urban institutions. The data on Medicare disproportionate-share hospitals (DSH) hospitals is also encouraging with considerable growth in EHR adoption apparent among all DSH hospitals. This rapid increase suggests that the HITECH incentives are likely spurring adoption. However, despite substantial progress, there is still considerable work to be done. As discussed in Chapter 1, the nation is still not close to the goal of universal adoption, and despite making considerable progress, institutions serving the vulnerable and underserved continue to lag behind. Further, the variable experiences of the states in implementing their Medicaid meaningful use incentive programs suggests that maintaining this progress for Medicaid hospitals and clinicians may be a challenge as states continue to grapple with tightening budgets. Overall, our findings indicate the need for continued efforts to ensure that these providers and institutions do not fall behind in order to ensure that all Americans can reap the benefits that the increased use of EHRs has the potential to offer, including more efficient, higher-quality care.

Exhibit 9A: **Percentage of Relative Change in EHR Adoption Among U.S. Hospitals**

	Hospital has at least a basic EHR					Relative Change 2010–2012
	2008	2009	2010	2011	2012	
Size						
Small	6.1	8.3	10.7	20.8	38.3	257.1%
Medium	9.8	13.0	17.8	29.8	46.5	161.1%
Large	18.5	24.1	25.7	43.0	61.9	140.8%
Region						
Northeast	10.0	12.2	16.1	26.9	44.4	176.2%
Midwest	8.3	11.6	16.5	29.7	49.2	197.8%
South	8.7	10.0	12.4	24.8	38.7	212.6%
West	8.9	15.7	18.0	25.1	46.2	157.1%
Profit status						
For-profit	6.5	8.1	7.8	16.7	29.8	282.1%
Private nonprofit	9.9	13.9	17.6	31.0	49.6	181.3%
Public	7.5	9.2	13.7	23.2	39.0	185.0%
Teaching status						
Major	21.1	31.6	40.9	55.1	68.6	67.9%
Minor	13.0	15.0	18.2	33.9	50.8	179.1%
Not Teaching	6.9	9.6	12.4	22.7	40.4	225.0%
Location						
Rural	4.6	7.9	9.8	19.4	33.5	240.6%
Urban	10.3	15.0	17.0	29.1	47.7	180.1%

Source: DesRoches CM, Charles D, Furukawa M, et al. "Progress on Electronic Health Record Adoption Among U.S. Hospitals." *Health Aff* (Millwood). 2013;32(8). [Published July 9, 2013, ahead of print], archived and available at www.healthaffairs.org.

Exhibit 9B: **Adoption of at Least a Basic EHR by Disproportionate Share Hospitals**

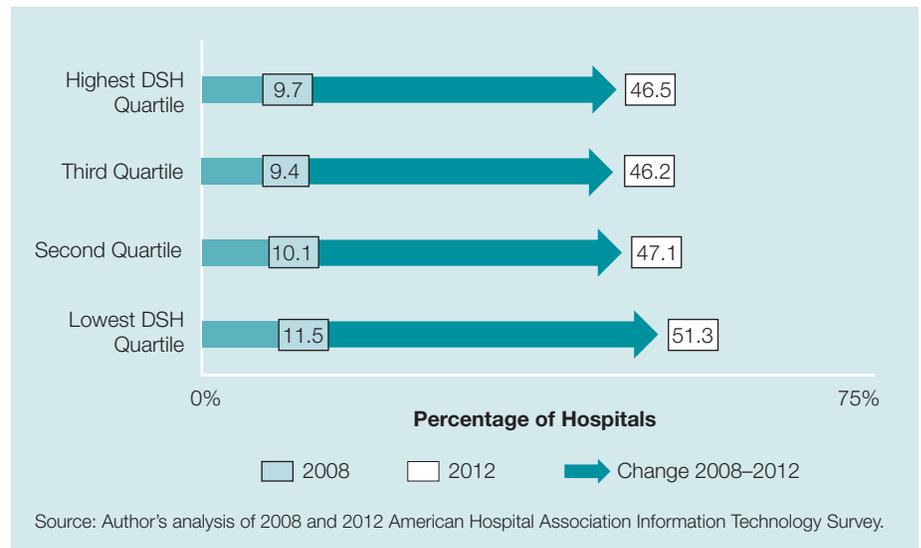


Exhibit 10: Medicaid EHR Incentive Program Participants Receiving Payments and Payment Amounts Through February 2013

	A/U		Meaningful Use	
	Providers (n)	Payment (\$)	Providers (n)	Payment (\$)
National				
Eligible Professionals	79,442	1,669,144,123	8,187	69,773,429
Hospitals - All	2,987	2,532,003,305	1,197	750,230,530
Alaska				
Eligible Professionals	323	6,821,252	41	348,500
Hospitals - Medicaid Only	0	—	0	—
Hospitals - Medicare/Medicaid	18	12,652,001	4	2,259,886
Colorado				
Eligible Professionals	1,105	23,396,254	0	—
Hospitals - Medicaid Only	1	2,616,739	0	—
Hospitals - Medicare/Medicaid	31	18,927,133	10	7,032,390
Delaware				
Eligible Professionals	436	9,243,751	78	663,000
Hospitals - Medicaid Only	1	2,135,845	1	1,708,676
Hospitals - Medicare/Medicaid	6	5,555,694	1	807,034
Massachusetts				
Eligible Professionals	3,195	66,980,043	337	2,810,673
Hospitals - Medicaid Only	1	2,299,789	0	—
Hospitals - Medicare/Medicaid	35	34,509,447	35	28,334,705
New York				
Eligible Professionals	4,697	98,642,555	56	476,000
Hospitals - Medicaid Only	3	4,959,085	1	1,470,366
Hospitals - Medicare/Medicaid	146	192,661,913	12	12,492,808
Texas				
Eligible Professionals	5,493	115,111,316	990	8,358,340
Hospitals - Medicaid Only	10	23,524,758	4	10,045,980
Hospitals - Medicare/Medicaid	268	236,194,608	120	94,366,736

Source: CMS EHR Incentive Program Payment Data: February 2013 Payments by Program and by Providers

Notes: National results include all hospitals receiving payment for the Medicaid EHR Incentive Program. Individual state results separate hospitals by those participating in both the Medicare and Medicaid EHR Incentive Programs and those participating in only the Medicaid EHR Incentive Program.

Endnotes

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7. Through February 2013.
8. CMS approved Colorado’s State Medicaid HIT Plan in October 2011. Medicaid provider registration began on March 5, 2012 and incentive payments began in May 2012. Other states began distributing incentive payments as follows: Alaska (April 2011), Delaware (December 2011), Massachusetts (December 2011), New York (December 2011), and Texas (May 2011).

Chapter 3. International Comparisons: Benchmarking HIT Adoption and Cross-Country Learning

Julia Adler-Milstein, PhD; Laura Winn, MA; and Ashish K. Jha, MD, MPH

Introduction

The United States is one of many countries that is heavily investing in health information technology (HIT) as a tool to help improve the quality and efficiency of health care. Countries are increasingly coming to the same conclusion: HIT is essential to any effort to reform existing care delivery models and innovate how care is provided.¹⁻³ Over the past five years, we have witnessed an evolution from excitement about the potential value of HIT to active efforts to increase adoption.⁴ In the United States, there has been a recent uptick in HIT adoption rates, prompted in part by newly available government incentives as detailed in Chapter 1 on EHR adoption.^{5,6} A recent international survey of primary care physicians in 10 countries suggests that increases are also happening in other high-income nations, and reveals notable progress in the use of electronic health records (EHRs).⁷ Much of this progress is attributable to the explicit government efforts to promote HIT adoption.

Despite an overall upward trend in adoption rates, there are still large country-to-country differences in the level of adoption. Several countries that have pursued EHR adoption over a longer period are close to universal adoption, at least in the ambulatory care setting. In other countries, such as the United States—which has only recently initiated efforts to increase adoption—EHR use, while increasing, has not quite become widespread. There are also varied approaches from country to country in how HIT is used to address cost and quality challenges. Differences are often dictated by the organization and financing of health care delivery, as well as the demographic and geographic heterogeneity of the country's population.

Even with these differences, there is a surprising degree of commonality in the challenges faced by countries as they work to implement HIT, and then go on to ensure that it results in quality and efficiency gains. For example, many countries, including the United States, are struggling with how best to overcome physician resistance to HIT adoption and use.⁸ A second area in which many countries are struggling is how to ensure the seamless electronic flow of clinical data between care delivery settings. These cross-country similarities create an unprecedented opportunity for learning from each country's successes and failures. Although HIT adoption and use occurs in markedly different contexts, comparisons that include a nuanced understanding of approach and impact may help enrich the resulting lessons.

In this chapter we seek to accomplish three aims. First, we seek to describe the context and motivation for government efforts to develop HIT adoption strategies. Second, we summarize key efforts to compare HIT strategies and levels of adoption across countries in order to provide the recent estimates of where countries currently stand. We also briefly discuss a current effort, led by the Organisation for Economic and Cooperative Development (OECD), to develop benchmark metrics that can be broadly and consistently measured across countries. The OECD effort aims to overcome differences across countries in defining and measuring the adoption of core HIT applications because this limits our ability to identify which countries are leaders in a given domain and therefore

impedes cross-country learning. Third and finally, to highlight the potential for cross-country learning, we describe selected features of innovative approaches to HIT adoption and use from other countries and suggest key insights that may inform the U.S. approach. We conclude with a summary of what has been learned from cross-country comparisons to-date and where the most promising future opportunities for learning lie.

HIT as a Global Endeavor

While countries vary in their motivation for pursuing HIT, an OECD survey identified four common core objectives for HIT implementation across countries: (1) To increase the quality and efficiency of care; (2) To reduce the operating costs of clinical services; (3) To reduce the administrative costs of running the health care system; and (4) To enable entirely new models of health care delivery. A related study suggested that these objectives are not limited to developed countries but extend to developing nations as well, pointing to broad consensus on the domains in which HIT is expected to improve health care delivery.⁹

There are a variety of ways that HIT can be leveraged to achieve these objectives, many of which we have discussed in previous annual HIT reports. For example, replacing paper-based medical records with EHRs can facilitate timely access to, and better transmission of, patient medical information across the health care continuum. This is likely to directly raise the quality of care by improving clinical decisions, avoiding errors, and reducing redundancy. These benefits have been demonstrated in an array of settings.¹⁰⁻¹²

The gains from EHRs extend far beyond direct care, to supporting clinical research, public health planning, and the evaluation of interventions in health care. In addition, HIT can enable entirely new ways of delivering care. For example, new payment models in the United States are facilitated by HIT as hospitals and providers have enhanced their abilities to monitor and report performance and costs. As discussed in the 2012 HIT report, patient-centered medical homes (PCMHs) and accountable care organizations (ACOs) are examples of innovative care models that are augmented by HIT. The goal of PCMHs is to apply highly integrated, team-based practices that promote patient-centered care through routine patient feedback and better access.¹³ They also promote improved clinical quality and efficiency through increased care coordination. To reach these goals, health systems need tools that facilitate feedback, integration, and quality measurements. EHRs, while still adapting to these new functions,¹⁴ promise to improve telehealth functionalities; measurement of quality and efficiency; care transitions; personal health records (PHRs); registries; team care; and clinical decision support for chronic diseases.¹³ Other new approaches to delivering care include advancements in telecommunications that have led to the emergence of tele-ICUs, where specialists can remotely monitor and care for patients who might otherwise lack access to such advanced care.¹⁵ Technologies—such as mobile monitoring and medication alerts, patient-controlled PHRs, and other consumer-oriented innovations—hold the potential to improve health outside the traditional health care system, often targeting populations that are difficult to reach.

Health systems across the globe are struggling with growing costs and the ability to provide quality care for all their citizens. The problems that HIT addresses are not country-specific, but universal concerns. As a result, unlike most other approaches that may not be as broadly applicable, HIT has garnered enthusiasm as a universally accepted tool to improve health care delivery. As both the need for

HIT and the available types of technology grow, the question is no longer *whether* a country should adopt these new technologies, but *when and how* they can be harnessed to make significant improvements in health care.

Cross-Country Comparisons

Efforts to Compare Countries are Expanding. Reflecting the growing interest in moving from HIT strategy to HIT implementation, there is an array of efforts to compare adoption, use and even impact of HIT across countries. Some major organizations, including the World Health Organization (WHO) and the European Union (EU), have conducted repeated surveys on eHealth policies and programs internationally. The OECD is in the midst of developing comprehensive benchmarking efforts through the creation of coordinated surveys which can be deployed cross-nationally.

The World Health Organization. In 2005, WHO adopted a resolution establishing an eHealth strategy for the organization. The resolution urged member states to plan for appropriate eHealth services in their countries. That same year, WHO launched the Global Observatory for eHealth (GOe), an initiative dedicated to the study of eHealth, its development and impact on health in countries. The GOe monitors and analyzes the evolution of eHealth, and supports member states in their national planning through the provision of information to government and health ministry officials. To this end, the GOe undertook a survey of member states in 2005 and 2009. While the first survey focused primarily on policies and plans for future implementation of eHealth, the 2009 survey included detailed questions about particular areas of HIT, including telemedicine; mobile health; learning how to use HIT; and patient information management, including the use of EHRs.¹⁶ A total of 114 WHO member states chose to participate in the 2009 survey.

The survey revealed that the majority of patient information is still collected on paper, with over 90 percent of countries reporting medium, high or very high adoption of paper-based records, and only 45 percent reporting medium, high or very high adoption of electronic records (many citing use of both, paper and electronic records). However, among many high-income countries, there is, not surprisingly, a greater use of electronic records than paper-based records. The survey also found that countries had more extensive use of electronic records for population-level activities (e.g., public health) than for individual care.¹⁷ While these large-scale trends are useful, a key limitation of this study is that with just a single response per country, it lacks granular data at the institution and health care professional levels that can better characterize the state of HIT adoption and use within each country.

The European Commission. In 2008, a review of 27 European Union countries found that the majority of governments had formulated specific strategies about their intentions and priorities for e-health.¹⁸ The most commonly stated policy targets were efficiency, improving or reforming the health care system, improving quality of care, and promoting patient-centered services. A second survey was then fielded in late 2010 to assess the use of e-health in hospitals.¹⁹ Chief information officers and medical directors from a random sample of facilities in the EU answered questions about their hospitals' electronic record systems. The survey also included questions about different functionalities, such as which departments had access to the EHR as well as other HIT functionalities. This survey found that a majority of European hospitals have a common EHR system (65%); however, only 45 percent of acute hospitals can exchange clinical information electronically with other settings, and telemonitoring remains rare (8%). Despite the high adoption of EHRs, there were stark country-to-country differences. For example,

half of hospitals in Malta reported that they used an EHR compared to countries such as Iceland, Slovenia, Belgium, and Cyprus that reported universal (100%) use of hospital-wide EHRs that can share information with other local and offsite EHRs. However, the comparability of these results across nations is very difficult because it is not clear whether respondents shared a common understanding of what it means to have an EHR or an EHR that can electronically share information with other settings.

