

By Michael F. Furukawa, Jennifer King, Vaishali Patel, Chun-Ju Hsiao, Julia Adler-Milstein, and Ashish K. Jha

DOI: 10.1377/hlthaff.2014.0445
HEALTH AFFAIRS 33,
NO. 9 (2014): 1672–1679
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Foundation, Inc.

Despite Substantial Progress In EHR Adoption, Health Information Exchange And Patient Engagement Remain Low In Office Settings

Michael F. Furukawa (michael.furukawa@ahrq.hhs.gov) is a senior staff fellow in the Center for Delivery, Organization, and Markets at the Agency for Healthcare Research and Quality, in Rockville, Maryland. He was director of the Office of Economic Analysis, Evaluation, and Modeling at the Office of the National Coordinator for Health Information Technology (ONC) in the Department of Health and Human Services when this article was written.

Jennifer King is chief of the Research and Evaluation Branch in the Office of Economic Analysis, Evaluation, and Modeling at the ONC.

Vaishali Patel is a senior adviser in the Office of Planning, Evaluation, and Analysis at the ONC.

Chun-Ju Hsiao is a health scientist administrator in the Center for Quality Improvement and Patient Safety at the Agency for Healthcare Research and Quality.

Julia Adler-Milstein is an assistant professor in the School of Information and the School of Public Health, University of Michigan, in Ann Arbor.

Ashish K. Jha is a professor of health policy and management at the Harvard School of Public Health, in Boston, Massachusetts.

ABSTRACT The United States is making substantial investments to accelerate the adoption and use of interoperable electronic health record (EHR) systems. Using data from the 2009–13 Electronic Health Records Survey, we found that EHR adoption continues to grow: In 2013, 78 percent of office-based physicians had adopted some type of EHR, and 48 percent had the capabilities required for a basic EHR system. However, we also found persistent gaps in EHR adoption, with physicians in solo practices and non–primary care specialties lagging behind others. Physicians' electronic health information exchange with other providers was limited, with only 14 percent sharing data with providers outside their organization. Finally, we found that 30 percent of physicians routinely used capabilities for secure messaging with patients, and 24 percent routinely provided patients with the ability to view online, download, or transmit their health record. These findings suggest that although EHR adoption continues to grow, policies to support health information exchange and patient engagement will require ongoing attention.

Accelerating the adoption of health information technology (IT) has been recognized as a national policy priority for more than a decade.¹ It has received particular attention since passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009.²

HITECH's goals are to promote the adoption and use of interoperable electronic health records (EHRs) and health information exchange (HIE), which can serve as the foundation for improvements in the cost and quality of the US health care delivery system.³ In particular, modernizing the country's health IT infrastructure enables broader efforts to pursue new models of care delivery. To help move the country toward this goal, beginning in 2011 the Centers for Medicare and Medicaid Services (CMS) be-

gan making incentive payments to eligible professionals who demonstrated the regular use of specific computerized capabilities that meet meaningful-use objectives.⁴

Early evidence on the impact of HITECH suggested that its investments had accelerated the rate of EHR adoption. From 2010 to 2012 adoption of basic EHR systems and specific meaningful-use capabilities grew rapidly among US ambulatory care physicians.⁵ Physicians who previously had significantly lower rates of adoption,⁶ including those who were older or worked in rural areas or areas with high rates of poverty, had the highest relative gains.⁴

Participation in the meaningful-use program has also been robust. About 65 percent of the eligible professionals have collectively received \$21.6 billion in incentives under the program as of February 2014.⁷

This growth in adoption has been good news. However, the 2012 data suggested that about 60 percent of office-based physicians still had not adopted at least a basic EHR at that time.⁵

Ongoing monitoring of progress toward widespread adoption and meaningful use of EHRs is critically important for several reasons. First, it is necessary to ensure that incentives continue to motivate physicians to adopt and use EHRs. Second, given concerns about disparities in EHR adoption, it is necessary to closely track who is being left out to identify and ultimately avoid a “digital divide” in access to health IT.

Finally, understanding whether and how EHRs are being used for increasingly advanced activities, such as HIE and patient engagement, becomes particularly important because these capabilities are newly required in the second stage of meaningful use.⁸ Furthermore, these advanced functions are vital to improving the efficiency and quality profile of the US health care delivery system. Understanding how physicians are faring with HIE and patient engagement will help shape policies to drive progress in these areas.

