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Meaningful Use of Electronic Health Record by Rural Health Clinics [Working Paper]

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Maine Rural Health Research Center
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February 2014

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Introduction

The use of health information technology (HIT) in general, and electronic health records (EHRs) in particular, is increasingly viewed as necessary to enable hospitals, physicians groups, and other providers to manage and document the quality of care provided to patients. Use of an EHR is also considered a prerequisite to cope with the demands of health reform and evolving practice transformation opportunities such as patient-centered medical homes and accountable care organizations. The Health Information Technology for Economic and Clinical Health Act (HITECH) of 2009, which was enacted as part of the American Recovery & Reinvestment Act of 2009 (hereafter collectively referred to as HITECH), committed substantial resources ($30 billion) and created financial incentives to support the adoption and meaningful use of EHRs.

As will be described in greater detail later in this paper, the term meaningful use describes the use of EHR technology to improve the delivery of care and builds on previous policy initiatives to modernize the U.S. health care infrastructure, in part, by promoting adoption of EHR technology. In current usage, the term meaningful use describes two related concepts. The first is a framework which defines the role of EHRs and health information technology in addressing the following five health outcome priorities: 1) improving health care quality, safety, and efficiency, and reducing health disparities; 2) engaging patients and families in their health; 3) improving care coordination; 4) improving population and public health; and 5) maintaining privacy and security of patient health information.[1,2] Expected benefits of the meaningful use of EHRs include: improved clinical and population health outcomes, increased transparency, and improved patient empowerment. The second is a process through which health care professionals and hospitals can qualify for Medicare and Medicaid incentive payments for adopting and using EHRs to achieve specified objectives[3] and demonstrate that they are using their EHRs in ways that positively affect the care of their patients. To qualify for incentive payments, providers must meet the Centers for Medicare and Medicaid Services (CMS) defined minimum requirements for meaningful use by attesting to their performance on objectives aligned with the above five priority areas.

With more than 4000 clinics serving rural residents nationwide, Rural Health Clinics (RHCs) are an important source of primary care services in rural areas.[4] Despite their important role in the health care infrastructure of rural communities, little information is available on their rate of EHR adoption and use, the barriers to EHR adoption they experience, or the technical assistance

and support resources necessary to encourage greater rates of adoption. This study was conducted to identify the rates of EHR adoption among a national random sample of RHCs, and the extent to which RHCs that have adopted an EHR are likely to achieve Stage 1 meaningful use of their EHRs.

Despite the importance of EHRs in today's health care environment, EHR adoption rates remain relatively low, with 40 percent of office-based physicians and 44 percent of hospitals reporting adoption of at least a basic EHR in 2012.[5] Physician practices and facilities that have adopted an EHR are more likely to be larger organizations located in urban areas. Office-based physicians that have adopted an EHR are more likely to be primary care physicians, practice in larger groups (more than 11 physicians), and/or practice in organizationally-owned rather than private practice settings.[5-7]

In a recent study, Hsiao and colleagues[7] found that relative increases in EHR adoption were highest among physicians who had traditionally low levels of EHR adoption (e.g., older physicians, physicians working in solo practices). Contrary to past perceptions, they found that rural physicians had higher rates of EHR adoption in 2012 than physicians in large urban areas. As in previous studies, primary care physicians continued to have higher rates of adoption than non-primary care physicians. The authors found no differences in the rates of EHR adoption across physicians practicing in high poverty areas compared to those in low poverty areas. However, small practices (i.e., five or fewer physicians) were less likely to have adopted an EHR than large practices (six or more physicians). Hsiao and colleagues also found that physicians who had adopted an EHR tended to routinely use the key capabilities of their EHRs, specifically particularly those specified by the Stage 1 core criteria for meaningful use.

Policy Context for Meaningful Use of Electronic Health Records (EHRs)

Meaningful use of EHRs and HIT has become a national health care priority with the passage of HITECH in 2009, providing resources to support the adoption and meaningful use of EHRs. Despite the recent attention focused on the meaningful use of EHRs, origins of the current policy interest date back to the early 1990s.