Recently the European Commission conducted two new surveys, which made an explicit effort to address definitional ambiguities by adopting a functionality-based assessment approach. Instead of asking about whether or not an EHR was in place, respondents were asked about whether their electronic system enabled them to perform key tasks (e.g., enter an order for a medication, record a list of clinical problems). The first survey targets general practitioners in 31 countries to better understand the adoption and use of EHRs, personal health records and information exchange, and perceived barriers to this adoption and use. The second survey targets acute care hospitals to help better understand the economic considerations they face when adopting new HIT as well as rates of HIT adoption. Unlike the 2010 survey that sampled 900 hospitals, the second was expanded to a much larger sample of approximately 2,000 hospitals. Preliminary results from both surveys are anticipated to be released in late 2013.

The Commonwealth Fund. The Commonwealth Fund also conducts repeated surveys to monitor and track HIT adoption across countries. In 2012 they released the findings of a survey of primary care physicians in 10 countries: Australia, Canada, France, Germany, the Netherlands, New Zealand, Norway, Switzerland, the U.K., and the United States. They found notable reported increases in the use of EHRs, but differences across countries persisted. Both U.S. and Canadian doctors significantly expanded their use of EHRs from 2009 to 2012, with an increase from 46 percent to 69 percent among U.S. PCPs and an increase from 37 percent to 56 percent among Canadian PCPs. Despite these increases, both countries continue to lag behind the U.K. (97% adoption), New Zealand (97%), Norway (98%) and the Netherlands (98%). France, Canada and Switzerland had the lowest rates of adoption (67%, 56%, and 41% respectively).⁷

The study also reported the use of specific HIT capabilities—such as order entry management; generating patient information; generating panel information; or routine clinical decision support—and found lower rates of adoption. PCPs reporting the use of EHRs to perform at least two of these capabilities ranged from 68 percent in the U.K. to 4 percent in Norway. The United States was in the middle with 27 percent adoption.⁷

The Organisation for Economic and Cooperative Development. The OECD is leading an effort to develop benchmark measures of adoption and use of health information and communication technologies (ICTs) that can be collected by countries to track their progress. This work was motivated by the results of a 2007 study on how OECD member countries were monitoring health ICT progress, which revealed serious concerns about the comparability of cross-country adoption figures due to idiosyncratic definitions and variable sampling techniques. The current OECD effort to develop benchmark measures has several notable features intended to promote both, comparability and broad usefulness across countries that may be in different stages of HIT maturity. For example, benchmark measures are organized along a continuum ranging from availability to measured outcomes from use, such that a country at a more basic stage of adoption could focus on availability measures and a more advanced country could collect outcomes measures in order to understand the value realized from HIT.

The OECD approach uses a “model survey” framework, which is composed of separate, self-contained modules that afford flexibility and adaptability to a rapidly changing environment. Additionally, to address the issue of competing definitions for technology, the OECD survey (like the recent EC surveys) uses a functionality-based approach to measure availability and use of electronic systems to perform specific clinical tasks, rather than relying on vague terms that may mean different things in different settings. A set of countries have volunteered to pilot the OECD survey, which will likely take place in late 2013.

Insights From Country-Specific Approaches

Ongoing efforts by the OECD, EC, and others to produce comparable data on cross-country HIT adoption will enable countries to more readily identify models from which they could learn. Given the variety of approaches that countries are taking to promote widespread adoption and effective use of HIT, there are important insights to be gained. To preview what these opportunities might look like for the United States, we describe innovative features of the HIT strategy in three countries and suggest some lessons to consider.

Sweden

Sweden has heavily invested in HIT over the past decade. Sweden’s National Strategy for eHealth, developed in 2006, put in place a regional approach to HIT adoption. Each of the 21 Regional Healthcare Authority of the County Council selects a single EHR system and associated technical standards that will be used across the county. This regional structure provides flexibility and customizability to accommodate local considerations, and has resulted in broad adoption across different settings of care. All laboratories in the nation are fully computerized; 100 percent of prescriptions are ordered and renewed electronically; and most EHRs have advanced capabilities, such as provider order entry.²⁰ A shared technical infrastructure within regions enables coordination between providers, such as care planning among primary, secondary, and long-term-care settings, as well as immediate automatic transfers from EHRs in ambulances to acute care settings.²¹

The challenge that Sweden’s highly regional approach has created is how to achieve nationwide electronic health information exchange (HIE); while exchange between providers of care within a county is available, coordination across counties is more difficult.²² Fifty percent of counties chose to use the same platform; there are an additional four counties that are geographically close to each other that plan to create a separate shared system; and the remaining regions will try to integrate intercounty EHRs once they are able to integrate between hospital, outpatient, and primary care systems within their counties. In addition, regional EHRs do not connect to the 60 national condition-specific quality registries in Sweden, which collect individual-level data on diagnoses, treatments, and outcomes.²⁰ To address these challenges, the Ministry of Health established the Center for eHealth in Sweden with the purpose of creating “the long-term conditions necessary for developing and introducing nationwide use of IT in the decentralized health and social care system.”²³ As part of this effort, the National Board of Health and Welfare has focused on improving national information structures and creating national terminology standards.²⁴

The United States wrestles with a similar tension in attempting to balance federal, state, and local involvement in HIT policies and implementation. On the whole, the United States has taken a national approach, with meaningful use (MU) standards defined consistently for all providers across the country and a common

set of certified EHRs (though, with several thousand products that have received certification, there is still substantial local discretion to choose the system that best fits the care delivery setting). The current approach did, however, carve out a clear and important role for state and local involvement. For example, state Medicaid programs can choose to define their own MU criteria; each state received funding to develop HIE infrastructure; and Regional Extension Centers were created to help doctors and hospitals implement and use EHRs.

Given that Sweden may be the single most advanced nation in the world in terms of EHR adoption across different aspects of the health care sector, its experience might suggest that, had the United States taken an even more regional (i.e., state-based) approach, we may have achieved greater adoption of EHRs more quickly. However, we would likely face even greater challenges with respect to connectivity, at least across state lines. Nonetheless, there are aspects of the Swedish approach that the United States may want to consider. In particular, gaining more insight into how well care is coordinated within regions could help provide a target for what we hope to achieve once EHRs, and connectivity between them, are in place. In addition, we could learn about the county-to-county differences that gave rise to different choices of EHR systems and implementation approach, and how this might help inform RECs as they work with practices and hospitals in different types of communities.

Germany

Germany, like Sweden, appears to have high adoption of EHRs in both hospital and primary care settings (64% adoption among acute-care hospitals based on EC data¹⁹ and 90% adoption among PCPs based on Commonwealth Fund data⁷). However, other studies have suggested that the adoption numbers, at least on the hospital side, may not be comparable to numbers seen in the United States because the German estimates have not required the presence of key functionalities, such as electronic prescribing.

Like Sweden, Germany has struggled to achieve broad connectivity. While major health care software companies attempted to create infrastructure to enable physicians to exchange clinical data, these efforts encountered an array of barriers, in particular, concerns about electronic health data protection and data security. Physicians, therefore, chose to store patient records on computers that were not connected to the Internet. However, a 2009 survey suggested broad support among German citizens for the idea of an electronic exchange of health-related data between health care providers,²⁵ and so the country decided to move forward with an approach to enable electronic clinical data sharing that puts patients at the center of the process. An electronic health insurance card with a medical information chip stores patient data and patients carry it with them between settings.³ These cards were first introduced in October 2011, and roll-out was expected to be completed by the end of 2012.

As the program is new and voluntary, uptake of the service is still unknown,²⁶ and this will be critical to inform the broader viability of the German approach. From a U.S. perspective, the experience in Germany should be particularly interesting to monitor. The United States has similarly struggled to enable clinical information to follow patients between delivery settings. However, the U.S. solution relies almost exclusively on health care providers sending and receiving information, not making the patient the center of the HIE transaction. As described in Chapter 4 of this report, there are 119 operational HIE efforts in the United States that predominantly involve physician practices and hospitals. The emergence of these efforts has been heavily subsidized by the government and serious questions remain about their

ability to become self-sustaining. Some of the key barriers include an uncertain return-on-investment for providers who choose to participate, as well as technical challenges and the high costs of participation.²⁷

If U.S. efforts struggle to overcome these barriers, alternative approaches to HIE that are more patient-centered may be of interest. The German model could be particularly appealing for several reasons. First, the United States is heavily promoting patient access to their own clinical data and to copies of their electronic health record; MU criteria require that providers make these available to patients. Thus, a systematic approach for the storage and transport of these data on a personal health card would be complementary. Second, the primary obstacle encountered in the United States' limited experience with patient-controlled health records was that patients were not willing to take the time to manually enter their health information. The health card enables direct download of the information, avoiding this issue entirely. Third, there is a broader movement in the United States to engage patients in their care and provide more patient-centered care. Putting patients at the center of the process of health information exchange would reinforce these efforts. There will, however, also be dimensions of the German approach that will likely need to be modified to work in the U.S. context—in particular, the involvement of health insurers who issue the cards is unlikely to appeal to the majority of Americans. Thus, a trusted source to administer the effort would need to be identified.

Canada

Canada offers an alternative model, and set of lessons, for the United States to consider with respect to achieving health information exchange. Canada has heavily invested in the creation of a complete health record that holds all relevant health information about a person over their lifetime. In Canada, the term electronic medical record (EMR) is used to refer to a partial health record under the custodianship of a health care provider(s) whereas the electronic health record (EHR) is defined as a complete health record that holds all relevant health information about a person over their lifetime from all sources. This is often described as a person-centric health record and acts in place of a series of connections between providers to exchange specific pieces of clinical data. Canada Health Infoway is the organization overseeing this effort²⁸ and it developed the EHR architecture and approach to connectivity through the use of interoperable pan Canadian standards. Each province and territory has a different strategy to promote EMR implementation and use among primary care physicians.²⁹ Thus, the Canadian approach to develop a single, shared patient-centric EHR involves efforts at both the national and provincial/territorial level.

In some sense, the Canadian approach offers a middle ground between the U.S. approach to HIE, which is provider-centric, and the German approach, which is patient-centric—the Canadian EHR is patient-centric but the locus of responsibility to ensure that it is created and available to providers resides largely with health care providers themselves. Thus, it could serve as an appealing model for the United States, and suggest a direction in which we might want to evolve. Currently, most HIE in the United States is point-to-point and focused on providing specific pieces of clinical data (e.g., test results).³⁰ And efforts to promote new approaches to exchange, such as DIRECT (discussed in Chapter 4), only push us farther in this direction. The drawback to this approach is that there is no place for providers to see a comprehensive record of the patient's health. As we progress toward widespread adoption of EHRs (or what Canada would call EMRs), we could build a similar patient-centric, lifelong record, and require that providers report the key pieces of data that comprise it. This could be particularly helpful in

supporting broader health care delivery reform efforts in the United States, such as patient-centered medical homes (PCMHs), which require that a team of providers share an integrated view of the patient's health status and care plan.

The Canadian experience also points to the challenges in this type of approach. For providers who have not yet adopted an electronic record, they have little incentive to do so once a robust EHR exists. They can reap all the benefits of consuming the information that the EHR contains while avoiding the costs (and disruption) required to implement an electronic record themselves in order to be able to contribute to the full EHR. This is a critically valuable insight, and suggests that U.S. policy-makers may want to wait to promote the comprehensive EHR until the vast majority of providers have an electronic system in regular use.

Conclusions

Since the last time we examined issues of adoption and use of HIT beyond the U.S. shores four years ago in this report, much has changed. Certainly, the United States has embarked on a major effort to create a nationwide health information infrastructure and we have chronicled the growth of that effort in this and prior reports. However, our current examination of the global scene suggests that this focus on health information technology is not the United States' alone. Indeed, there have been substantial efforts to engage in broad measurement of EHR and related technologies by many international entities including WHO, the European Commission, and the OECD. The current approach taken by OECD is likely to have substantial impact and we suspect that over the next few years, it will become the gold standard by which HIT is examined across nations.

Beyond the interest in benchmarking, there is also substantial progress in adoption across countries. The work to-date suggests that high-income countries across the globe are making major investments in EHRs and related technologies. Even middle-income countries are seeing substantial investments, such as those seen in the Shanghai district of China or Brazil. Over the next few years, efforts toward EHR adoption in countries such as India and South Korea are anticipated, with ongoing progress in the traditionally wealthier nations, such as those in Europe.

There are key lessons that the United States can glean from the efforts of very specific countries. Sweden took a primarily regional approach and may be further ahead on EHR adoption and interconnectivity within regions (counties) than any other nation in the world. A more regional approach has substantial appeal. Germany made a substantial investment in giving patients access to their own records through a smart card, and letting patients become the source of interconnectivity. The Canadian approach has been to build a lifetime single EHR that draws on data from various sources. While none of these are exactly the right approach for the United States (because ultimately, each nation must meet its own unique needs), there are important lessons that if learned effectively, can propel the U.S. health care system into the 21st century.

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Chapter 4: Health Information Exchange Under HITECH: Progress and Challenges

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Introduction

Enabling clinical data to follow patients electronically between delivery settings is widely viewed as critical to realizing quality and efficiency gains from the large investment in electronic health records currently under way in the United States.¹ Without such exchange, providers are forced to make decisions about patient care with incomplete information, and substantial time and resources are wasted exchanging information manually. Despite agreement on the potential value, achieving broad-based electronic health information exchange (HIE) has been a major clinical and policy challenge. There is an array of barriers to widespread HIE that must be tackled before we can realize the associated benefits.²

Congress, as part of the 2009 Health Information Technology for Economic and Clinical Health (HITECH) Act, identified HIE as a key priority area. Congress stipulated that HIE must be included in the definition of meaningful use (MU) of electronic health records (EHRs) for which providers receive financial incentives of up to \$44,000. In the initial stage of meaningful use, providers must demonstrate that their EHR is capable of exchanging data with providers using different EHRs. This helps ensure that exchange can take place between unaffiliated organizations and follow patients between sites of care. In the second stage of MU, providers are asked to begin exchanging specific types of data when patients move between care settings.