Therefore, in this study we sought to answer four questions. First, how have rates of EHR adoption among office-based physicians changed since the passage of HITECH in 2009? Second, what proportion of physicians was engaged in HIE with other providers in 2013? Third, what proportion of physicians had adopted and was routinely using computerized capabilities for patient engagement in 2013? And fourth, how did EHR adoption, HIE, and the use of patient engagement capabilities vary by key physician and practice characteristics in 2013?

Health IT is the backbone of any effort to reform the health care delivery system, and expanding the use of both HIE and patient engagement are key priorities in the national strategy to improve health care.⁹ Therefore, findings from this work have policy implications for helping shape new regulations, including stage 3 meaningful-use requirements, and for identifying barriers to the broader use of EHRs to support payment and delivery reforms and enhance care, lower costs, and improve population health.¹⁰

Study Data And Methods

DATA We used data from the 2009 National Ambulatory Medical Care Survey (NAMCS) and the 2009–13 Electronic Health Records Survey, a mail survey that was designed as a supplement to the NAMCS. These surveys sampled office-based physicians who provided direct patient care, excluding radiologists, anesthesiologists,

and pathologists. The surveys collected information on physicians’ adoption and use of EHR systems, including electronic HIE with other providers and the routine use of computerized capabilities.

The National Center for Health Statistics of the Centers for Disease Control and Prevention conducted the surveys. The EHR survey was sponsored by the Office of the National Coordinator for Health Information Technology.

Since 2010 the EHR survey sample has been increased significantly to allow for state-level estimates. Estimates of EHR adoption in 2009 were obtained from a combination of NAMCS in-person interviews and the EHR mail survey because of the small sample size for the 2009 EHR survey.

Nonrespondents to the EHR survey received follow-up telephone calls. The 2009–13 weighted response rates adjusted for nonresponse bias were 61–70 percent; the unweighted response rates were 64–70 percent.

EHR ADOPTION We used two measures of EHR adoption: the use of “any type” of EHR system and the adoption of a “basic” EHR system. The use of any type of EHR system was determined by a “yes” response to the question, “Does this practice use electronic medical records or electronic health records (not including billing records)?”

The measure of a “basic” EHR system was defined by an expert panel and has been used to monitor EHR adoption since 2006.¹¹ A basic EHR is a system with the following seven electronic capabilities: recording patient history and demographic information; maintaining patient problem lists; recording clinical notes; recording medication and allergy lists; viewing laboratory results; viewing imaging reports; and using computerized prescription ordering.¹²

HEALTH INFORMATION EXCHANGE WITH OTHER PROVIDERS We used a broad measure of HIE that focused on physicians’ electronic exchange of clinical data with other providers, including affiliated partners. HIE with any other providers was determined by a “yes” response to the question, “Do you share any patient health information electronically (not fax) with other providers, including hospitals, ambulatory providers, or labs?”

The survey also collected information on physicians’ electronic HIE by organizational affiliation of the exchange partner for specific types of health data: lab results, imaging reports, patient problem lists, medication lists, and medication allergy lists. We used the following two categories to report the rate of electronic HIE with different partners. *HIE inside the organization* was defined as sharing one or more types of health data electronically with either or both of

“ambulatory providers inside your office/group” and “hospitals with which you are affiliated.” This HIE is needed when provider organizations have multiple EHRs or other electronic systems that are not interoperable. *HIE outside the organization* was defined as sharing one or more types of health data electronically with either or both of “ambulatory providers outside your office/group” and “hospitals with which you are not affiliated.”

COMPUTERIZED CAPABILITIES FOR PATIENT ENGAGEMENT The survey collected information on the availability of specific computerized capabilities and whether these capabilities were “used routinely.” We focused on four EHR capabilities related to meaningful-use objectives for engaging patients and families. The first capability is required to meet stage 1 core criteria for meaningful use: providing patients with clinical summaries for each visit. The other three capabilities are required to meet stage 2 core criteria for meaningful use: identifying educational resources for patients’ specific conditions; exchanging secure messages with patients; and providing patients with the ability to view online, download, or transmit information from their medical record.

For each of the four capabilities, we report the proportion of physicians having the capability and the proportion of physicians routinely using the capability among those who had adopted it (Appendix 1).¹³

ANALYSES We calculated univariate descriptive statistics to assess the rate of EHR adoption from

2009 to 2013 and the rate of HIE and routine use of patient engagement functionalities in 2013. We used multivariate logistic regression to examine physician and practice characteristics associated with eight dependent variables related to EHR adoption, described in the previous section; HIE; and the routine use of computerized capabilities for patient engagement by providers that have those capabilities.