The Institute of Medicine (IOM) has been a leading advocate for the use of HIT in improving patient care. In 1991, the IOM called for "nationwide implementation of computer-based patient records."[8] In its 2001 *Crossing the Quality Chasm* report, the IOM recognized the potential role

of HIT in the development and operation of systems of care that are safe, effective, patient-centered, timely, efficient, and equitable.[9] The report acknowledged the relatively slow growth in the use of HIT to improve administrative and clinical processes and identified investment in HIT as one of the important organizational capabilities for redesigning the U.S. health care system. The IOM called for a "renewed national commitment to building an information infrastructure to support health care delivery, consumer health, quality measurement and improvement, public accountability, clinical and health services research, and clinical education."[9] The IOM further suggested the "elimination of most handwritten clinical data by the end of the decade" as a system goal.[9]

The push for widespread adoption of EHRs was given a boost in 2004 by President George Bush with the creation of the Office of the National Coordinator for Health Information Technology (ONC) within the Department of Health and Human Services (DHHS).[10] The ONC was created in support of President Bush's goal that most Americans would have access to an interoperable electronic medical record by 2014. President Bush's vision and the creation of the ONC encouraged the formation of numerous stakeholder panels and commissions that served to move the field forward by defining goals, standardizing language and terminology, and standardizing data types. For example, the framework for meaningful use grew out of the work of the National Priorities Partnership, a group convened by the National Quality Forum and funded by the U.S. DHHS. The group identified the following national system priorities to focus performance improvement efforts: patient engagement; reduction of racial disparities; improved safety; increased efficiency; coordination of care; and improved population health.[10,11] Privacy and security were added to the list by the Meaningful Use Work Group of CMS's Health IT Committee.[11] The meaningful use framework lays out criteria to measure the extent to which physicians or other clinicians with prescription privileges are using EHR technology to positively manage the quality of care they provide.

HITECH contributed to the development of meaningful use by incentivizing adoption and deployment of EHRs and HIT more generally by:[12-14]

1. Promoting HIT, including improving health care quality, safety, and efficiency, and the application and use of HIT standards;
2. Conducting HIT testing, including pilot testing of standards, implementation specifications, a voluntary testing program, and research and development programs;

3. Funding grants/loans and demonstration programs, including:
    a. Medicaid and Medicare monetary incentives for eligible health care professionals and hospitals when they adopt and achieve meaningful use of certified EHR technology,
    b. funding to strengthen HIT infrastructure,
    c. HIT implementation assistance including the creation of Regional Extension Centers to provide EHR and meaningful use technical assistance to under-resourced providers, and
    d. other grant support for HIT;
4. Focusing on privacy/security and the Act's relationship to other laws and reporting requirements;
5. Establishing State Health Information Exchanges to facilitate information exchange between providers; and
6. Encouraging HIT workforce development through community college HIT training programs.

Medicare meaningful use incentives are available to eligible providers[*] through 2016 (depending on the date of adoption).[15,16] HITECH also contains provisions for Medicare penalties for eligible professionals that fail to achieve meaningful use of an EHR by 2015. For those failing to achieve meaningful use, their Medicare payments will be reduced by one percent in 2015, two percent in 2016, and three percent in 2017 and subsequent years.[2,17] If less than 75 percent of EPs have become meaningful users of EHRs by 2018, the adjustment will change by one percentage point each year to a maximum of five percent.

Since RHCs submit Medicare claims as a facility to Medicare Part A, rather than under the Part B fee schedule, individual RHC clinicians are not eligible for Medicare meaningful use incentives. RHC clinicians who provide over 50 percent of their total encounters through the RHC over a period of 6 months in the most recent calendar year are eligible for Medicaid meaningful use incentives, as long as they practice in an RHC with a minimum 30 percent of its volume attributable to "needy" individuals.[15] Needy individuals are defined as such by virtue of receiving: medical assistance from Medicaid or the Children's Health Insurance Program

[*] For purpose of Medicaid meaningful use incentives, eligible providers include: physicians; nurse practitioners; certified nurse-midwives; dentists; and physician assistants who furnish services in an FQHC or RHC that is led by a physician assistant (see reference #15). Facilities such as RHCs and Federally Qualified Health Centers (FQHCs) are not eligible to receive meaningful use incentive payments directly; rather, their clinicians (also known as eligible providers for purposes of MU incentive payments) are eligible to receive incentive payments for meaningful use of their EHRs. As noted above, RHCs are not eligible for Medicare meaningful use payments based on their submission of claims as a facility rather than under the names of individual providers. For purposes of Medicare meaningful use incentives, eligible providers are defined as doctors of medicine or osteopathy, oral surgery or dental medicine; podiatric medicine; optometry; and chiropractic medicine (see reference #16).

(CHIP); uncompensated care from the eligible provider; or services at either no cost or reduced cost based on a sliding scale. This is not necessarily a disadvantage to RHCs, provided they meet the 30 percent standard, as the Medicaid meaningful use incentives provide greater flexibility in terms of adoption date; maximum payout is higher ($63,750 over six years compared to $44,000 over five years from Medicare); and, unlike Medicare meaningful use incentives, Medicaid meaningful use incentives do not decline for the first five years based on the year of adoption.[18]

Understanding Meaningful Use

HITECH[19] established the following three key requirements defining a "meaningful EHR user":

- Use of certified EHR technology in a meaningful manner, including the use of electronic prescribing as determined to be appropriate by the Secretary;
- Use of certified EHR technology that is connected in a manner that provides for the electronic exchange of information to improve the quality of health care, such as promoting coordination of care; and
- Submission of information on clinical quality measures (and other such measures as selected by the Secretary) using certified EHR technology.