To enable providers to meet the HIE-related requirements of MU, almost \$600 million in HITECH funding was devoted to create the State HIE Cooperative Agreement Program (CAP). Under this program, each state received a one-time grant to expand HIE capabilities, with flexibility to do so in a way that conforms to the needs and considerations of the state. Some states are pursuing centralized approaches in which there is a single statewide exchange. More often, states are fostering local exchange efforts and then putting in place services that enable these efforts to connect to each other (i.e., a network-of-networks model).

Whether the combination of HIE-related MU criteria and state funding to expand HIE will be sufficient to overcome the barriers to HIE is not yet clear. A number of barriers to robust, sustainable HIE has resulted in a high failure rate of HIE efforts over the past decade.^{2,3} The barriers fall into several key domains, including technical issues, legal challenges, regulatory barriers, and those that deal primarily with privacy and security; however, the most persistent and substantial barriers are financial. The majority of HIE efforts report struggling to find a sustainable business model because few providers are willing to pay for HIE and other stakeholders believed to benefit from HIE, such as payers, have yet to offer substantial financial support to these efforts. Even recently, with the additional support for HIE under HITECH, two well-known HIE efforts, the D.C. Regional Health Information Organization and CareSpark, an HIE effort in Tennessee, decided to shut down because they were unable to identify a sustainable business model.^{4,5} Tackling financial barriers to HIE is a particularly critical issue facing states as they work to expand HIE and determine how to sustain it when the CAP funding comes to an end in 2014.

The hope is that forces beyond HITECH will help promote HIE and create a stronger business case. In particular, new approaches to the delivery and payment of care, such as Accountable Care Organizations (ACOs), could increase demand for HIE and related services.⁶ These organizations will be required to effectively manage utilization and monitor performance; therefore, better access to timely clinical data is essential. In addition, there are other uses for exchanged data that go beyond clinical care. For example, clinical data repositories can be set up to facilitate research on the comparative effectiveness of various treatments. Aggregated data can support a more comprehensive assessment of provider performance, which can be used for public reporting or for pay-for-performance. In the public health sphere, HIE enables syndromic surveillance that can identify and enable a more rapid response to disease outbreaks.⁷

HIE is currently in a critical period. We are midway through the implementation of the HITECH Act and at the beginning of major health care delivery reform efforts authorized under the Affordable Care Act (ACA) and policy interest and focus on HIE is as high as it has been in a decade. There are substantial resources and efforts being devoted to increase HIE and to determine how to sustain it. It is therefore crucial to understand how HIE efforts are faring under HITECH and identify the challenges that policy-makers will urgently need to address going forward.

In this chapter we present recently collected data from a national survey of HIE efforts. The data speak to the overall progress toward nationwide HIE, as well as the gaps and barriers. We conclude with a set of policy recommendations for how to ensure that current efforts to promote HIE can thrive and the United States can realize the large anticipated gains from better availability of clinical data.

Methods

HIE takes place under different types of organizational arrangements. In some cases, stakeholders in a community come together and establish a not-for-profit entity to oversee exchange activities. In other cases, exchange is initiated and run by an existing organization, such as a public health department or a hospital that wants to increase exchange with community physicians. These varied approaches to HIE fall under the broad umbrella of moving clinical data electronically between unaffiliated organizations and reflect the current policy view of what constitutes HIE.¹ We therefore sought to survey all organizations in the United States that facilitate exchange of clinical data between independent entities (organizations with no shared financial or governance relationship). We relied on our list of efforts from three prior national HIE surveys conducted between 2007 and 2010.^{2,3,8} We supplemented this list with information in the eHealth Initiative (eHI) directory of Health Information Exchange Initiatives. We also drew on two sources that were newly available since our last survey: the State HIE Cooperative Agreement Program's website that lists all state-level HIE efforts and strategic plans created by each state that describe local HIE activity. This process resulted in the identification of 322 organizations that were potentially engaged in facilitating HIE.

Our survey instrument included two parts. The first asked respondents screening questions to determine whether, as of July 1, 2012, the organization was facilitating clinical data exchange among independent entities or at least pursuing it as a goal. Respondents that met these criteria were prompted to complete the second part of the survey, which asked for organizational demographics (numbers and types of stakeholders involved in data exchange, governance), types of data exchanged, ability to support MU criteria, funding sources, and barriers to

development. The survey was administered between August and November 2012. We determined that 101 organizations on our initial list (31%) did not meet inclusion criteria, most often because they had been misclassified in our source data as an HIE effort when in fact they were a participant in an HIE effort. Of the 221 remaining HIE efforts, we received responses from 172, a response rate of 78 percent. We classified the 172 respondents as either “operational” if they were actively facilitating exchange of clinical data between independent entities of any type or “planning” if they were pursuing clinical data exchange but not yet exchanging data.

Key Findings

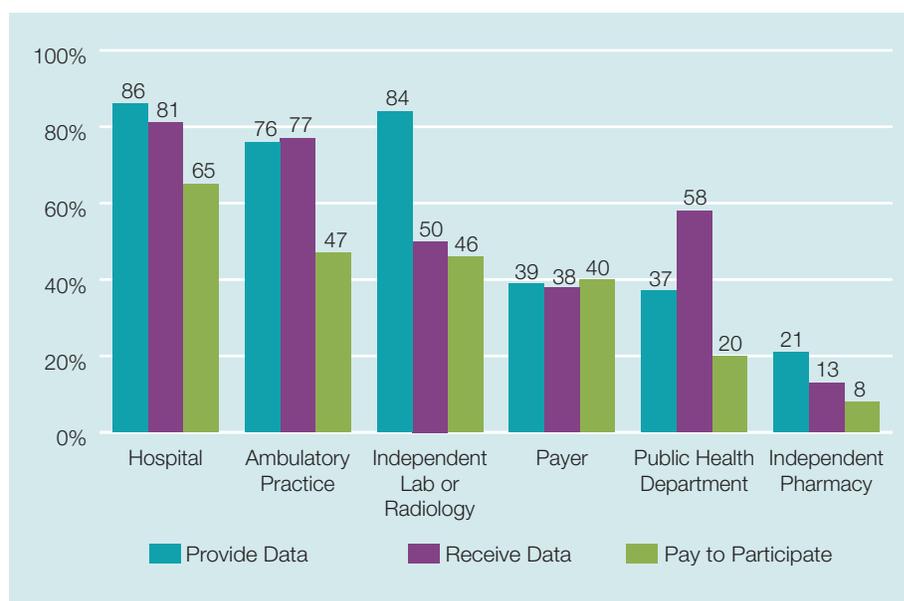
Number of HIE Efforts and Growth

We identified 119 operational HIE efforts, representing a 61 percent increase in the number of operational HIE efforts since our last survey in early 2010 in which we identified 75. The remaining 53 efforts were in the planning phase, a decrease from the 73 that were planning in 2010. The majority of operational efforts had been actively exchanging clinical data for less than 2 years (65%), suggesting that a group of efforts that had been planning in 2010 were able to become operational with the new support for HIE under HITECH. The next largest group of respondents also became operational relatively recently and had been exchanging data for three to four years (24%). Two-thirds of efforts operated as an established, independent organization and the remaining third operated from within another organization (e.g., a hospital or an integrated delivery network).

Types of Participants

Hospitals and ambulatory practices were the most common stakeholders sending and receiving data as participants in operational HIE efforts. Hospitals provided and received data in more than 80 percent of operational efforts while ambulatory practices provided and received data in more than 75 percent of operational efforts. Hospitals were the stakeholder most likely to pay to participate in data exchange (in 65% efforts). Independent labs and imaging centers were the next most common participants, though they provided data more often than they received data (84% of efforts and 50% of efforts, respectively). The opposite was true for public health departments—they received data more often than they provided data (58% of efforts and 37% of efforts, respectively). Payers participated in data exchange and paid to participate in less than half of operational efforts.

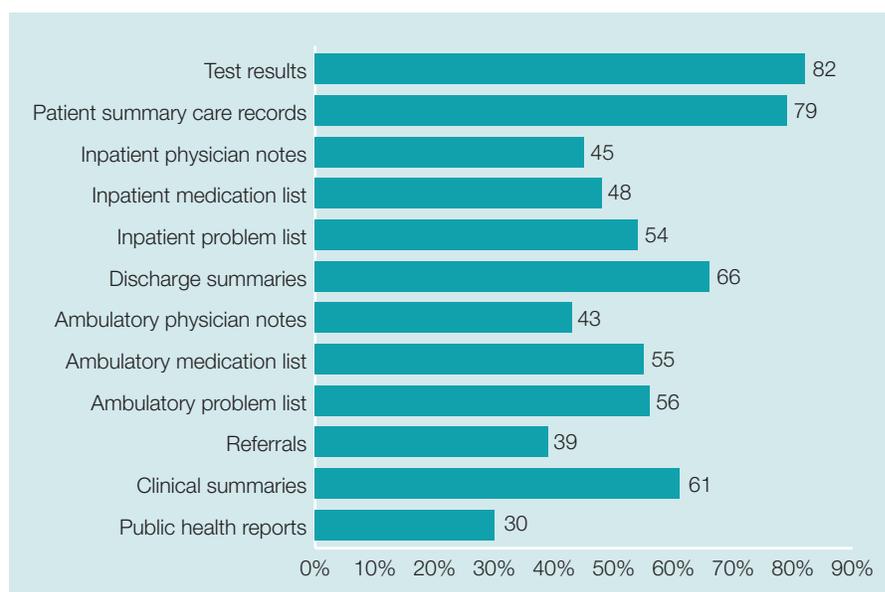
Exhibit 11: **Percentage of Operational HIE Efforts Engaging Various Types of Participants**



Types of Data Exchanged

Consistent with the high participation of labs and radiology facilities, test results were the most common type of data exchanged (82% of efforts). The next most common type was patient summary care records (exchanged in 79% of efforts). Discharge summaries were the most common type of data exchanged from inpatient settings (66% of efforts) and clinical summaries were the most common type of data exchanged from ambulatory settings (61% of efforts). Public health reports were the least common type of data exchanged (occurring in only 30% of efforts).

Exhibit 12: **Percentage of Operational HIE Efforts Exchanging Various Types of Data**



Approaches to Exchange

HIE efforts can use a range of technical approaches to support exchange, and each approach carries different implications for how information is accessed and used. Many HIE efforts offer more than one approach to accommodate different types of data or different preferences from participating stakeholders about how to exchange data. Among respondents, the most common technical approach was a query model, in which users actively search for available data for a given patient (69% of operational efforts). One of the strengths of this approach is that it is driven by need—if a patient arrives in an emergency department, for example, a provider can then search for that patient’s relevant medical history. This approach avoids the need to address the complexities associated with determining who should receive a given piece of data, such as a test result, which may be relevant to multiple providers. A drawback of the query-based approach is that many providers may not be aware that the data are available or may not take the time to search, limiting the value of the increased availability of clinical data.

The second most common technical approach was a push model in which data is actively sent out to users (64% of operational efforts). In contrast to a query model, this approach does not require that providers seek out data. However, the value of the data is limited because it is directed to specific users and therefore not broadly available. In the example from above, there is no way to anticipate that a patient’s data would be needed and pushed to the ED provider.

An alternative to both the push and query models is an end-to-end integration model in which data is seamlessly included in the user’s electronic system, such as an EHR. This approach, which was offered by 60 percent of operational efforts, avoids many of the drawbacks of the push and query models. However, this approach is technically more complex to set up and, unlike the other two models that allow users with only Internet access to view data, an end-to-end integration approach requires an electronic system. Therefore, this approach is often offered alongside push or query.

A relatively recent approach to exchange promoted by the federal government and developed through a public-private partnership is known as Direct. Direct is a solution that facilitates point-to-point transport of health information through a secure, inexpensive connection. It is conceptually similar to email and utilizes a push model. This model limits the value of the exchanged information because data only moves between providers during planned transitions. However, the hope is that Direct will be broadly used to quickly and easily enable exchange, particularly in states that do not have existing HIE infrastructure.

Forty-three percent of operational efforts report that they are currently offering Direct as a method of exchange. An additional 32 percent of efforts report that they are planning to support Direct. We found that the most common types of HIE for which Direct was being used were related to transitions of care, such as sending a clinical summary from the hospital to a primary care physician or from a primary care physician to a specialist. Sixty-one percent of operational efforts were either currently using Direct to support this type of exchange or planning to do so. Public health reporting was the next most common type of exchange—currently supported or planned to be supported by 31 percent of operational efforts. Approximately the same proportion of efforts were using or planning to use Direct for sending information to patients and exchanging lab results.

Penetration of HIE

With the growth in the number of operational HIE efforts across the country, we found that a substantially higher proportion of hospitals and ambulatory practices are now engaged in HIE compared to 2010. In our most recent survey of 2012, we found that 1,398 U.S. hospitals (30% of U.S. community hospitals) participate in HIE efforts, compared to 14 percent of hospitals doing so in 2010. Similarly, in 2012, 23,341 ambulatory practices (10% of U.S. practices) participated in the 119 operational HIE efforts, a near tripling of the 3 percent in 2010.

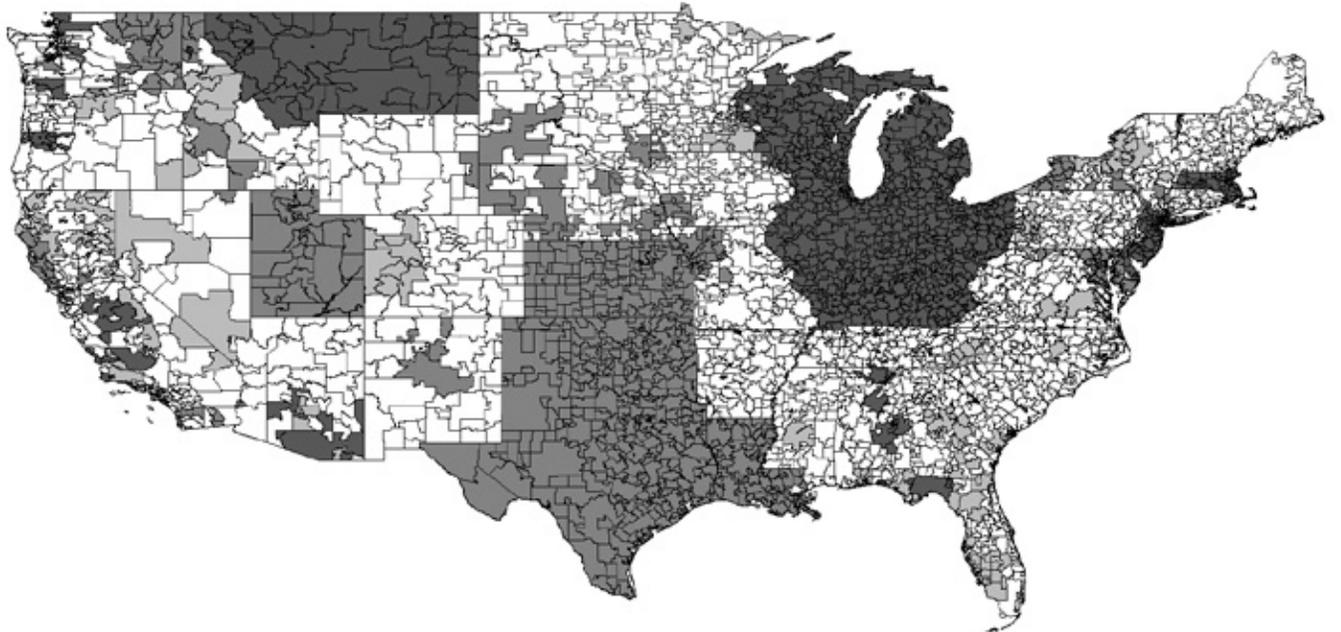
HIE and Meaningful Use

When we assessed the degree to which HIE efforts are enabling participating providers to achieve stage 1 meaningful use, a key goal of the State HIE CAP, we found that a small subset (10%) supported all six HIE-related functionalities. The majority of efforts enabled providers to demonstrate that they have the capability to exchange key clinical information electronically (91% of operational efforts). Among the criteria that require actual exchange to take place, it was most common for HIE efforts to support the ability to provide a summary of care record for patients referred or transitioned to another provider or setting (78% of operational efforts). Two public health-related criteria were the least often supported: syndromic surveillance (29% of efforts) and reportable lab results (26% of efforts).