Using the logistic regression estimates, we calculated the predicted probability of EHR adoption for each physician and practice characteristic after adjusting for other characteristics. We also examined the characteristics associated with electronic HIE with other providers and the routine use of computerized capabilities for patient engagement in 2013. Adjusted odds ratios from multivariate logistic regression are reported in the online Appendix (Appendices 3–5).¹³

All analyses were weighted to account for non-response bias. Standard errors accounted for the sample design.

LIMITATIONS Our study had several limitations. First, self-reported survey data may overestimate EHR adoption and use if respondents were more likely to have been adopters. To address this limitation, we weighted all analyses to account for nonresponse bias. Some specialties and states had higher response rates than others did. Thus, we used both specialty and state to adjust for nonresponse bias.

Second, the survey measured the number of physicians at the location where they saw the most ambulatory care patients, as is common in these kinds of surveys. However, practices may have additional physicians at other locations. As a result, we may have underestimated the number of physicians working in some practices.

Third, our data enabled us to examine only whether or not providers engaged in HIE—not the volume of the information they exchanged with other providers. And fourth, it is possible that respondents had varying interpretations of *routine use* of patient engagement capabilities.

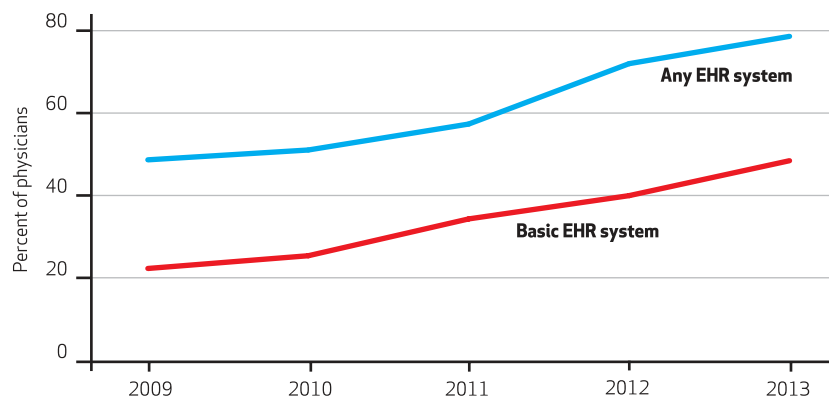
Study Results

ELECTRONIC RECORDS ADOPTION We found that in 2013, 78 percent of office-based physicians reported having adopted some type of EHR system (Exhibit 1). Furthermore, 48 percent had a basic EHR system—a doubling of the adoption rate in 2009 and an increase of 22 percent since 2012.

PHYSICIAN CHARACTERISTICS The adoption of basic EHR systems in 2013 varied according to physician and practice characteristics

EXHIBIT 1

Office-Based Physicians’ Adoption Of Electronic Health Record (EHR) Systems, By Level Of Capability, 2009–13



SOURCE Authors’ analysis of data from the 2009 National Ambulatory Medical Care Survey and the 2009–13 Electronic Health Records Survey. **NOTES** Percentages are unadjusted. “Any EHR system” means a health record system that is partially or all electronic. A “basic EHR system” has the following seven capabilities: recording patient history and demographic information; maintaining patient problem lists; recording clinical notes; recording medication and allergy lists; viewing laboratory results; viewing imaging reports; and using computerized prescription ordering.

(Exhibit 2). Fifty-three percent of primary care physicians had a basic EHR system in 2013, compared to 43 percent of physicians in other specialties. Two-thirds of physicians in practices with eleven or more physicians had a basic EHR, compared to 37 percent of solo practitioners.

The largest differences in basic EHR adoption rates were by practice size and ownership (Appendix 3).¹³ Relative to solo practitioners, physicians in practices with six or more physicians had 172–255 percent higher odds of basic EHR adoption. Physicians in practices owned by hospitals or academic medical centers or by HMOs or other organizations had 43–204 percent higher odds of adoption than physicians in practices owned by physicians.

Physicians in primary care specialties, multi-specialty practices, or the Midwest had significantly higher rates of EHR adoption, compared to physicians in other specialties, single-specialty practices, or the Northeast. Physician age and location in a Metropolitan Statistical Area were not associated with the adoption of a basic EHR.