These three requirements, as discussed earlier, were supplemented by the following framework for meaningful use adapted from the national priorities and goals established by the National Priorities Partnership (NPP):[10]

- Improving quality, safety, efficiency, and reducing health disparities;
- Engaging patients and families in their health care;
- Improving care coordination;
- Improving population and public health;
- Ensuring adequate privacy and security protections for personal health information.

As described in its recommendations to the Health IT Policy Committee, the Meaningful Use Workgroup used the NPP's goals and priorities (i.e., patient engagement, reduction of racial disparities, improved safety, increased efficiency, coordination of care, and improved population health) for the first four elements of their meaningful use framework.[11] The Workgroup added the fifth area of privacy and security to reflect the importance of preserving

the confidentiality of patient information and ensuring patient trust in the use of EHRs. The concept of meaningful use is predicated on the belief that HIT is necessary to achieve these priorities and goals.

As developed by the U.S. DHHS, meaningful use standards are being implemented in three stages over the five year period 2011-2016 (see Figure 1).

Figure 1. Stages of Meaningful Use

Stage 1: 2011-2012 Data Capture and Sharing	Stage 2: 2014 Advanced Clinical Processes	Stage 3: 2016 Improved Outcomes
Criteria focus	**Criteria focus**	**Criteria focus**
Electronically capturing heath information in a standardized format	More rigorous health information exchange (HIE)	Improving quality, safety, and efficiency leading to improved health outcomes
Using that information to track key clinical conditions	Increased requirements for e-prescribing and incorporating lab results	Decision support for national high-priority conditions
Communicating that information for care coordination processes	Electronic transmission of patient care summaries across multiple settings	Patient access to self-management tools
Initiating the reporting of clinical quality measures and public health information	More patient-controlled data	Access to comprehensive patient data through patient-centered HIE
Using information to engage patients and their families in their care		Improving population health

Source: HealthIT.gov. What Is Meaningful Use?[3]

Stage 1 meaningful use measures: As mentioned earlier, one aspect of meaningful use established by HITECH involves using a certified EHR to report on clinical quality and other measures identified by the Secretary of Health and Human Services. Through an extensive process involving input from a variety of health care and HIT stakeholders, a set of Stage 1 meaningful use measures were identified and released by CMS on July 28, 2010.[20] The measures are summarized in Figures 2 and 3 on the following pages.

Originally, the Stage 1 measures set for eligible providers consisted of 25 measures that included 15 required core measures and 10 menu measures.[21] Beginning in 2013, a measure related to the capacity to exchange health information between health providers was eliminated from the core set due to provider confusion on the measure.[22] To achieve Stage 1 meaningful

use and qualify for meaningful use incentive payments, providers must meet the criteria for all 14 core measures and at least five of the remaining menu measures. Of those core and menu measures, 16 require data submission and eight (originally nine) require yes/no attestation.

Figure 2. Stage One Meaningful Use Objectives: Core Set

Goal(s)	Objective	Measure Specifications
Improve quality, safety, efficiency, and reduce health disparities	CPOE	More than 30 percent of patients on meds with at least one CPOE order
	Drug-drug and drug allergy interactions	Feature implemented/turned on (yes/no)
	Up to date problem list	More than 80 percent of patients have at least one entry (or an indication of no known problems) recorded as structured data
	ePrescribing	More than 40 percent of prescriptions are transmitted using EHR
	Active medication list	More than 80 percent of patients have at least one entry (or entry indicating that patient is not on medications) recorded as structured data
	Active medication allergy list	More than 80 percent of patients have at least one entry (or entry indicating patient has no medication allergies) recorded as structured data
	Demographic information	More than 50 percent of patients have demographics (preferred language, gender, race, ethnicity, date of birth) recorded as structured data
	Vital signs	Vital signs (height, weight, BP, body mass index (BMI), growth charts for children 2-20 including BMI) are recorded as structured data for more than 50 percent of patients age two and over
	Smoking status	More than 50 percent of patients 13 years old or older have smoking status recorded as structured data
	Quality measures	Report ambulatory clinical quality measures to CMS or, in the case of Medicaid EPs, the states (yes/no)
	Clinical decision support	Implement one clinical decision support rule relevant to specialty or high clinical priority with ability to track compliance with rule (yes/no)
Engage patients and families in their health care	eHealth summary/information	More than 50 percent of patients requesting an electronic copy of their health information (including diagnostic test results, problem list, medication lists, and medication allergies) receive it within three business days
	Clinical summaries	For more than 50 percent of office visits, patients receive a visit summary within three business days
Improve care coordination	Information Exchange - ***No longer required beginning 2013 (CMS 2012)***	Has performed at least one test of its capability to exchange key clinical information among providers of care and patient authorized entities electronically (yes/no)
PHI Privacy/security protection	Protect personal health information (PHI)	Conduct or review a security risk analysis per 45 CFR 164.308(a)(1), implement security updates as necessary, and correct security deficiencies (yes/no)