Exhibit 13. **HIE Efforts' Support for Meaningful Use**

HIE-Related Stage 1 Meaningful Use Criteria	Core or Menu Criteria	Percentage of Operational Efforts Able to Support Criteria
Implement capability to electronically exchange key clinical information among providers and patient-authorized entities	Core	91%
Provide summary of care record for patients referred or transitioned to another provider or setting	Menu	78%
Incorporate clinical laboratory test results into EHRs as structured data	Menu	60%
Submit electronic immunization data to immunization registries or immunization information systems	Menu	39%
Submit electronic syndromic surveillance data to public health agencies	Menu	29%
Submit electronic data on reportable laboratory results to public health agencies	Menu	26%

When we examined geographic coverage of HIE efforts, we found that 2,562 of the 3,146 hospital service areas (HSAs) in the United States (75%) had an operational HIE. When we then examined the geographic coverage of HIE efforts able to support stage 1 meaningful use, we found that 2,309 HSAs (67% of all HSAs) had an operational effort that could enable providers to at least meet the core HIE criteria of implementing the capability to engage in HIE. For the HSAs with coverage, 777 (23% of all HSAs) had an effort that could only support the core criteria, another 693 (20% of all HSAs) had an effort that could enable providers to meet the core and at least half of the menu measures, and the remaining 839 (24% of all HSAs) had an effort that enabled providers to meet both core and menu criteria. While coverage was spread across the country, there was more robust coverage in the Midwest, perhaps because two of the oldest HIE efforts (IHIE and HealthBridge) started in this region.

Exhibit 14. **Geographic Coverage of HIE Efforts Based on Meaningful Use Support****Legend:**

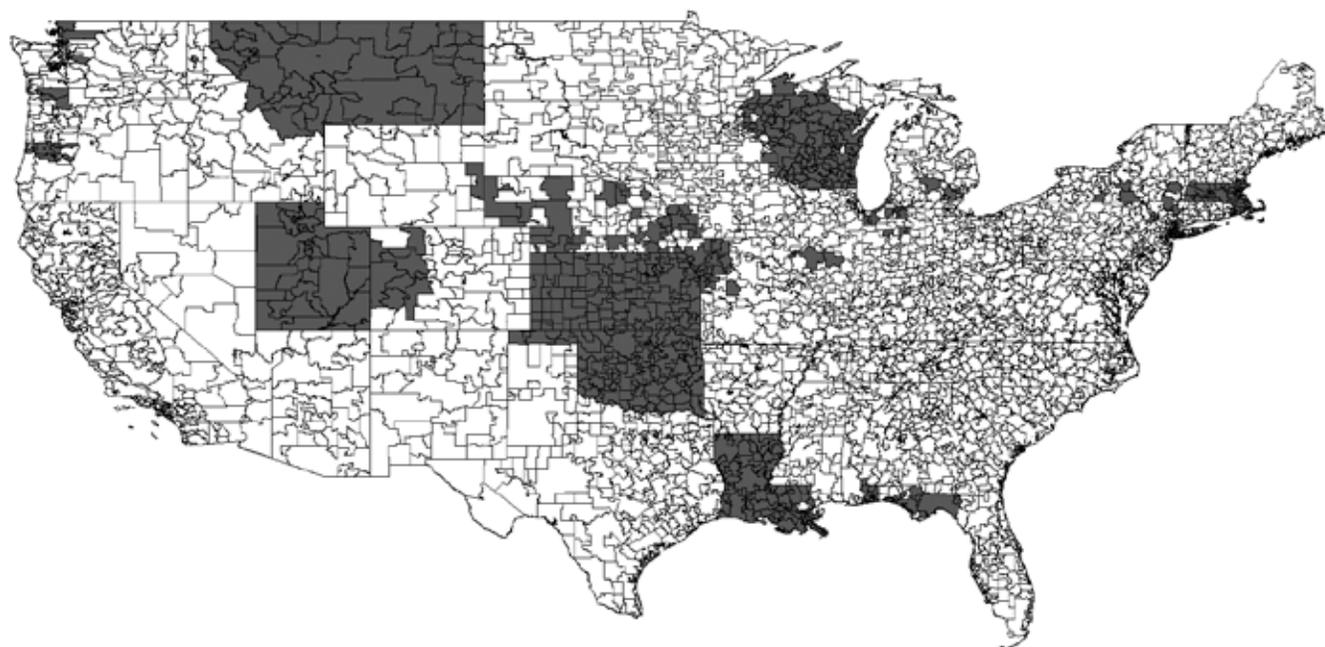
□ No operational HIE

□ Operational HIE that supports at least core criteria

□ Operational HIE that supports core criteria and at least half of menu criteria

□ Operational HIE that supports core criteria and all menu criteria

The ultimate goal of the MU criteria is to incentivize providers to use their electronic health records as more than simple replacements for paper records to realize significant gains in health care quality and efficiency. HIE is considered a critical component of this movement toward higher quality and more efficient care and stages 2 and 3 of the MU criteria will demand more of providers with respect to the amount and types of data they are electronically exchanging. In order to provide a baseline for how well current HIE efforts are meeting this standard, we applied an expert panel definition of an HIE effort that facilitates at least the essential exchange of clinical data needed to generate modest quality or efficiency gains across a minimum set of stakeholders (a “basic” HIE effort).² We found substantially less extensive geographic coverage of these basic HIE efforts. Only 18 percent of HSAs had an operational effort that met the basic criteria of facilitating the exchange of test and imaging results, medication lists, outpatient problem lists, and discharge summaries among hospitals and ambulatory practices for at least 5,000 patients. These efforts were dispersed across the country and included a few state-level efforts and more often, local efforts (Exhibit 15). The limited coverage of basic HIE efforts suggests that many efforts are still narrow in the exchange that they support, and therefore restricted in the likely impact on cost and quality.

Exhibit 15. **Geographic Coverage of Basic HIE Efforts****Legend:**

■ Operational HIE that meets “basic” definition

□ No operational HIE that meets “basic” definition

Financial Sustainability of HIE Efforts & Barriers to Development

When respondents were asked about barriers to development, they reported substantial challenges. Developing a sustainable business model was the most widely cited barrier, identified as a moderate or substantial barrier by 74 percent of efforts. This was closely followed by concerns about lack of funding (66% of efforts). Additional barriers cited by more than half of efforts included stakeholder concerns about data privacy and confidentiality (64%), addressing government policies and mandates (60%), technical barriers (60%), stakeholder concerns about the competitive implications of sharing data (56%) and accurately linking patient data (52%).

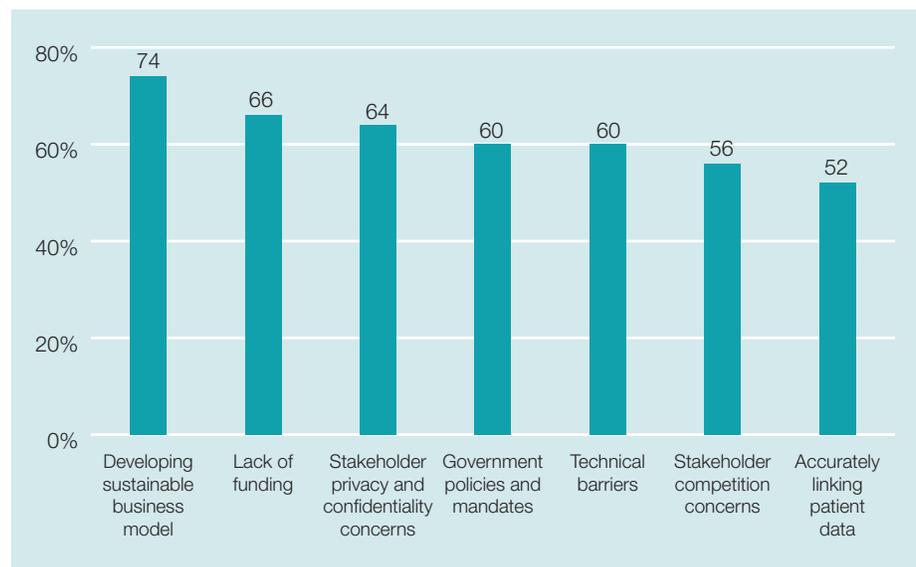
There are several intertwined challenges related to funding and sustainability. It is expensive to set up the technical infrastructure and policies to enable exchange to occur, and many potential participants are hesitant to financially support these efforts without a clear sense of the timing and likelihood of benefits. The Congressional Budget Office refused to score the financial savings from HIE in 2008 given the paucity of data,⁹ and we continue to lack rigorous evaluations of the magnitude of benefits and to whom they accrue. This results in a stalemate with providers who feel that they are being asked to shoulder the majority of the cost and payers and patients who are perceived as reaping the benefits from reduced redundancy and improved quality. However, payers are hesitant to support HIE efforts because they are uncertain whether they will be viable in the long run and feel that they have limited ability to ensure that providers use newly available data to make better care decisions.

What makes the financial barriers even trickier is that potential participants may be concerned about the competitive implications of engaging in HIE.¹⁰ The initial step of agreeing to discuss a collaborative effort can be very difficult in highly competitive markets. Even if competitors agree to preliminary discussions, providers have to weigh whether they will lose more patients than they will gain if they make it easier for patients to seek care from their competitors by participating in HIE.

The barriers associated with stakeholder concerns about data privacy and confidentiality are also challenging to overcome. Stakeholders' understandably have serious concerns about data privacy and security, as well as legal and regulatory challenges if there is a data breach or unauthorized access. HIE is an emerging area with limited legal precedent and an array of state and federal regulations affecting it. HIE efforts must identify the relevant laws, most of which were developed without consideration for HIE, and interpret their applicability. Given the highly sensitive nature of patient health information, issues like data ownership and protocols for user authentication and access must be clarified. Participants may have different and perhaps even conflicting perspectives on acceptable solutions.

What is particularly notable about the barriers to HIE development is that there is not one single issue that, if solved, would enable efforts to flourish. Successful HIE requires tackling many different types of barriers—none of which are easy.

Exhibit 16. Percentage of HIE Efforts Reporting Various Barriers to Development



Current Financial Sustainability and Business Models for HIE

Given the pervasive challenges associated with financial viability and identifying sustainable business models for HIE, we specifically examined current sources of financial support, as well as asked respondents about the business models that they felt were most viable. Grants and contracts were the most substantial source of support for the majority of operational HIE efforts (52%), followed by fees from participants (28% of efforts). However, less than a quarter of HIE efforts (24%) reported that they were able to cover operating costs with revenue from participants (our definition of a financially sustainable entity).

When we asked respondents to report what business models they felt were most viable in the long run, in 66 percent of instances, respondents identified *fees paid by participants*. The next most popular option, a *cost-savings* approach in which payments based on the projected operational costs saved or avoided by each stakeholder from their participation in the HIE, was supported by 29 percent of respondents. When we asked which type of stakeholder should pay the highest proportion of fees, payers were the most commonly cited by 47 percent of respondents. This stands in contrast to reality in which payers are behind hospitals, ambulatory practices, and lab and imaging facilities in how often they pay to participate in HIE.

Exhibit 17: **Business Models for HIE Efforts**

Business Model	Examples	Percentage of Operational Efforts Reporting Highly or Moderately Viable
Fees paid by participants	Assessment fees, membership fees, usage/transaction fees, service fees.	66%
Cost savings	Payments based on the projected operational costs saved or avoided by each stakeholder from their participation in the HIE.	29%
Public funding through state or federal government	Government grants or appropriations, taxation.	18%
Stakeholder that should pay the highest proportion of fees		
Payers		47%
Providers		18%
Ancillary service providers		1%
Patients		1%

Despite the gap between the business models perceived to be most viable and the reality of heavy dependence on grants, there was optimism about future viability. More than half of both planning and operational efforts that were not yet viable thought that they would become so in the future. There was also substantial optimism that, in three years without any additional federal or state funding, they would still be operational; 80 percent of respondents reported that this was likely or very likely.

HIE Efforts' Engagement in Health Reform

There are several ways in which HIE efforts could engage in health reform and offer services that are in greater demand than HIE itself, leading to a sustainable business model. The first is through using exchanged data to support quality reporting. By aggregating data from multiple sources, more comprehensive and reliable quality measures can be created, which can be used for performance measurement, public reporting or pay-for-performance. Just over half of operational efforts (52%) report being able to use exchanged data to profile participating providers on standard quality metrics. However, only 18 percent of efforts are actually doing so, and only 4 percent report the data publicly, suggesting that there may not be widespread demand for this use of exchanged data.

HIE efforts were more engaged in new approaches to care delivery. Thirty-two percent of operational efforts reported supporting Accountable Care Organizations (ACOs) and 45 percent are supporting patient-centered medical homes (PCMHs). An additional 35 percent are not currently supporting ACOs, PCMHs, or other reform efforts but plan on doing so in the future. HIE efforts are valuable in the context of these new models because such organizations require enhanced management of utilization and performance monitoring. For both of these activities, better access to timely clinical data is essential. The most common activities that HIE efforts engaged in to support these new models were providing technical infrastructure (36% of efforts), followed by consulting on design and/or operational approach (29%), and providing analytics (25%). Given the relatively recent development of these models, the high level of engagement suggests that HIE efforts are meeting an important new need. However, it is not yet clear whether they will be able to translate this into a sustainable business model.