HEALTH INFORMATION EXCHANGE WITH OTHER PROVIDERS Thirty-nine percent of office-based physicians reported having any electronic HIE with other ambulatory providers or hospitals in 2013 (Exhibit 3). Rates of HIE inside the organization were higher than those outside.

Physician and practice characteristics were associated with engaging in HIE (Appendix 4).¹³ Physicians in larger practices had 36–99 percent higher odds of any electronic HIE, compared to solo practitioners. Physicians in practices owned by hospitals or academic medical centers or by health maintenance organizations (HMOs) or other organizations had 146–185 percent higher odds of any HIE relative to physician-owned practices. Multispecialty practice type was associated with 110 percent higher odds of any HIE, compared to single-specialty practices.

The magnitude and significance of the associations between physician characteristics and HIE both overall and inside the organization were similar. In contrast, very few characteristics were associated with HIE outside the organization. The rate of having any outside HIE was significantly lower among physicians in practices that were owned by community health centers and those that were located outside of Metropolitan Statistical Areas.

ROUTINE USE OF PATIENT ENGAGEMENT CAPABILITIES In 2013 about two-thirds of office-based physicians had the capability to electronically provide patients with visit summaries or patient-specific educational resources (Exhibit 4). About half had the capability to exchange secure messages with patients.

The routine use of two patient engagement capabilities lagged behind the use of other such capabilities. Four in ten physicians had the capability to enable patients to view online, download, or transmit their health information electronically (Exhibit 4). However, only about half of these physicians routinely used this capability. Similarly, only about a third of the physicians with secure messaging capability reported that it was routinely used (Appendix 1).¹³

Among the physicians who had adopted patient engagement functionalities, practice size, type, and ownership were associated with a greater likelihood of routinely using the capabilities (Appendix 5).¹³ Relative to solo practitioners, physicians in the largest practice category (eleven or more physicians) had 82–145 percent higher odds of routinely using secure

EXHIBIT 2

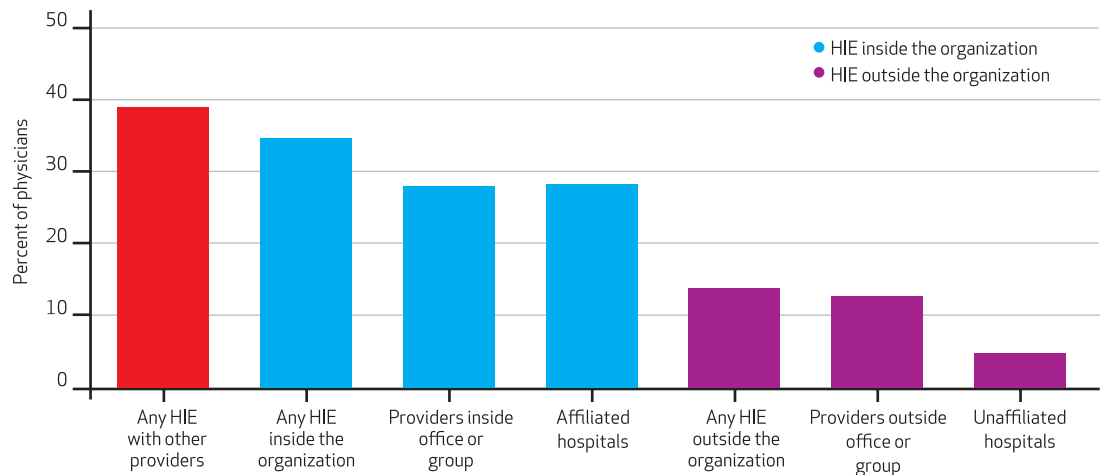
Adoption Rate Of Basic Electronic Health Record (EHR) Systems, By Selected Physician And Practice Characteristics, 2013

Characteristic	Basic EHR adoption rate
PHYSICIAN SPECIALTY	
Primary care	53.3%
Other	42.9****
PHYSICIAN AGE (YEARS)	
Under 50	49.9
50 or older	46.9
PRACTICE SIZE (NUMBER OF PHYSICIANS)	
1	37.1
2–5	44.2**
6–10	59.8****
11 or more	65.6****
PRACTICE TYPE	
Single specialty	44.5
Multispecialty	58.6****
PRACTICE OWNERSHIP	
Physician or physician group	45.6
Hospital or academic medical center	53.6**
HMO or other health care organization	69.5****
Community health center	36.5*
Other or unknown	39.1
REGION	
Northeast	43.5
Midwest	53.5***
South	47.2
West	48.9
METROPOLITAN STATISTICAL AREA	
Yes	48.2
No	46.7