Source: Community Clinics Health Network. Eligible Professional Meaningful Use Table of Contents: Core and Menu Set Measures. 2010, November 7.[21]

Figure 3. Stage One Meaningful Use Objectives: Menu Set

Goal(s)	Objective	Measure Specifications
Improve quality, safety, efficiency, and reduce health disparities	Drug formulary checks	Implemented this function and has access to at least one internal or external formulary during the entire EHR reporting cycle (yes/no)
	Lab results	More than 40 percent of clinical lab test results (results are either positive/negative or numerical format) are incorporated as structured data
	Patient lists/registries	Generate at least one patient list based on a specific condition for QI, reduction of disparities, research, or outreach (yes/no)
	Patient reminders	More than 20 percent of patients 65 or older or 5 years or younger were sent an appropriate reminder for preventive/follow up care
Engage patients and families in their care	eAccess	At least 10 percent of patients are provided with electronic access to their health information within four business days of being updated in the EHR
	Patient education resources	More than 10 percent of patients are provided patient-specific educational resources using EHR technology
Improve care coordination	Medication reconciliation	Medication reconciliations are performed for more than 50 percent of patients transitioned from another source of care into the care of the EP
	Summary of care record	Provide a summary of care record for more than 50 percent of patients transitioned/referred to another setting of care
Improve population and public health	Immunization registries	Performed at least one test of capacity to submit electronic immunization data to immunization registry (unless no registry is capable) and follow up submission if the test is successful (yes/no)
	Syndromic surveillance	Performed at least one test of capacity to submit electronic syndromic surveillance data to public health agencies (unless no public health agency is capable) with follow-up submission if the test is successful (yes/no)

Source: Community Clinics Health Network. Eligible Professional Meaningful Use Table of Contents: Core and Menu Set Measures. 2010, November 7.[21]

Rural Health Clinics (RHCs) and EHR Adoption

RHCs are an important source of primary care services in rural areas, with over 4,000 clinics operating nationwide.[4] To date, no national studies on the rate of EHR adoption by RHCs have been conducted. This study was conducted to identify the rates of EHR adoption among a national random sample of RHCs, and the extent to which RHCs that have adopted an EHR are likely to achieve Stage 1 meaningful use. In light of the prior studies of EHR adoption by physicians, which suggest that small physician practices (which would include some RHCs) may be less likely to adopt an EHR, we sought to answer the following research questions:

- What is the overall rate of EHR adoption among RHCs?
- Among those RHCs that have adopted an EHR, what is the level of meaningful use of their EHRs?
- Does the rate of EHR adoption and meaningful use of EHRs vary between provider-based and independent RHCs?
- Does the rate of EHR adoption and meaningful use vary by the size of the RHC (based on the number of providers)?
- How do RHCs that have adopted an EHR perform on the core and menu set meaningful use criteria?

Study Description, Comparison of Survey Respondents to Overall Population of RHCs and Study Limitations

The study drew a random sample of 660 RHCs from the CMS Provider of Services file. The survey was conducted electronically using Survey Monkey, which required participants to have a functioning email address. Data collection for the survey took place during spring and summer of 2011. Due to an initial low response rate (67 completed surveys), the survey instrument was revised and released again in March of 2012. Data collection with extensive follow up activity continued through December 2012, resulting in an additional 158 completed surveys. One difficulty encountered in fielding the survey was that clinic administrator and/or owner contact information, including email address, is not available through public data sources such as the Provider of Services file or the public CMS RHC list. Instead, contact information was collected from state licensing and survey divisions, State Offices of Rural Health, state RHC associations, and through phone calls to individual clinics. In the end, we were unable to obtain contact information for 114 clinics from our sample.

Drafts of the survey instrument were reviewed by Bill Finerfrock, Executive Director of the National Association of Rural Health Clinics and Ron Nelson, PAc, co-founder and past-president of the National Association of Rural Health Clinics, clinic administrator, and RHC consultant. Finally, the survey was pre-tested with a small sample of RHCs and revised based on their feedback. Based on our pre-test of the instrument, the survey took approximately 30 minutes to complete for those with an EHR, and approximately 20 minutes for those without an EHR.