Policy Implications

The substantial growth in the number of HIE efforts, the majority of which became operational in the past two years, should be seen as good news among policy-makers and early evidence of the beneficial impact of HITECH. The explicit support for HIE within HITECH likely prompted many efforts to start, or in the case of struggling efforts, to stay engaged and continue their work to become operational. In addition, State HIE Cooperative Agreement Program funding and the explicit goal of the CAP to ensure that all providers have at least one option to meet HIE-related MU criteria, may have led states to either build exchanges themselves or create more hospitable conditions for existing efforts to expand. Taken together, this seems to have resulted in not only more operational efforts but broad geographic coverage and greater provider engagement in HIE efforts.

Coupled with the good news are substantial challenges facing HIE efforts, with long-term financial outlook being the most pressing. The fact that three-quarters of efforts cite developing a sustainable business model as a major barrier should be a warning to policy-makers that the growth in HIE will not be sustained unless we are able to address this more effectively. This finding is not a surprise—financial viability has been the Achilles’ heel of HIE. HIE efforts struggle because the gains are to the broader community and they have not been able to capture those gains in a way that generates adequate revenue.

What can policy-makers do to help? First, it will be critical to ensure that stage 3 MU substantially increases the requirements for HIE in order to bolster provider demand for and participation in exchange efforts. This, in turn, should make stakeholders more willing to pay for HIE. A complementary approach is to better engage payers in HIE efforts. Despite the widely held belief that payers are the primary beneficiary of HIE, they are engaged in less than half of the efforts. In order to increase their participation, it will be critical to determine what is holding them back and design policies in response. In addition, in the remainder of the State HIE CAP period, it is essential that the Office of the National Coordinator emphasize the requirement that states identify sustainable business models. While every state has a plan, the viability of these plans has not been rigorously assessed. Federal funding will not continue indefinitely; and without rigorously assessed, sustainable business models, many HIE efforts will not be able to successfully transition to private funding.

Beyond the challenge of identifying sustainable business models for existing exchange is the challenge of continuing to expand exchange. We found limited coverage of HIE efforts that support the types of exchange that is likely required to realize the projected quality and efficiency gains from HIE. Ultimately, the largest challenge facing policy-makers is determining not only how to increase exchange, but also how to ensure that it translates into meaningful improvements. Here, policy-makers should continue to promote broader health reform efforts that leverage HIE to improve care quality and efficiency.

Conclusions

Robust and widespread HIE, in which clinical data follows patients between delivery settings, is critical to reforming health care delivery. Although there are many approaches to achieving this goal, much of the national effort is focused on local and state-level HIE efforts that facilitate clinical data exchange. We collected national data to understand our progress toward achieving broad-based HIE through these efforts. We found substantial growth in the number of operational HIE efforts and broad geographic coverage in their ability to support meaningful use. However, these efforts continue to struggle with financial viability, which will be critical to address before HITECH funding comes to an end. If this need is not addressed, it is likely that the progress toward greater HIE spurred by HITECH will not be sustained and we will not be able to realize the large anticipated gains in the quality and efficiency of care.

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Chapter 5: Improving Patient Education With EHRs

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Health care providers can improve their patients' health outcomes by delivering the right information at the right time in the right way to help patients prevent or manage acute and chronic health conditions, such as diabetes, cardiovascular disease, hypertension, and asthma. Research suggests that electronic health records can be used toward this end in several ways: during an office visit; prior to a visit or a procedure; after a visit or procedure; or as part of ongoing self care. However, an estimated 90 million people in the United States have limited health literacy or English proficiency. Little is known about best approaches for using EHRs to provide patients with materials that are understandable and actionable for patients, especially those with limited health literacy and English proficiency.

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Table 1 summarizes existing stage 1 and stage 2, and proposed stage 3 meaningful use rules related to use of EHRs to deliver patient education. Existing rules specify the provision of patient-specific education materials to 10 percent of patients, and propose the provision of materials to at least some patients with limited English proficiency (LEP). The rules on capture of patient demographics include recording preferred language, but do not reference health literacy. Overall, existing rules have little to say about documenting patient needs and preferences for communication, or about the consistent provision of patient-specific education materials.

In 2011, the Agency for Healthcare Research and Quality (AHRQ) contracted with Abt Associates, Inc. and researchers at Northwestern University's Health Literacy and Learning Program (HeLP) and the Mongan Institute for Health Policy (MIHP) at Massachusetts General Hospital (MGH) to conduct a project titled, "Improving EHR Patient Education Materials."

The two main tasks were:

1. to develop an instrument to assess the understandability and actionability of print and audiovisual patient education materials that EHRs can link to; and
2. to examine the patient education capabilities and features of EHRs, both with the input of a national panel of experts on health literacy, health IT and patient education. We developed the Patient Education Materials Assessment Tool (PEMAT), a reliable and valid tool that offers a systematic method to evaluate and compare the understandability and actionability of both print and audiovisual patient education materials on diverse patient education topics (e.g., diseases, procedures, medications), including materials that can be linked within an EHR. The PEMAT will be made available on AHRQ's website in Fall 2013.

In this chapter, we discuss the process and findings of that task and make recommendations for health care professionals, EHR and patient education vendors, and stage 3 meaningful use.

Reviewing Current EHR Patient Education Capabilities and Features: Our Approach

In 2011–2012, we conducted a review of patient education capabilities and features of EHRs. Our review had three phases: a) consultation with a Technical Expert Panel (TEP) to define the scope of patient education materials of interest and assist us with guidelines as to what “maximizing the potential of EHRs to deliver patient education materials” might look like; b) review of complete or partial EHR products; and c) conducting case studies to examine innovative practice in the use of EHRs to deliver patient education to patients.

Patient Education Materials

How might electronic access to health information and the delivery of tailored patient education materials to patients be operationalized in physician practices? We considered that this might include:

- a library of information available to providers may be viewed or printed and provided at a clinical visit—such information may be suggested to clinicians by the EHR system keyed by the entry of specific diagnoses, symptoms, procedures, medications or other elements entered in the clinical record;
- a library of information that may be accessed directly by patients through a patient portal or gateway;
- tools or information that can be “prescribed” or ordered by physicians through EHR functionality and disseminated to patients outside of the office setting via mail or Internet or telephone; and
- population or system-prescribed information that may be generated by a practice for all patients meeting certain conditions or criteria.

We recognize that even in practices that have adopted EHRs, electronic or interactive patient information may not be widely used, especially with low literacy or vulnerable populations. Patient gateways are not widespread in availability or use, a factor that may limit electronic information provision outside of the context of a visit. Often, available patient education materials are “static”—essentially in the form of electronic brochures or fact sheets in digital format that is printable and must be hand-selected from a library by a physician, nurse or patient educator. Newer generation products that harness the power of the EHR will allow for more real-time prompts to physicians at the point of care and more interaction between the patient and the practice. One might envision integration of patient information that is system-generated and tailored to patient needs based on their reporting or recording of symptoms or of clinical information such as weight, blood sugar, informed consent for procedures, and more.

Our TEP identified the following characteristics of ‘maximizing EHRs’ patient education potential’ for low literacy and Limited English Proficiency populations. EHRs should:

- stimulate patient and clinician discussion or shared decisions (instead of just printing or sending materials);
- be easy for clinician to access (not too many clicks, no extra logins);
- allow tailored information to be delivered to patients based on patient demographics, preferences for mode of information delivery, laboratory and pharmacy codes, ICD-9, CPT or procedure codes, assessments of literacy, or other factors;
- record what information was delivered to patient;

- be monitorable (e.g., what percentage of patients had tailored education materials delivered). This criteria is part of the proposed stages 2 and 3 meaningful use criteria);
- include anything that works or is appropriate to the patient, different modes (video, print, audio, cell phone applications), and materials for LEP populations.

We used these guidelines and observations as we looked for innovation in the EHR marketplace. To understand the landscape of what is possible in the delivery of information through EHRs, we began with a review of existing EHR systems to understand how they are designed and used to deliver patient information. We used the vendor findings to identify case study subjects that would allow us to elicit clinician and vendor perspectives.

Vendor Review

The purpose of the review of EHR vendors was to identify those products with the functionalities required for innovative patient education with low literacy populations. In collaboration with AHRQ and with input from the TEP, we agreed upon and used three broad criteria to select ambulatory care EHRs for review.

Group 1: Market Leaders—We identified market leaders from among the Certification Commission for Health Information Technology (CCHIT) product list for comprehensive ambulatory EHR products that is posted on the CCHIT website (www.cchit.org/products/onc-atcb). At the time, the list provided the most comprehensive listing of EHRs that have been tested and certified under the Temporary Certification Program maintained by ONC. To be included on the list, EHRs must have been certified by an ONC-Authorized Testing and Certification Body (ONC-ATB). In order to be certified, products must include the ability to “enable a user to electronically identify and provide patient-specific education resources, according to, at a minimum, the data elements included in the patient’s record: problem list; medication list; and laboratory test results; as well as provide such resources to the patient.” Then-current market share was determined through a review of multiple sources of information, including ONC and CCHIT websites, and market and trade websites and blogs.

Group 2: Products used with vulnerable populations—We aimed to identify products that have been demonstrated to be used successfully by practices and organizations that serve vulnerable populations, including patients who are underrepresented minorities, have low literacy, limited formal education, LEP, disability or other risk factors for limited health literacy. To identify these products we considered those products used in federally qualified community health centers (FQHCs) [cite www.nachc.com/client/NACHC%202008%20HIT%20Survey%20Analysis_FINAL_6_9_091.pdf], products used by the U.S. Department of Veterans Affairs (VA) and Indian Health Service (IHS) (early and innovative, diverse use of EHRs) and materials provided online by EHR vendors documenting products and services for low literacy, LEP and FQHCs. [cites: <http://medinnovationblog.blogspot.com/2010/05/emrs-size-of-physician-market-number.html> (May 2010) www.softwareadvice.com/articles/medical/abr-software-market-share-analysis www.capsite.com/news/press-releases/2010-u-s-ambulatory-ehr-practice-management-study/-1051410/ www.healthcareitnews.com/blog/abr-software-market-share-analysis www.medicinetechnology.com/2011/06/11-vendors-who-have-helped-their.html www.ehr-software.findthebest.com/compare/59-150-236/eClinicalWorks-vs-Next-Gen-Ambulatory-EHR-5-6-vs-Allscripts-ED-6-3-Service-Release-4]

Group 3: Innovative products, modular products or “home grown” systems—We aimed to identify five products that may not be comprehensive EHRs, but may be certified as modular products, or “home grown” or more limited applications that represent innovations in disease-specific tools, population-specific innovations for vulnerable populations, new media or technology applications or other products. This category proved challenging to identify once we started searching. We began with modular products that were ONC-ATB certified, as well as patient education tools that were reported in the published or gray literature or suggested by our TEP members. Not surprising, many of these products had existing partnerships or interfaces with our Group 1 market share leaders. Several experts, including members of our TEP, as well as other leaders in patient-centered care and information therapy informed this selection.

To research vendors, methods included online research at company and organizational websites, trade organization and government websites and informational contacts by telephone and email. Information at websites was often limited or dated—this was then, and still is, a rapidly evolving marketplace.

Seventy-five percent of the EHR vendors we researched had formed partnerships with one or more of six vendors of patient education content. Medline, patient education content which is publicly available through the National Library of Medicine, was also mentioned.

To determine the functionalities and attributes of EHRs and modules of interest for our vendor review, we built on previous EHR adoption research and considered the input of the TEP, ONC meaningful use criteria, and CCHIT requirements as they pertain to patient education. Within the limits of information that was publicly accessible, we documented:

- Form and format of information in patient education libraries
- Vendor and partner relationships with producers of patient education content
- Linkage of tailored information to patient demographics; patient preferences for mode of information delivery, assessment of health literacy, pharmacy, laboratory, procedure; ICD-9 or CPT codes; problem lists or other innovations for tailoring the right information to the patient at the right time.
- Mechanisms for recording information was delivered to patient (includes process of accessing materials, order sets, libraries, etc.)
- Point of patient access (direct, through gateway, in clinician office, etc.)

We relied on CCHIT and ONC-ATB certification to try to document readiness for meaningful use functionalities, including:

- provide patients with electronic copies of their own health information including glossary, definitions, normal values and information needed to interpret clinical information
- provide clinical summaries for patients for each office visit annotated with relevant patient education materials and references
- use of EHR-certified technology to identify patient-specific education resources and provide those at the point of care and outside the clinical office setting to the patient as appropriate
- capability for monitoring the provision of materials (e.g., what percentage of patients got tailored education materials delivered; part of proposed criteria for certified EHRs in ambulatory settings.)

We conducted our review of EHR systems in the spring and summer of 2011 at a time when the landscape was evolving in rapid response to a dynamic business and regulatory requirements. At the time, few companies seem poised to deliver tailored information at the point of care. Still, we found some partnerships and innovators where the focus is on serving diverse populations and getting information to low literacy and LEP populations. We focused on these partnerships for our subsequent case studies. In August 2011 we summarized the findings of the vendor review as follows:

- Patient education capabilities and features. Multiple companies have developed or are developing the capability to tailor information by patient demographics or ICD-9 codes. Given the standardization within ICD-9, this type of matching is more consistent. Patient demographics, especially race, ethnicity and language are not consistently collected by all organizations and pose some obstacles to consistent matching, but this process was under way in several organizations.
- No EHR system that we looked at has developed its own patient education materials. Rather, they are likely to provide materials through vendor or partner relationships with patient education vendors or through customization with existing physician practices. The EHR complete systems have relationships with many patient education modular EHR products—few relationships are exclusive. Most major market share EHR vendors offer dedicated products for federally qualified health centers. Within our review, a few vendors demonstrated a real commitment to the particular information needs of the vulnerable and diverse populations served by FQHCs and an understanding of the complexity of tailoring information to patients in these practices.
- In virtually all cases, review of websites and informational calls were not sufficient to gain even a general picture of how EHRs are and might be used to tailor the delivery of patient education materials to patient needs at the point of care.
- The published literature has many individual experiments and tests with homegrown patient education materials or vendor-developed materials. While extensive review of these many materials and solutions was out of our scope, we did note innovative uses of patient demographics and diagnostic codes to tailor education in preparation for surgical procedures, management of chronic illnesses, education about cancer screening and treatment, and more. Generally the monitorable information was captured in order sets (more favorable for retrieval) or clinical notes (less favorable for retrieval) and occasionally in a special “patient education” site.
- We noted strong devotees of HL-7 standards and strong devotees of Cloud-based and Web-based EHR solutions.¹ Meaningful use is possible with both; CCHIT is certifying both. Web-based solutions seem to offer more flexibility, but the HL-7 standards seem to assure a more specific matching of data from one system to the next.