SOURCE Authors' analysis of data from the 2013 Electronic Health Records Survey. **NOTES** Basic EHR adoption rates are adjusted percentages based on multivariate logistic regression that controlled for physician specialty and age; practice size, type, and ownership; region; and metropolitan status. Practice size refers to the location where the physician saw most ambulatory care patients. The first variable listed in each category is the reference group. Significance denotes difference from reference category. HMO is health maintenance organization. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$ **** $p < 0.001$

EXHIBIT 3

Office-Based Physicians' Electronic Health Information Exchange (HIE) With Other Providers, By Organizational Affiliation, 2013



SOURCE Authors' analysis of data from the 2013 Electronic Health Records Survey. **NOTE** Percentages are unadjusted.

messaging; patient-specific education; and the capability of having patients view, download, or transmit information.

Physicians in practices owned by hospitals or academic medical centers or by HMOs or other organizations had 51–219 percent higher odds of routinely using secure messaging or the view, download, or transmit capability, compared to those in physician-owned practices. Physicians in multispecialty practices had 50–68 percent higher odds of using secure messaging and after-visit summaries, compared to those in single-specialty practices.

Physician specialty, age, and location in a Metropolitan Statistical Area were not associated with the use of patient engagement capabilities among those with the capability.

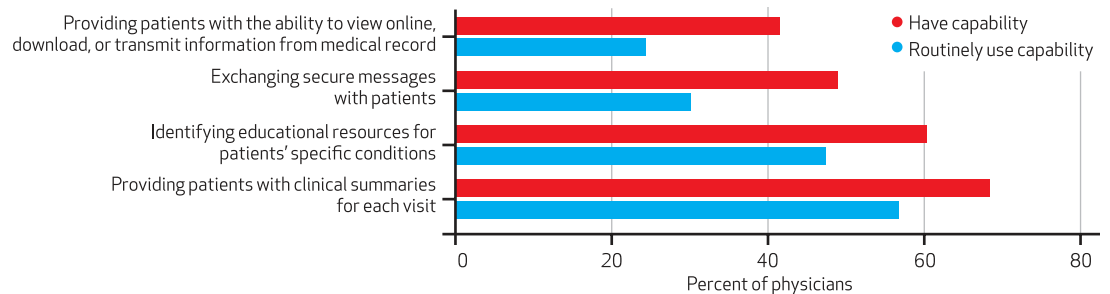
Discussion

We found steady growth in EHR adoption among office-based physicians since the start of HITECH in 2009. In 2013 nearly half of all US office-based physicians had the capabilities associated with a basic EHR. This percentage has nearly doubled since 2010.

Compared to larger practices and primary care physicians, we found that solo practitioners and other specialty physicians continued to lag behind. However, we found little difference in the adoption and use of EHRs by physician age, region, or rural status. These results suggest that although important progress toward widespread EHR adoption continues, particular areas will require additional attention to ensure an even and, ultimately, universal use of these systems. One set of characteristics was strongly as-

EXHIBIT 4

Office-Based Physicians' Adoption And Routine Use Of Computerized Capabilities For Patient Engagement, 2013



SOURCE Authors' analysis of data from the 2013 Electronic Health Records Survey. **NOTE** Percentages are unadjusted.

Our findings point to the need to support the majority of physicians who have yet to engage in electronic exchange with other providers.

sociated with whether or not a physician had adopted a basic EHR: practice organization and ownership. Physicians in large multispecialty practices—especially those that were owned by hospitals or other large health care organizations—not only had higher rates of adopting EHRs but also were more likely both to engage in HIE and to use EHR capabilities to engage patients in their care.

These findings may not be surprising. Indeed, we suspect that these results likely reflect greater access to financial resources, more managerial resources (the ability to choose and implement IT systems), or different care delivery models that require and more clearly reward a stronger IT infrastructure.¹⁴

Our HIE results have important implications for future policy emphasis and resources. In 2013 about four in ten physicians had any electronic exchange with other providers, and one in seven exchanged clinical data with providers outside their organization. HIE has been and continues to be a major policy priority, both for Congress when it passed HITECH and for the Obama administration.