Invitations to participate in the survey were sent to the identified contacts, typically either the clinic administrator or owner, in each clinic. The invitation contained a link to Survey Monkey that was unique to the clinic. Staff from the Muskie School of Public Service's Survey Research Center followed up with non-respondents at least three times by email and telephone. Information on the survey was sent to each State Office of Rural Health and State Rural Health Clinic Association, as well as the National Association of Rural Health Clinics. Each organization was asked to share information on the survey with their constituents and encourage them to participate.

As we worked through the survey, 58 clinics from our sample were excluded as the clinic had either closed, had a phone number that was not in service, had terminated participation in the RHC program, or had converted to another type of provider. As discussed above, we were unable to obtain email addresses for 114 clinics in our sample despite multiple attempts and contacts. As a result, these clinics never received an invitation to participate in the survey. This left us with a usable sample of 488 clinics that received invitations to participate in the online survey. Of the usable sample, our response rate for completion of the survey was 46.7 percent. Overall, survey respondents were similar to the overall population of RHCs based on key characteristics using the CMS Provider of Services file (see Table 1). The major differences involved the geographic distribution of survey respondents, with a somewhat higher percentage located in the Northeast, Midwest, and West, and somewhat fewer respondents located in the South than the distribution of the overall population of RHCs.

Caution should be exercised in interpreting these results due to the small "n" of our analytic file (225 clinics responded to our survey). As we undertook the analysis of subsets of the responding clinics (e.g., clinics reporting implementation of an EHR or clinics reporting performance on different meaningful use measures), the "n" for any given question was substantially smaller. As a result, few of our findings are statistically significant and we have not reported p-values. Although not statistically significant based on the small size of the analytic file, it should be noted that we do have a rich data set on EHR adoption, performance on Stage 1 meaningful use measures, and barriers and challenges of EHR implementation among responding clinics.

Table 1. Comparison of Survey Respondents to Overall Population of RHCs

	Survey Respondents	All RHCs
Number of RHCs	225	3798
Independent RHCs	56.0%	54.3%
Provider-Based RHCs	44.0%	45.7%
Location in Census Region		
Northeast	6.2%	3.6%
Midwest	48.0%	39.0%
South	25.8%	39.5%
West	20.0%	17.9%
Ownership Type		
Government Owned	12.4%	16.7%
For Profit	45.8%	45.5%
Non-profit	41.8%	37.8%

While a total of 225 clinics responded to the survey, they did not all respond to every question presented to them. As a result, the reported "n" varies from question to question. For sake of clarity, we report the actual number of clinics responding to each question.

One final potential limitation is worth noting. We observed some unexpected differences between independent and provider-based clinics in terms of their use of different technologies, particularly practice management/billing systems. Based on their assumed access to the greater resources of their parent hospitals, our hypothesis was that provider-based RHCs would report equal, if not greater, use of technology compared to independent RHCs. This was not always the case. Although we cannot explain these differences using our survey data, our experience with provider-based clinics suggests that decisions about technology and implementation may occur at the hospital system rather than clinic level. As such, practice management and billing services may be conducted using the parent hospital's system rather than a system in place at the clinic. This would understate technology use among provider-based clinics and suggests that future survey questions be worded in a way that accounts for this potential issue.

Adoption of Information Technology by RHCs

To establish contextual information on the information technology capacity of RHCs, we asked about their internet access and use of practice management software to manage clinic billing and patient account activities. In terms of internet access, almost 90 percent reported using high speed internet options such as DSL, cable, fiber optic or wireless connectivity (see Table 2).

Slightly over 2 percent of respondents had no internet access (1.3 percent) or only a dial-up connection (0.9 percent). Close to 9 percent were unsure of the type of internet connection available to their clinic. In general, RHCs have access to high speed internet access necessary for the use of HIT.

Table 2. Clinic Internet Access

	All RHCs (n=224)	Independent RHCs (n=126)	Provider-Based RHCs (n=98)
DSL	30.8%	40.5%	18.4%
Cable	9.8%	11.1%	8.2%
Fiber optic/dedicated internet access (T1)	33.9%	28.6%	40.8%
Wireless (3g/4g)	14.3%	11.9%	17.3%
Dial up	0.9%	1.6%	0.0%
No Internet access	1.3%	0.8%	2.0%
Not sure	8.9%	5.6%	13.3%

We also examined the use of practice management/billing systems by RHCs. Practice management software is designed to automate one or more of the day-to-day operations/functions of a medical practice including: capturing patient demographics; scheduling appointments; maintaining lists of insurance payers; submitting third party claims; preparing patient bills/statements; generating reports to assist in managing the clinic; or preparing cost reports.