It became evident that a variety of technology exists in theory and practice that can be used for tailoring patient education materials on at least some demographic and diagnostic criteria, but whether clinicians will avail themselves of this technology and participate in patient education—and what incentives are needed to drive that interaction—was not answerable by the review. We conducted case studies to explore our findings in more depth. We report on the two case studies here that address patient education for low literacy or LEP populations.

Case Studies of EHR Vendors

Methods

On the basis of our vendor review and in consultation with AHRQ and our TEP, we selected three vendors for case studies. We report on two of those studies here.

We conducted key informant interviews with both vendor representatives and clinician users to understand how these patient education functionalities are being deployed in the clinical setting. The interviews typically took from 30–60 minutes to complete, and we conducted three interviews per case study, utilizing semi-structured interview guides developed by the research team. Questions included descriptions of patient populations; typical provision of education within and apart from the patient visit; types of education materials typically used, including print, video or other tools; access to external websites; EHR capabilities and functionality, availability of information for patients with low literacy, limited English proficiency, or functional disability; incentives or barriers to the provision of patient information, including any pay-for-performance initiatives with disease-specific or targeted patient populations; and available patient or provider assessments of the quality of information provided.

For each vendor or product, we identified at least one implementation physician office. Interviews were conducted in-person and by telephone and included visual confirmation of processes to access patient education materials within the EHR.

We synthesized information gleaned in the case studies, along with the EHR vendor and product review findings, to summarize the effective uses of EHRs to deliver high-quality patient education materials to diverse populations, as well as barriers and facilitators to the effective use of EHRs as patient education tools. Further, our synthesis describes best practices already in place in different ambulatory and hospital settings in the United States, and proposes recommendations for both EHR developers and users to maximize the patient education potential of EHRs.

CASE: EHR Vendor at Blackstone Valley Community Health Care

Interviewees:

- Jerry Fingerut, MD, Medical Director, Blackstone Valley Community Health Care;
- Robert Bowden, Physician Assistant, Certified, Blackstone Valley Community Health Care; works as an independent adult primary care clinician collaborating with a physician, speaks fluent Spanish and some Portuguese; administrative responsibilities include quality improvement for diabetes care programs.
- Vice President of Product Management, Solutions for Ambulatory, Inpatient and Community Connectivity, EHR vendor (unnamed).

Setting and Patient Population

Blackstone Valley Community Health Care (BVCHC) is a federally qualified, Joint Commission-accredited health center located in Pawtucket and Central Falls, R.I. Established in 1990, BVCHC provides a range of services, including pediatric; internal medicine; family medicine; midwifery and obstetrics/gynecology; dental, and behavioral health. BVCHC has six full-time and four part-time physicians, four physician extenders, six nurses, and 10 medical assistants. In 2010, BVCHC

provided care to more than 11,000 patients who made 63,000 visits. The National Committee for Quality Assurance (NCQA) recently designated BVCHC as a Level 3 patient-centered medical home, in part because it excels in its use of health information technology to provide patient-centered care. BVCHC is also a Beacon Community grant participant, as a part of the Rhode Island Quality Institute.

In 2010, BVCHC statistics showed that of the center's 11,115 patients, 36.6 percent were uninsured, 48.6 percent received Medicaid benefits, 4.3 percent had Medicare coverage, and the remaining 10.5 percent had a private payer. Nine out of 10 patients who receive their care at BVCHC live at or below the poverty level. One quarter of patients speak English as their primary language, with the majority speaking Spanish, Portuguese, or Cape Verdean Creole. The two health professionals we interviewed indicated that the patients in their own personal panels of patients reflect the overall population of the Center and have common chronic illnesses that include high prevalence of diabetes, hypertension, obesity, and asthma.

EHR and Patient Education

BVCHC implemented an ambulatory EHR product in their medical and dental clinics in 2007. The company did very few customizations, and BVCHC is using the EHR 'out of the box'. BVCHC took advantage of the opportunity to standardize patient care processes and the delivery of patient education materials with the use of the EHR. Dr. Fingerut indicated that previously, patient education included 'handouts with lots of variation across the department and from clinician to clinician.'

We had identified an EHR vendor in our vendor review as a market leader in ambulatory EHR products used in federally qualified community health centers. The EHR vendor sees the provision of patient education materials as core to its mission. The vice president of product management at the EHR vendor explains, "We feel it's an essential part of an EHR. Clients expect patient education just like many other components of the EHR...If a client doesn't want to go with [what we provide], or wants to include their own information, they can upload anything using an HTML format, so that's always an option."

An ambulatory EHR product has the functionality to select patient education materials based on the patient's diagnosis. Our EHR vendor contact explains, "This gives our providers and patients the ability to get to *targeted* information, based on ICD-9 codes, and not have to rely on their own Internet searches. The EHR vendor has worked with health professionals to develop workflows for different conditions, such as diabetes, asthma, pregnancy, and others where standard education materials become part of the process of care for patients with a new diagnosis, an abnormal test result, or new medications. Embedding materials within the workflow helps to minimize the time to search repeatedly for the same educational materials.

At the time of our case study interviews, the EHR vendor had recently made a transition to using patient education content from the patient education vendor—for all new clients as well as many existing clients—using the patient education vendor's patient instructions integrated with an ambulatory EHR product and patient education vendor integrated with patient portals. The EHR vendor's decision to partner with a patient education content vendor was driven in part by language needs for the community health centers that the EHR vendor serves, and by the separate patient education content database for patient portals.

Patient Education in Clinical Setting

At the time of our November 2011 site visit to BVCHC, the center was in testing mode for a change to the patient education vendor content from the prior vendor content. In current practice, for most patients, clinicians use materials from the “Patient Education” tab within the ambulatory EHR product file menu. While diagnosis to patient education mapping is available in an ambulatory EHR product, BVCHC providers are currently manually searching for specific topics by selecting “Patient Education” from the ambulatory EHR product file menu.

The EHR vendor’s capability to select patient education materials by ICD-9 codes or other patient demographics was not yet available at BVCHC with the exception of some diagnoses or specialty clinics. Preferred language is captured at registration and could be used by the EHR to tailor materials, although literacy level is not formally assessed. Both the EHR vendor and BVCHC consider additional mapping of content to factors, such as preferred language or gender to be desirable enhancements to the EHR. During a patient encounter, the provider scrolls through and selects material, choosing a topic and toggling gender and language choice.

Within the clinical encounter, BVCHC clinicians we interviewed reported a variety of approaches to patient education, from use of whiteboards to draw and diagram information, to printing materials or viewing the screen together. Exam room configuration is an important part of using the EHR to deliver patient education. At BVCHC, desktop computers are used in exam rooms and they are positioned so that clinicians don’t have to turn their back on patients during the visit. Many rooms have swivel screens that facilitate looking at materials together. Providers are able to share their screens when pulling up patient education materials or showing patients a trend in their own data. Dr. Fingerut explains, “The EHR vendor’s auto-graphics allow you to graph any two points, like weight, blood glucose, or cholesterol. Showing someone their own statistics graphically in the exam room really helps. And patients with low literacy understand it.” Mr. Bowden, Physician Assistant, certified at BVCHC, comments, “The computer is my most useful tool in asthma education. I use it to show patients what they should be doing, how to manage asthma, use of medications, what good control looks like, how to use a peak flow meter and the importance of pulmonary function tests, and allergens in the home.”

The visuals are especially important given the paucity of information in other languages, and low literacy even in the patient’s preferred language. Clinicians expressed some frustration with the range of materials available for LEP patients and acknowledged occasional use of online translation tools when adequate translation and appropriate materials were unavailable.

Patient Education and Patient Portal

BVCHC staff members are encouraging use of their patient portal, HealthKey, by having patients sign up while they are at the clinic with the assistance of center staff. Patients can get Internet access at BVCHC and also at nearby community locations, such as the public library, local Internet cafes, or at the senior center. For this population, BVCHC leadership believes that email addresses may be a more stable means of contacting patients than home addresses or home phone numbers have been. At the time of our interview, about 10 percent of the patients who receive their care at BVCHC had signed on to the patient portal and were using it. Language and literacy are substantial barriers for many patients, since not all materials are available in languages other than English and many patients whose preferred language is other than English may not be able to read and write in that language.

For now, patient education is largely accomplished in the clinical encounter and portal capabilities at BVCHC are limited to secure messaging between patients and providers and the provision of some targeted patient education material. The patient portal is used to support an online diabetes program designed by the Diabetes Educator, Quality Director, and Patient Coordinator at BVCHC. The 12-week program, modeled after the ADA's group curriculum, begins with a patient visit during which the patient chooses self-management goals. Patients receive biweekly emails that include educational materials, both, in the body of the email and as an attachment, and hyperlinks to access more detailed information. BMI and blood glucose are monitored. The email messages become a part of the EHR. Clinicians receive read receipts and are alerted if emails remain unopened.

Tracking and Meaningful Use

Some tracking of the provision of patient education materials is captured within the EHR at BVCHC if the materials are part of those that the EHR vendor provides. If a provider opens a health education template and selects a handout, this will be reflected in the visit summary. For all other patient education that is delivered, documentation depends on the clinician to initiate by selecting from a pick list within the EHR.

The diversity of the BVCHC population poses both a major challenge and a major opportunity to improving the delivery of patient education materials through the EHR. At BVCHC, a new ambulatory clinic was soon to open offering updated technology and spaces designed for patient access to information as well as more flexible space for clinical and community care. Plans to expand patient access to patient information include using the new space to afford access to computers, expanding the use of the patient portal, and encouraging the expansion of special disease-based programs. There will be tablets available in the waiting rooms for patients to use to look at health education material, in addition to kiosks.

CASE: Indian Health Service at Santa Fe Service Unit and Cherokee Indian Hospital

Interviewees:

- Cecilia Butler, MS, RD, CDE, Clinical Dietitian, Santa Fe Service Unit: Sees patients of all ages and meets with every inpatient at Santa Fe Indian Hospital (SFIH), in addition to outpatient visits and community education.
- Christopher Lamer, PharmD, BCPS, MHS, CDE, Clinical Informaticist, Indian Health Service; and
- Michael E. Toedt, MD, Executive Director of Clinical Services, Cherokee Indian Hospital: board certified in Family Medicine and divides his time at CIH between administrative and clinical roles where he spends 20 percent of his time in direct patient care and has a "full-spectrum family practice."

Settings and Patient Population

Our inquiry within the Indian Health Service (IHS) included two ambulatory patient care settings where IHS had identified clinicians who are actively engaged in patient education.

Cherokee Indian Hospital

There are more than 14,000 members of the Eastern Band of Cherokee Indians, most of whom live across a five-county area in the mountains of western North Carolina. Through partnership with the IHS, the tribe has led the way in applying information technology to improve health outcomes. In Cherokee, N.C., the Cherokee Indian Hospital (CIH) is the primary medical home and public health provider to its Cherokee Indian residents. The hospital and satellite clinics serve an important role in the community as the outpatient department logs an average of 22,000 primary care visits per year, and the emergency department sees an additional 20,000 visits each year. The hospital itself is small, with just 20 inpatient beds, 10 emergency department rooms, and 22 outpatient clinic exam rooms. <http://healthit.bhs.gov/portal/server.pt?open=512&mode=2&objID=1958&PageID=20411>

Santa Fe Service Unit

The Santa Fe Service Unit (SFSU) covers an extensive portion of Northern New Mexico, from just north of Albuquerque to the Colorado Border. SFSU serves nine pueblos: Cochiti, Nambe, Pojoaque, San Ildefonso, San Felipe, San Juan, Santa Clara, Santo Domingo, and Tesuque. The SFSU facilities consist of the Santa Fe Indian Hospital and health clinics located in Santa Clara, Santo Domingo, San Felipe and Cochiti pueblos.

A wide range of ambulatory care services are offered at all facilities by a combination of direct services and contract care providers. In addition to general outpatient care, SFSU facilities provide dental services; health education; nutrition services; behavioral health services; public health nursing; community diabetes education; occupational therapy; contract care; environmental health; and sanitation services. Special clinics focus on women's health, diabetes, children, and wellness. Additionally, each facility works closely with tribal governments and other programs in community outreach efforts focusing on health promotion and disease prevention.

Santa Fe Indian Hospital is located in Northern New Mexico, just north of Albuquerque and serves about 30,000 patients from 11 pueblos, as well as urban American Indians and Alaska Natives. SFIH is an acute care hospital with 39 licensed beds and a Level III urgent care room, and provides approximately 65,000 ambulatory care visits per year, www.ihs.gov/facilitieservices/areaoffices/albuquerque/index.cfm?module=abq_santa_fe_su

The characteristics of the patient populations the two sites serve are similar; the vast majority list English as their primary language, with tribal elders speaking native dialects. Seven percent of patients at the Cherokee Indian Hospital list English as a second language. Frequent patient diagnoses include diabetes; hypertension; depression; renal disease; liver disease; obesity; substance abuse; asthma; and respiratory infections. Among children, the most common problems are pre-diabetes and obesity.

EHR and Patient Education

The Indian Health Services Resource and Patient Management System (RPMS) is in use at 281 practice sites and serves 900 physicians, with 11,778,527 outpatient visits conducted in 2010. RPMS and VistA were developed collaboratively and share a common database, with RPMS specialized for ambulatory care. Collaboration continues today, with as much technology sharing as possible. RPMS is certified for meaningful use by ONC-ACTB.

Patient and Family Education Protocols and Codes (PEPC) is the IHS instruction manual for providing and documenting patient education within RPMS. The 17th edition, released in January 2011, includes over 400 diagnosis-specific education protocols that are developed in-house by the PEPC Committee. Lamer explains that, “Each diagnosis has two–six standards that list discussion points for the provider, but not the specifics. If specifics were listed, it would be too hard to assure they were current and review would be too labor intensive.” (Toedt serves as committee chair and Lamer and Butler are committee members.) This group meets annually to review and improve patient education tools and throughout the year, providers can send feedback or requests for a topic. “We develop content that is provider-centric and patient-centric.” Patient Education Protocols are available within RPMS, www.ihb.gov/HealthEd/docs/Final%202011%20All%20Codes%20Booklets.pdf (See Exhibit 18.)

Exhibit 18: **Patient and Family Education Protocols and Codes****PATIENT EDUCATION PROTOCOLS: DEHYDRATION****DEH - Dehydration****DEH-AP ANATOMY AND PHYSIOLOGY**

OUTCOME: The patient/family will understand anatomy/physiology of dehydration.