The Office of the National Coordinator for Health Information Technology has a multi-prong approach to promoting HIE.^{15,16} In recent years there has been progress in expanding the infrastructure and services available to support health information exchange,¹⁷ and there has been growth in the adoption of health IT functionalities to support the exchange of some types of clinical information.⁵ However, our findings point to the need to support the majority of physicians who have yet to engage in electronic exchange with other providers.

There are many reasons why physicians may not be sharing clinical data with other providers, especially with those outside their organization. There are privacy concerns¹⁸ and technical bar-

riers because of incompatible systems.¹⁹ Limited interoperability of EHR systems across vendor platforms can hinder HIE, even among providers in the same organization. Additionally, HIE often requires the redesign of clinical work flow,²⁰ which is inherently disruptive and may be difficult to justify in the absence of a clear business case for HIE.

Previous analyses have found that providers often fail to share clinical data (whether those data are on paper or in electronic systems) at the time of clinical care transitions.²¹ Broader delivery system reforms, such as accountable care organizations and readmission penalties, may provide an incentive to ensure that when patients leave one site of care for another, their information follows them electronically.²² It will be critical to assess whether these and related strategies are driving broad-based electronic HIE as they are more widely implemented.

The routine use of computerized capabilities for patient engagement was also low in 2013, with only one-quarter of physicians routinely providing patients with the ability to view, download, or transmit their health record. Physicians who opt to provide these capabilities by implementing a patient portal linked to their EHR may face several challenges.

First, patients' uptake of patient portals has been relatively low. Lack of awareness regarding the availability of these capabilities has been identified as a barrier, along with poor usability.^{23,24} Second, physicians may worry that patient portals might generate a large volume of clinical issues that require responses (time for which the physician cannot bill).²⁵ And finally, some providers are concerned that accessing these data might make patients confused or worried.

These concerns make sense. However, most of the data suggest that patients like having access to their information even if they don't use it regularly, and they rarely generate substantial new work for the physician.²⁶ Stage 2 of the meaningful-use program requires the adoption of computerized capabilities for patient engagement, which will likely drive their greater use among both providers and patients and spur innovation in this area.

Policy Implications

Our findings have several policy implications. First, EHR adoption continues to increase at a steady pace. However, understanding what is holding back the physicians who have not yet adopted a basic EHR is critically important.

Many providers may not feel that the available products meet their needs or have been designed with their work flow in mind. A 2011 survey

found that nonadopters cited many barriers to EHR adoption, including cost, productivity loss, and difficulty in finding a reliable EHR that met their practice's needs.²⁷ We need to continue to track and understand the factors holding nonadopters back so that the next generation of policies can be designed to result in universal use of EHR systems.

Second, current policies have focused on expanding HIE¹⁵ and patient engagement,²⁸ both directly through the meaningful-use program and through broader delivery system reforms such as accountable care organizations and re-admission penalties. It is necessary to better understand the barriers to greater HIE and patient engagement and address them directly.

Both of these areas are critical to improving the efficiency and effectiveness of the health care delivery system. However, they carry a unique set of challenges because they require systematic and regular contact with external entities. In particular, new work flows are required to ensure that providers and patients engage with the information.

Furthermore, there may be cognitive barriers to incorporating information into clinical decisions and patients' self-management efforts. A more sustained effort to understand these challenges and what might be done to overcome them is needed. This is particularly critical for future stages of the meaningful-use program, which will emphasize the use of the digital infrastructure that was implemented in earlier stages of the program to achieve improvements in the cost and quality of care.

Conclusion

Using the latest national data, we found that

Many providers may not feel that the available products meet their needs or have been designed with their work flow in mind.

since the passage of HITECH in 2009 there has been steady growth in the adoption of EHR systems among office-based physicians. Nonetheless, there is substantial work ahead, since about half of these providers have yet to adopt at least a basic EHR. The rates of adoption varied by practice size and ownership in 2013. However, the small differences suggest that the gaps are likely surmountable through additional policy efforts.

Paying close attention to HIE and online patient engagement will be especially important in the future to ensure that federal incentives translate into better care for patients. HITECH focused on implementing the digital infrastructure. Policies now should address barriers to broader EHR use to support the care coordination and patient engagement objectives in new payment and delivery reforms. ■

Chun-Ju Hsiao worked on this article out of office hours. The views expressed in this article are those of the authors and do not necessarily reflect those of the

Agency for Healthcare Research and Quality, the Office of the National Coordinator for Health Information Technology, or the Department of Health

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