Close to 70 percent of RHCs responding to the question regarding electronic practice management/billing systems (n=222) had such a system in use to perform practice management functions (e.g., scheduling, patient billing, etc.) for more than 90 percent of their providers and staff (see Table 3). Another 10 percent of RHCs had a practice management/billing system in use for some providers and staff. Almost 21 percent had either no electronic practice management/billing system in place or had begun installation but were not yet using the system. In general, close to 80 percent had implemented and were using practice management software to manage their clinic operations. Close to eight percent were in the process of implementing their practice management system, but were not yet using it to manage operations.

Independent RHCs were more likely than provider-based RHCs to report the use of a practice management system (83 percent vs. 75 percent, respectively). This may be due to the fact that provider-based clinics may not have their own practice management systems in place but, rather, use their parent hospital's management/billing system.

Table 3. Practice Management and Billing Systems

	All RHCs (n=222)	Independent RHCs (n=123)	Provider-Based RHCs (n=99)
Electronic PM/billing system in use in more than 90 percent of practice	69.8%	72.4%	66.7%
Electronic PM/billing system in use for some providers and staff	9.5%	10.6%	8.1%
No electronic PM/billing system	13.1%	10.6%	16.2%
Begun installation but not in use yet	7.7%	6.5%	9.1%

As shown in Table 4, independent RHCs were generally more likely than provider-based RHCs to have implemented automated practice management functions using their practice management/billing software. As above, this may reflect provider-based clinics' use of their parent hospital's practice management or billing system, as opposed to using a clinic-specific system of their own. As such, they may be less likely to report in-house implementation of the above practice management functions. At the same time, some of these practice management functions may be conducted at the hospital or system level rather than at the clinic level.

Table 4. Automated Practice Management Functions

	All RHCs (n = 176)	Independent RHCs (n = 102)	Provider-Based RHCs (n = 74)
Patient registration	79.0%	76.5%	82.4%
Patient scheduling	84.7%	84.3%	85.1%
Patient accounts receivable	83.0%	83.3%	82.4%
Electronic billing to 3rd party payers	86.4%	88.2%	83.8%
Reporting and analysis	78.4%	85.3%	68.9%
Insurance verification	58.5%	56.9%	60.8%
Produce interim cost reports	23.3%	23.5%	23.0%
Produce reports to manage clinic/ complete cost reports	73.9%	78.4%	67.6%

Adoption of Electronic Health Records (EHRs) by RHCs

Fifty-nine percent of respondents reported having implemented the use of an EHR for at least some of their providers and staff, with 52 percent reporting its use for 90 percent or more of their practice (see Table 5). Independent RHCs were more likely to have an EHR in use in at least some of their practice (69 percent) than provider-based clinics (47 percent). Notably, more provider-based clinics (26 percent) were in the process of installing their EHRs (but not yet using them) compared to independent clinics (8 percent). Once fully implemented, the percentage of independent RHCs compared to provider-based RHCs using an EHR will be comparatively similar. Overall, 25 percent of respondents had no EHR capacity.

Table 5. Implementation of Electronic Health Records (EHR)

	All RHCs (n=217)	Independent RHCs (n=121)	Provider-Based RHCs (n=96)
EHR in use in more than 90 percent of practice	51.6%	59.5%	41.7%
EHR in use for some providers and staff	7.4%	9.1%	5.2%
Begun installation but not in use yet	16.1%	8.3%	26.0%
No EHR	24.9%	23.1%	27.1%

Most commonly implemented brands of EHRs: Over 50 different EHR platforms were represented among survey participants. The six most commonly used EHR systems by vendor were:

- AllscriptsMisys (n=19)
- eClinicalWorks (n=15)
- Epic Systems Corporation (n=15)
- McKesson Provider Technologies (n=9)
- e-MDs (n=8)
- GE Healthcare/Centricity (n=8)

Characteristics of RHCs without an EHR: Most of the responding clinics (25 percent) without an EHR tended to be smaller facilities with 63.5 percent reporting one or fewer full time physicians (MDs/DOs), 17 percent reporting more than one and up to three physicians; and

19 percent reporting more than three physicians. Two thirds of RHCs without an EHR had one or fewer full-time physician assistants, nurse practitioners, or certified nurse midwives.