STANDARDS:

1. Explain that the human body is made of 70-80% water.
2. Explain that water from food and drink is absorbed through the small and large intestines.
3. Discuss that the kidneys regulate fluid status.
4. Discuss that dehydration may result from a wide range of diseases and states that impair water homeostasis in the body, including external or stress-related causes, infectious diseases, malnutrition, food borne illness, and diabetes.
 - a. Discuss external or stress related causes: excessive sweating, blood loss or hypotension due to physical trauma, diarrhea, hyperthermia, shock (hypovolemic), vomiting, burns, use of methamphetamine, amphetamine, caffeine and other stimulants and excessive consumption of alcoholic beverages.
 - b. Discuss infectious diseases related to dehydration: Cholera, gastroenteritis, and shigellosis.
 - c. Discuss malnutrition as it relates to dehydration including fasting, electrolyte disturbances, and rapid weight loss

DEH-C COMPLICATIONS

OUTCOME: The patient/family will understand the complications of untreated dehydration.

STANDARDS:

1. Explain that untreated, severe dehydration can lead to shock and damage to vital organs such as the kidneys. This may result in death.
2. Discuss that milder dehydration may result in confusion, headache, dizziness, decreased urination. Explain that these symptoms should prompt a visit to a healthcare provider.

DEH-DP DISEASE PROCESS

OUTCOME: The patient/family will understand the specific cause of the patient's dehydration and its symptoms.

PEPC also provides definitions for each patient education code set and examples of how they should be used in documenting patient care. IHS defines correct documentation as requiring the completion of the following elements: (*denotes required documentation)

1. Readiness to Learn (a Joint Commission requirement)
2. *Disease state, Illness, or Condition
3. *Education Topic Discussed
4. *Level of Understanding
5. *Time (spent providing the education)
6. *Provider Initials
7. *Behavior Goal: Goal Not Set; Goal Set; Goal Met; Goal Not Met

RPMS is designed to capture this data as well as Educational Assessment Codes. RPMS features capture patient characteristics as a part of patient registration that pertains to selecting health education materials for the patient. The groundwork of Health Communication at IHS begins with the assessment of Health Factors which include Barriers to Learning, Learning Preferences, and Confidence. Health Factor status is made a part of the patient's EHR, and may change over time as the provider develops a greater understanding of the patient or as the patient's condition changes. Clinicians must initiate completion of Health Factor fields and health education topics, using scroll-down menus. There are some tobacco reminders that appear automatically.

Patient wellness handouts (PWHs), *My Wellness Handout*, are generated at the end of every visit, and are written in simple language and include the patient's vital statistics and weight and general follow-up recommendations. At registration, PWH data is confirmed and updated, and if the PWH hasn't been printed for six months or longer, it is printed and given to the patient so that they can review the document and prepare questions before their visit. For new patients, a new intake form is completed. During the patient visit, the clinician reviews relevant information on the PWH, such as immunizations, reconciling the medication list, or ordering preventative maintenance that might be due. Pharmacy staff print the PWH prior to patient counseling and use the allergy and medication list to update the medication profile in RPMS and to address the requirements of medication reconciliation. The PWH serves as a personal medication record (PMR) and provides the patient with a current medication list to take home.

Patient Education and the Clinical Encounter

Clinicians using RPMS are prompted to provide patient education using clinical decision supports in PEPC. Medline Plus[®] is used for patient education content and, in addition, IHS develops some of their own patient education materials targeted for the needs of their population. Providers access MedLine Plus through an info button and document the delivery of patient education by using education codes, which include a topic and subtopic.

Exhibit 19: **Tailoring Content to Patient Needs**

Barriers to Learning	Learning Preferences
<ul style="list-style-type: none"> ■ No Barriers ■ Interpreter Needed ■ Visually Impaired ■ Fine Motor Skills Deficit ■ Blind ■ Dementia ■ Hard of Hearing ■ Values or Beliefs ■ Deaf ■ Stressors ■ Does Not Read English ■ Low Health Literacy ■ Speaks English as a Second Language ■ Cognitive Impairment 	<ul style="list-style-type: none"> ■ Do or Practice ■ Read ■ Small Group ■ Talk ■ Media (e.g., video, games, not print)
<p>Confidence: Confidence is used to assess the likeliness that the patient will take an active role in managing their health and well-being. Ask the patient, “How sure are you that you can manage and control most of your health problems?”</p>	
<ul style="list-style-type: none"> ■ <i>Very Sure</i> The patient is confident that they can take an active role and manage most of their health problems. The patient is very likely to achieve their health goals. ■ <i>Somewhat Sure</i> The patient is at least 70% confident that they can take an active role and manage most of their health problems. The patient is likely to achieve their health goals. ■ <i>Not Very Sure</i> The patient is less than 70% confident that they can take an active role and manage most of their health problems. Support and education should be provided to assist them in increasing their confidence and ability to participate in self-care activities. ■ <i>I do not have any</i> The patient does not acknowledge health problems. It is unlikely that the patient will be willing to set and achieve health goals at this time. Emphasis should be placed on providing the patient with support and education to understand their health problems, improve their confidence and ability to participate in self-care activities. 	

In addition to the Patient Education Protocols, which list discussion points that clinicians should cover with their patients, clinicians have access to over 200 health education handouts that have been developed in-house. To access IHS handouts from RPMS, clinicians must go to the Internet and scroll through topics that are arranged alphabetically on the Health Communications Web page of IHS. This directory also includes information on where the handout was developed and if it is suitable for low literacy.

In her work as a clinical dietician, Ms. Butler keeps her use of the EHR completely separate from face-to-face visits with patients. “I see every patient in the hospital. I walk in prepared, already having gotten the information I need from the EHR, and I know what I’m going to target.” She begins an education session by asking, “What’s the hardest thing about diabetes for you?” and before concluding the session, uses teach-back methods to confirm understanding. Ms. Butler does not want to bring the computer into a patient education encounter: “People are too involved in screens in their lives. They see a screen and they get fixated. I want to build trust with my patients and to watch whether they are connecting with the information I’m giving them. You have to build trust...share the information and assure understanding.”

Dr. Toedt indicates that in his Family Medicine practice, “For certain conditions, I am much more aggressive about resources and materials than for other conditions. We are focusing the intensity of the resources based on need, chronicity, and potential impact.” He uses smoking cessation as an example to illustrate his point about tailoring information. “You assess where they are.

Where is the patient in terms of readiness for change?” If he feels they are in a pre-contemplative state, he makes sure they have the phone number for the quitline and information on cessation. “If they are ready to quit, then I go into much more depth and provide literature and a referral to a cessation program.” He mixes the mode of information delivery, seeing that brochures and handouts in the exam room can be very effective. At CIH, exam rooms are outfitted with laptop computers and Toedt sometimes uses the EHR to show patients trends in their weight curves, blood glucose, or cholesterol. If he were to provide contraception counseling, he would use the EHR to access the Education Protocol and the computer is always used for documenting patient education in the patient record. While he uses the materials developed specifically in the IHS for that population, he notes that even this material may not be suitable for all regions—recent North Carolina forest fires created the need for patient information about the effects of the fires on pulmonary function; however, much of the IHS content on forest fire exposure was developed in the West and Southwest, where vegetation and landscape are markedly different, and exposures variable. So tailoring content based on geography was important, and patient education materials had to be developed in that context.

Patient Education and Patient Portal

Although there is a patient portal available, it was not in use at CIH or SFSU at the time of our interviews as access to the Internet is still not widespread. While the urban population does use the Internet, Butler reports that very few people on the reservations have computer access. “Most people have just enough money to pay the electric bill.” In Cherokee, patients access the Internet at the library, while most Santa Fe patients can use the Internet at casinos in Albuquerque. Health professionals can direct patients with access to sites of interest, but do not count on this mode of patient education for most patients.

Tracking and Meaningful Use

Through RPMS, IHS has an extensive structure and protocol in place for providing and documenting patient education, but it relies on the clinician to be disciplined and dedicated in getting it done. Toedt cites the interface of “humans with the computer, and the number of clicks required” as the most limiting factor in the delivery of patient education, and the current ways of getting things done aren’t the best workflow. Toedt explains, “The challenge is documentation. I can have two providers who handle this patient exactly the same way, but one provider will click the box and the other won’t. The value of that additional click is in tracking and some providers don’t see the value of it. It can be tough to get people to realize that value.” Toedt helped lead CIH’s efforts to achieve meaningful use. He sees the need for mapping of patient metadata to health education materials, “It will be great when the links are completed and the standards get you to the right material, and to local material if it’s available. If MedLine Plus and IHS materials were linked in so that the right materials were available within the visit without searching, that would be ideal.” In addition, he would like to be able to have clinician prompts in place for patient education for asthmatics, or exercise education; for instance, “We all get alert fatigue and begin forgetting to do things.”

Themes From the Case Studies

Several themes emerged from the case studies:

Commitment to EHRs

1. The leadership and clinicians we interviewed at all sites are experienced EHR users who believe that EHRs are important to delivering health care and measuring quality.
2. All have access to computers in examination rooms that allow for sharing of information online, on-screen or other modes.
3. Patient portals are still not widely utilized, and especially not for tailored patient education. Overcoming computer access barriers (Southwestern state practice), language barriers (community health center) and patient preferences for engaging with the materials is difficult.

Workarounds are still common for accessing patient education materials within the EHR.

4. All EHRs we studied have patient education content provided and accessible through the EHR at the point of care, but use is highly variable and often subject to workarounds.
5. Order sets may be available where tracking content provided might be recorded, but even if these functions are used, there is likely other patient education going on within and after the clinical visit that is not captured.
6. Clinical workflows for all but a few chronic illnesses are not smooth and require a clinician to go to a specific order set, look for appropriate materials, and then discuss. Workarounds to other content are not generally tracked unless the clinicians record it personally. Minimizing clicks and finding a way to track and capture clinician common searches would be helpful.

Tailoring is still more a manual than an electronic process.

7. While tailoring functionality exists in these record systems for diagnosis, language, literacy, it may not be widely used if it requires clinician effort to add or filter those data. All clinicians indicated that at least some manual selection was required.
8. At all sites, clinicians and leaders we interviewed are committed to patient-centered care and understand core concepts of tailored patient education. At all places, we observed specific processes and protocols for incorporating patient education in the clinical visit, albeit with a strong reliance on paper and visual presentation to augment online or electronic materials.
9. Clinicians all mentioned the power of showing patients their own clinical information, especially as a graph or image, to teach about laboratory values at a point in time or graphed over time, imaging results, Body Mass Index or other trends.
10. The actual process by which patient education is accomplished may not be electronic, and may therefore appear outmoded, but remains personal and intentional. From the perspective of technology and record keeping, the

variation we observed is a bit troubling. Very little patient education provided was tracked. The right technology would enable clinicians to search for what they need, and track and archive those materials for later use for the same patient or for others with similar characteristics.

Accessing patient education content appropriately categorized for language and literacy remains a challenge.

11. Access to materials in languages other than English and Spanish is a major challenge, as are materials that are appropriate to local geography, culture and population demographics.
12. In daily practice, patient education with LEP patients is accomplished with bilingual staff, interpreters, drawings, images and more likely includes conversation rather than provision of print materials. On the one hand, more teaching is done in person, and on the other hand, LEP patients are much less likely to have access to materials outside the visit to reinforce the teaching at the point of care.
13. Low literacy materials are a goal at most places but providers need to take into account that speaking, listening and reading literacy are not the same. Most clinicians can talk about the grade level of materials, but recognize the limits of that type of rating for the populations they serve.

Current and Future Best Practices: Vendors and Health Professionals

The goal of this task was to review the capabilities and features of EHRs that will enhance the delivery of patient education at the point of care, tailored to patient characteristics and needs, with special consideration to solutions for patients with limited literacy or English proficiency. The results of our review and the case studies that followed suggest several best practices that we propose should be pursued by vendors and by health care organizations and professionals. Several of these practices are still in the early phases of implementation and planning or even at the “pipe-dream” stage within the organizations we studied. Nevertheless, based on what we learned and observed, we see the promise for some of these practices if they were more widely available and disseminated.

EHR Vendors and Patient Education Content Providers

1. Many, but not all, EHR vendors partner with at least some patient education content vendors and make materials available to health care professionals. The library of patient education information available to physicians is often not available to patients in patient portals. Similarly, some EHR vendors also partner with content providers for patient portals, and those materials are not easily accessed or prescribed by providers. Providers and patients within the same health center or system should have access to a common library of patient education materials and tools. This will facilitate the sharing of information and decisions based on common information.
2. Most EHRs, including patient portals, currently do not track the routine searches and orders for patient education materials that are made by clinicians and patients even if the content is within the record. Often the additional functionality exists to link the health professional to outside Internet content, and these workflows are not captured either. Clinicians find themselves repeating similar searches over and over for patients with similar conditions.

The EHR should be able to capture common searches and page views by both clinicians and patients, and make these common or routine workflows to make these standard and easily accessed again. This technology exists routinely on many commercial retail sites that learn user preferences and use them to tailor products. Some providers have worked with EHR vendors to build disease-specific workflows with preferred information. These efforts could be enhanced and expanded by tracking what physicians routinely do.

3. Patient education vendors typically do not label content with measures of literacy or even grade level. Many vendors have very limited libraries of information for patients with LEP. The health professionals we interviewed noted that they cannot find the information they need and, instead, rely upon interpreters, family members, and online translation services to meet the need for appropriate materials. Face-to-face teaching within a visit cannot always be reinforced with materials to take home. Online translation software is not geared toward medical terminology and problematic translations are common. Systems that tag information by literacy and language are essential to appropriate use.
4. The number of clicks or additional processes required to access material reduced the likelihood that materials, even good materials, will be used. The technology that will select an appropriate list of materials matched on diagnosis or symptoms, literacy and language, does exist and should be easier to access.
5. The display of test results is a powerful tool for teaching patients at the point of care. The ability to display trend data (BMI, weight, blood glucose, kidney function, hematology) is key. These data would be more powerful if high-quality patient education was shared in person so the patient can have assistance understanding test results. This is an important feature as patient portals develop and clinicians are concerned that showing results without interpretation will create considerable concern.

Health Care Professionals

1. Clinicians, or other clinical team members, need to document what materials are provided to patients. Ideally, the person providing the education, be it the physician, nurse, nutritionist, health coach or other staff, should capture the information in a way that is trackable. This may be accomplished in many, but not all, systems as an “order set.” Capture in notes that are unsearchable is not helpful. The trackable features noted above would also enhance the capture of information for those clinicians who do not record it.
2. Some practices have developed standard protocols for patient education and the types of materials that should be provided to patients at different points in the care continuum. Such workflows and protocols, if more widely developed would make documentation easier.
3. Clinicians should avoid the use of online translation tools that do not have the capability to translate medical terminology. While we recognize the convenience of these tools, they are not appropriate for transmitting accurate clinical information to patients.
4. Health systems should consider standardizing the provision of patient information and education materials to specific tools and vendors by use of a common library of patient education materials. Additional materials that are developed or purchased can be added to a standard library.