Computerized Physician Order Entry (CPOE): The use of CPOE is an important component of EHR use as it allows providers to electronically enter their instructions for the treatment of patients under their care. These orders are electronically communicated to the medical staff or to the departments (pharmacy, laboratory, or radiology) responsible for fulfilling the order. CPOE decreases delays in order completion, reduces errors related to handwriting or transcription, allows order entry at the point of care or off-site, provides error-checking for duplicate or incorrect doses or tests, and facilitates updating of the patient's medical record.[2]

Almost 90 percent of respondents with an EHR had a system with built in CPOE functions, and just over 78 percent used the functions for some or all of their providers (see Table 6). Slightly more independent RHCs used CPOE (81 percent) than provider-based clinics (74 percent).

Table 6. EHR Has Computerized Order Entry (CPOE) Function

	All RHCs (n=134)	Independent RHCs (n=84)	Provider-Based RHCs (n=50)
Yes-in use for some or all providers	78.4%	81.0%	74.0%
Yes but turned off or not in use	11.2%	9.5%	14.0%
No	4.5%	2.4%	8.0%
Not sure	6.0%	7.1%	4.0%

***Plans to Acquire an EHR*:** Slightly more than 37 percent of responding RHCs without an EHR had plans to acquire and implement a system within the next 12 months, and slightly more than 46 percent had plans to acquire and implement a system more than 12 months from the time of the survey. Over 16 percent reported no plans to acquire an EHR or were unsure of their clinics' plans. Provider-based RHCs, which essentially operate as a department of their parent hospital and presumably have access to the greater IT and administrative resources of that hospital, were more likely than independent RHCs to report plans to acquire and implement an EHR within the next 12 months (46.2 percent vs. 28.6 percent, respectively). Independent RHCs (18 percent)

were more likely to report no plans to implement an EHR than were provider-based clinics (7.7 percent).

Barriers/challenges impacting plans to acquire and implement an EHR: Respondents without an EHR reported that the most common barriers to acquiring and implementing an EHR were the costs to acquire and maintain an EHR (80 percent), lack of capital (57 percent), and concerns about productivity and/or income loss during transition (50 percent). Independent clinics were more likely than their provider-based counterparts to report each type of barrier. For example, lack of physician/provider support (46 percent vs. 7.7 percent) and security/privacy concerns (19 percent vs. 7.7 percent) were greater challenges for independent clinics than for provider-based clinics.

Sources of Technical Assistance and Support: To understand the extent to which RHCs are able to access technical assistance and support around their EHR decisions, and the sources of that technical assistance and support, we asked a series of questions related to this topic. In particular, we were interested in the extent to which RHCs have used their Regional Extension Centers (RECs) to support their efforts to purchase and implement an EHR. RECs were funded under HITECH in recognition of the fact that small and rural providers (including physician practices and hospitals) have historically faced challenges in maximizing the use of HIT to improve quality and coordinate care.[23] RECs provide free or reduced cost technical assistance on EHR selection, implementation, and use to priority primary care providers (i.e., doctors of medicine or osteopathy, nurse practitioners, nurse midwifes, or physician assistants with prescriptive privileges in the locality where s/he practices family medicine, internal medicine, pediatric medicine, or obstetrics and gynecology) who practice in: individual or small practices of 10 providers or less; Community Health Centers, primary care clinics, or RHCs; public or Critical Access Hospitals; or other settings that serve uninsured, underinsured, and medically underserved populations.[24]

Overall, 44 percent of responding clinics reported use of their REC for technical assistance or support related to the purchase or implementation of an EHR/HIT system. Clinics without an EHR were more likely than those with an EHR to report having contacted their area REC for technical assistance and support (51.2 percent vs. 39.5 percent, respectively) (see Table 7). This finding held true for both independent and provider-based RHCs. Just under 8 percent of all

clinics responding to this question reported that they were not aware of the REC program. Clinics that already had an EHR were more likely to report that they were not aware of the REC Program than clinics without an EHR (11 percent vs. 4 percent, respectively). This was also true for both independent and provider-based RHCs.

Table 7. Sought Technical Assistance or Support from Area HIT Regional Extension Center

	All Respondents (n=203)		Independent RHCs (n=112)		Provider-Based RHCs (n=91)	
	With EHR (n=119)	W/O EHR (n=84)	With EHR (n=76)	W/O EHR (n=36)	With EHR (n=43)	W/O EHR (n=48)
Yes	39.5%	51.2%	42.1%	50.0%	34.9%	52.1%
No	31.1%	33.3%	30.3%	38.9%	32.6%	29.2%
Not sure	18.5%	11.9%	15.8%	8.3%	23.3%	14.6%
Not aware of REC Program	10.9%	3.6%	11.8%	2.8%	9.3%	4.2%

For other types of technical assistance or support (not provided by the RECs), the source of support varied somewhat based on the clinic type. Provider-based RHCs, which operate under the supervision and direction of their parent hospitals, were more likely than independent RHCs to have received technical assistance and/or support from a parent hospital, system, or provider network (41 percent vs. 14 percent, respectively). Provider-based RHCs were also more likely than independent RHCs to report in-house expertise (20 percent vs. 12 percent). In contrast, independent RHCs were more likely than provider-based clinics to have received technical assistance and/or support from a vendor (27 percent vs. 19 percent) or external organization (e.g., quality improvement organization (34 percent vs. 14 percent). Independent RHCs were also more likely to have not received any technical assistance or support (13 percent vs. 5 percent).