5. Patient education materials are commonly provided on paper. Pages should be dated for the patient so the age of the content is apparent. Materials provided on paper should also be provided through patient portals so patients may access them freely outside the visit. Tracking the provision of information would allow for important updates to be provided to patients.
6. Many patients cannot access personal electronic health information securely at home or at office locations. Health centers should provide basic access to computers and training as needed to access their health information and key materials provided by patients.

Recommendations for Meaningful Use Criteria

Based on our findings—including our review of the literature, the advice of the TEP, our vendor review, and our case study investigation—we recommend the following additional meaningful use criteria for certified EHRs in ambulatory care settings:

Demographics

Identify patient-preferred language for written and spoken communication, and patient-declared ability to read and speak English, including: Preferred language for written communication; preferred language for spoken communication; ability to read and understand English; ability to speak English; and preference for interpreter.

Patient Lists and Reminders

1. Generate preventive care reminders using patient's preferred communication medium, preferred language, and need for understandability.
2. Generate report listing patients of eligible professional (EP) with specific condition who have not been given or completed basic patient education for given condition.
3. Include patient education materials and tools for patients with high-priority health conditions in order sets and workflows.

Patient-Specific Education Resources

1. Identify patient-specific education resources using patient diagnosis, ICD-9 and ICD-10, rather than the problem list.
2. Availability of education resources to the EP from any EHR display screen for a given patient.
3. Identify for the EP educational resources that have been prescribed/recommended and that the patient has accessed outside of the patient visit (e.g., lab values, disease-specific information, food and fitness guides).
4. Record patient's preferred mode of communication of patient education delivery (paper, online).
5. Provide choice of printing patient education resources in black-and-white or color.
6. Modify font and font size of written communication to accommodate patient with impaired vision.

7. Generate patient education resources in any of the five most commonly used languages by patients of EP.
8. Use professionally translated educational resources for all available languages. (Online translation should not be used for medical information, e.g., Google Translate.)

Lab Results

1. Present structured, trended lab results with link to interpretive information displayed on the same screen.
2. Display lab value trends are for viewing and sharing by EP and patient during the visit.

Electronic Access

Alert patient when new test results are available in EHR patient gateway.

Conclusions

Our review of patient education capabilities and features of EHRs demonstrated that several improvements are needed in order to realize the vision of EHR-enabled, tailored patient education at the point of care or through patient portals. There are particular challenges in providing materials that are readily accessible, linked to patient needs, and appropriate for low-literacy and LEP populations. Even with improved functionality, high-quality patient education still depends on clinicians and educators with the time and skills to tailor the right materials to the patient at the right time.

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Exhibit 20: **Summary of Meaningful Use Rules Related to Use of EHRs to Deliver Patient Education**

Stage 1, Final Rule (2011) ²	Stage 2, Final Rule (2014) ³ Sept. 4, 2012	Proposed Stage 3, as of Aug. 3, 2012 ⁴ (as early as 2016)
<p>Demographics Record the following demographics:</p> <ul style="list-style-type: none"> ■ Preferred language ■ Gender ■ Race ■ Ethnicity ■ Date of birth <p>(50%)</p>	<p>Demographics Record the following demographics:</p> <ul style="list-style-type: none"> ■ Preferred language ■ Gender ■ Race ■ Ethnicity ■ Date of birth <p>(80%)</p> <p>2014 EHR Certification Criterion 170.314 (a)(3)</p>	<p>Demographics Record the following in structured data:</p> <ul style="list-style-type: none"> ■ Preferred language ■ Gender ■ Race ■ Ethnicity ■ Date of birth ■ Occupation and industry codes <p>Clinical:</p> <ul style="list-style-type: none"> ■ Sexual orientation, gender identity ■ Disability status <p>(80%)</p>
<p>Clinical Decision Support: Implement one decision support rule relevant to specialty or high clinical priority along with the ability to track compliance with that rule.</p> <p>Implement one clinical decision support rule.</p>	<p>Clinical Decision Support: Use clinical decision support to improve performance on high-priority health conditions.</p> <p>Implement five clinical decision support interventions related to four or more clinical quality measures, if applicable, at a relevant point in patient care for the entire EHR reporting period.</p> <p>The EP, eligible hospital, or critical access hospital has enabled the functionality for drug-drug and drug-allergy interaction checks for the entire EHR reporting period.</p> <p>2014 EHR Certification Criterion 170.314 (a)(8)</p>	<p>Clinical Decision Support:</p> <p>Objective: Use clinical decision support to improve performance on high-priority health conditions.</p> <p>Measure:</p> <ol style="list-style-type: none"> 1. Implement 15 clinical decision support interventions related to five or more clinical quality measures, if applicable, at a relevant point in patient care for the entire EHR reporting period. <ol style="list-style-type: none"> a. Include renal dosing checks (may need to be stage 4 due to lack of structured Sigs) b. Include clinical decision support for appropriateness of lab or radiology orders (to avoid redundant or inappropriate orders) 2. The EP, eligible hospital, or critical access hospital has enabled the functionality for drug-drug and drug-allergy interaction checks for the entire EHR reporting period. <p>Certification criteria only:</p> <ol style="list-style-type: none"> 1. Ability to track clinical decision support triggers and how the provider responded. 2. Ability to flag preference-sensitive conditions, and provide decision support materials for patients.
<p>Patient-specific education resources</p> <p>Identify patient-specific education resources using certified EHR technology and provide those resources to the patient if appropriate. (10%)</p>	<p>Patient-specific education resources</p> <p>Use clinically relevant information from certified EHR technology to identify patient-specific education resources and provide those resources to the patient.</p> <p>(10%) 2014 EHR Certification Criterion 170.314 (a)(15)</p>	<p>Patient-specific education resources</p> <p>Retain objective and add language support:</p> <p>Option 1: Of those patients who speak one of the top five nationally prevalent languages, 80% of materials must be provided in the language according to patient's preference, where materials are publicly available.</p> <p>Option 2: For one non-English speaking population, provide patient education materials in that language, where materials are publicly available.</p>

Exhibit 20: **Summary of Meaningful Use Rules Related to Use of EHRs to Deliver Patient Education (continued)**

Stage 1, Final Rule (2011) ²	Stage 2, Final Rule (2014) ³ Sept. 4, 2012	Proposed Stage 3, as of Aug. 3, 2012 ⁴ (as early as 2016)
Clinical summary Provide clinical summaries for patient for each office visit. (50%, within 3 days)	Clinical summary Provide clinical summaries for patients for each office visit within one business day. (50%) 2014 EHR Certification Criterion 170.314(e)(2)	
Vital signs Record and chart changes in vital signs: height, weight, blood pressure; calculate and display the Body Mass Index; plot and display growth charts for children 2–20 years, including BMI, and display as structured data. (50%)	Vital signs Record and chart changes in vital signs: height, weight, blood pressure; calculate and display the Body Mass Index; plot and display growth charts for children 2–20 years, including BMI, and display as structured data. (80%)	Vital signs Maintain as is for Stage 3 or retire as topped-out measure.
Lab results Incorporate lab results as structured data. (40%)	Lab results Incorporate lab results as structured data. (55%)	Lab results Incorporate clinical lab test results into EHR as structured data. (80%)
Problem list Maintain an up-to-date problem list of current and active diagnoses. (80%)	<i>Problem list is no longer a separate objective for Stage 2.</i>	
Smoking Status Record smoking status for patients 13 years or older. (50%)	Smoking Status Record smoking status for patients 13 years or older. (80%)	Smoking Status Consider retiring or incorporating into clinical quality measures.
Electronic Access Provide patients with timely electronic access to their health information (including lab results, problem lists, medication lists, and medication allergies) within four days.(10%)	<i>This measure is eliminated from Phase 1 in 2014 and is no longer an objective for Phase 2.</i>	Electronic Access Provide patients the ability to view online, download, and transmit their health information within four business days of the information being available to the EP. EP Measure: <ol style="list-style-type: none">1. More than 50% of all unique patients seen by the EP during the EHR reporting period are provided timely (within four business days after the information is available to the EP) online access to their health information subject to the EP's discretion to withhold certain information.2. More than 10% of all unique patients seen by the EP during the EHR reporting period (or their authorized representatives) view, download, or transmit to a third party their health information.
New	Secure messaging Use secure messaging to communicate with patients on relevant health information. (5%) 2014 EHR Certification Criterion 170.314(e)(3)	Secure messaging Use secure messaging to communicate with patients on relevant health information More than 15% of patients use secure electronic messaging to communicate with EPs.

Exhibit 20: **Summary of Meaningful Use Rules Related to Use of EHRs to Deliver Patient Education (continued)**

Stage 1, Final Rule (2011) ²	Stage 2, Final Rule (2014) ³ Sept. 4, 2012	Proposed Stage 3, as of Aug. 3, 2012 ⁴ (as early as 2016)
<i>New</i>	<i>New</i>	<p>Patient-Supplied Medical Information,</p> <p>Option 1: Provide 10% of patients with ability to submit information (provider chooses one or more of these information types according to what is most appropriate to their practice) such as:</p> <ol style="list-style-type: none"> 1. Family Health History [as per Surgeon General] 2. ODLs [as per How's Your Health] 3. Caregiver status and role [as per DECAF] 4. Functional status [as per PROMIS 10] 5. Patient-created health goals (needs a standard, also in care summary and plan) 6. Medical device: Glucose level* 7. Medical device: Blood Pressure* 8. Medical device: Weight* <p>*[SNOMED/LOINC]</p> <p>Option 2: Provide 10% of patients with ability to submit information using:</p> <ol style="list-style-type: none"> 1. A generic semi-structured questionnaire platform and 2. Capability to receive uploads from home devices (e.g., glucometer, BP device, scale) that accommodate the data above.
<i>New</i>	<i>New</i>	<p>Include Pre-Visit Patient Forms in EHR; Create capability to accept pre-visit prep tools into the EHR (e.g., the ability to consent to treatment, fill out administrative forms) (and also could send to other EHRs) certification criteria only.</p>

Endnotes

1. HL7 encompasses the complete life cycle of a standards specification process for electronic health records, including the development, adoption, market recognition, utilization, and adherence. In a [cloud or web-based system](#), a practice's data is stored on external servers and can be accessed via the Web, requiring only a computer with an Internet connection.
2. Stage 1 v. Stage 2 Comparison Chart for Eligible Professionals, August 2012, www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/Downloads/Stage1vsStage2CompTablesforEP.pdf
3. Meaningful Use, Final Rule, September 4, 2012, www.gpo.gov/fdsys/pkg/FR-2012-09-04/pdf/2012-20982.pdf
4. HIT Policy Committee: Meaningful Use Workgroup Stage 3—Preliminary Recommendations, Paul Tang, Palo Alto Medical Foundation, Chair, George Hripcsak, Columbia University, Co-Chair, August 1, 2012. (The summary above includes information on objectives and measures from Subgroup 1, Improve Quality Safety, Efficiency and Reducing Health Disparities, and Subgroup 2, Engage Patients and Families.), http://www.google.com/url?sa=t&rc=t&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CCIQFjAA&url=http%3A%2F%2Fhealthit.hhs.gov%2Fportal%2Fserver.pt%2Fdocument%2F958329%2Fapplication_vnd_openxmlformats-officedocument_presentationml_presentation&ei=TFlsUIbrwOseT0QG3voDgCw&usq=AFQjCNH-GmZdm0bvJ_FcE5aNre29ITV26Q&sig2=vxUYIhpChwUvgKRKBb0DKw

Acronyms

- ACA (Affordable Care Act of 2010) or PPAC
- ACO (accountable care organization)
- AHRQ (Agency for Healthcare Research and Quality)
- AHA (American Hospital Association)
- A/I/U (Adopt, Implement, Upgrade)

- BVCHC (Blackstone Valley Community Health Care)

- CAP (Cooperative Agreement Program)
- CCHIT (Certification Commission for Health Information Technology)
- CEO (chief executive officer)
- CIH (Cherokee Indian Hospital)
- CIO (chief information officer)
- CMS (Centers for Medicare and Medicaid Services)

- Department of Health and Human Services, U.S. (HHS)
- Department of Veteran's Affairs, U.S. (VA)
- DSH (disproportionate share hospital)

- EC (European Commission)
- eHI (eHealth Initiative)
- EHR (electronic health record)
- EMR (electronic medical record)
- EP (eligible professional)
- EU (European Union)

- FQHC (Federally Qualified Health Center)
- FTE (full-time equivalent)

- GOe (Global Observatory for eHealth)

- HeLP (Health Literacy and Learning Program)
- HHS (Department of Health and Human Services, U.S.)
- HIE (health information exchange)
- HIT (health information technology)
- HITECH (Health Information Technology for Economic and Clinical Health Act)
- HMO (health maintenance organization)
- HSA (hospital service area)

- ICT (Information and Communication Technologies)
- ICU (Intensive Care Unit)
- IHS (Indian Health Service)
- IHS RPMS (Indian Health Service Resource and Patient Management System)

- LEP (limited English proficiency)

- MeHI (Massachusetts eHealth Institute)
- MGH (Massachusetts General Hospital)
- MIHP (Morgan Institute for Health Policy)
- MMC (Medicaid Managed Care)
- MU (meaningful use)

- NAMCS (National Ambulatory Medical Care Survey)
- NCHS (National Center for Health Statistics)
- NCQA (National Committee for Quality Assurance)

- OECD (Organisation for Economic and Cooperative Development)
- ONC (Office of the National Coordinator for Health Information Technology)
- ONC-ATB (Office of the National Coordinator for Health Information Technology Authorized Testing and Certification Body)

- PCMH (patient-centered medical home)
- PCP (primary care physician)
- PEPC (Patient and Family Education Protocols and Codes)
- PHR (personal health record)
- PMR (personal medication record)
- PPAC (Patient Protection and Affordable Care Act of 2010) or ACA
- PWH (patient wellness handouts)

- REC (Regional Extension Center)
- RPMS (Resource and Patient Management System)

- SFIH (Santa Fe Indian Hospital)
- SFSU (Santa Fe Service Unit)
- SSI (Supplemental Security Income)

- TEP (Technical Expert Panel)

- HHS (U.S. Department of Health and Human Services)
- VA (U.S. Department of Veteran's Affairs)

- WHO (World Health Organization)

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