Influence of and eligibility for meaningful use incentive programs: The Medicare and Medicaid EHR incentive programs are intended to encourage providers to adopt and implement EHRs and, once implemented, achieve the increasingly more rigorous Stage 2 and 3 standards of meaningful use of those systems. As discussed earlier, RHCs do not qualify for Medicare meaningful use incentives due to the fact that they submit claims as a facility under Medicare Part A rather than under the Medicare Part B fee schedule. As such, the Medicare meaningful

use incentives are not expected to have an influence on their decisions regarding adoption and meaningful use of an EHR. RHCs are, however, eligible for Medicaid meaningful use incentives, provided that 30 percent or more of their volume represents services provided to needy individuals (i.e., covered by Medicaid or CHIP or receiving uncompensated care or discounted care based on a sliding fee scale). To assess the influence of the meaningful use incentives on RHCs and the extent to which they are likely to qualify for Medicaid meaningful use incentives, we asked survey respondents about the influence of meaningful use incentives on their decisions regarding EHR implementation and the extent to which 30 percent or more of their clinic volume represented services provided to needy individuals.

Just over 69 percent of clinics without an EHR reported that the meaningful use incentives will affect their decision to implement an EHR (see Table 8). Slightly more than half (52 percent) of clinics with an EHR reported that meaningful use incentives will affect their decision to update their EHR to a certified system. These findings were consistent across independent and provider-based RHCs.

Table 8. Will Meaningful Use Incentives Affect Your Decision Regarding Implementation or Updating of an EHR?

	All Respondents (n=166)		Independent RHCs (n=89)		Provider-Based RHCs (n=77)	
	With EHR (n=127)	**W/O EHR (n=39)**	**With EHR (n=72)**	**W/O EHR (n=17)**	**With EHR (n=55)**	**W/O EHR (n=22)**
Yes	52.0%	69.2%	51.4%	70.6%	52.7%	68.2%
No	37.0%	23.1%	40.3%	23.5%	32.7%	22.7%
Not sure	11.0%	7.7%	8.3%	5.9%	14.6%	9.1%

Qualification for Medicaid Incentive Payments

While 67.5 percent of clinics indicated that 30 percent or more of their clinic volume was attributed to needy individuals, independent RHCs were more likely than their provider-based counterparts to meet the 30 percent threshold (72.3 percent vs. 61.5 percent, respectively) (see Table 9).

Table 9. 30 Percent or More of Clinic Volume Attributed to Needy Individuals

	All Respondents (n=203)	Independent RHCs (n=112)	Provider-Based RHCs (n=91)
Yes	137 (67.5%)	81 (72.3%)	56 (61.5%)
No	35 (17.2%)	17 (15.2%)	18 (19.8%)
Not sure	31 (15.3%)	14 (12.5%)	17 (18.7%)

RHC Performance on Stage 1 Meaningful Use Measures

In analyzing the performance of responding RHCs on the core and menu measures sets (see Tables 10 and 11), it is important to note that questions related to the core measures were only asked of those 128 clinics that reported active use of their EHRs (defined by the project team as using their EHRs for at least some, if not all, of their providers and staff). The 35 clinics that reported having purchased or implemented an EHR but were not yet using it to manage patients were not asked these questions, as they currently have no experience to report.

To assess RHCs' progress towards meaningful use, we asked a multi-level question for each measure with the following options:

- Are the clinic's eligible providers meeting the threshold criterion for the measure necessary to achieve meaningful use?
- Are the clinic's eligible providers using the clinic's EHR for the tasks and functions established by the measure but without meeting the established threshold criterion necessary to achieve meaningful use?
- The clinic's EHR has the function specified by the measure but it is turned off or not in use.
- The respondent did not know the answer to the question.
- No, the clinic's providers were not using the feature at all.

By using this multilevel response set, we are able to assess the extent to which clinics were either meeting the criterion for meaningful use for a given measure or at least using their EHR as specified by the measure and moving towards meeting the criterion. For purposes of the following discussion, the clinics in this latter category are those that are "approaching" the threshold.

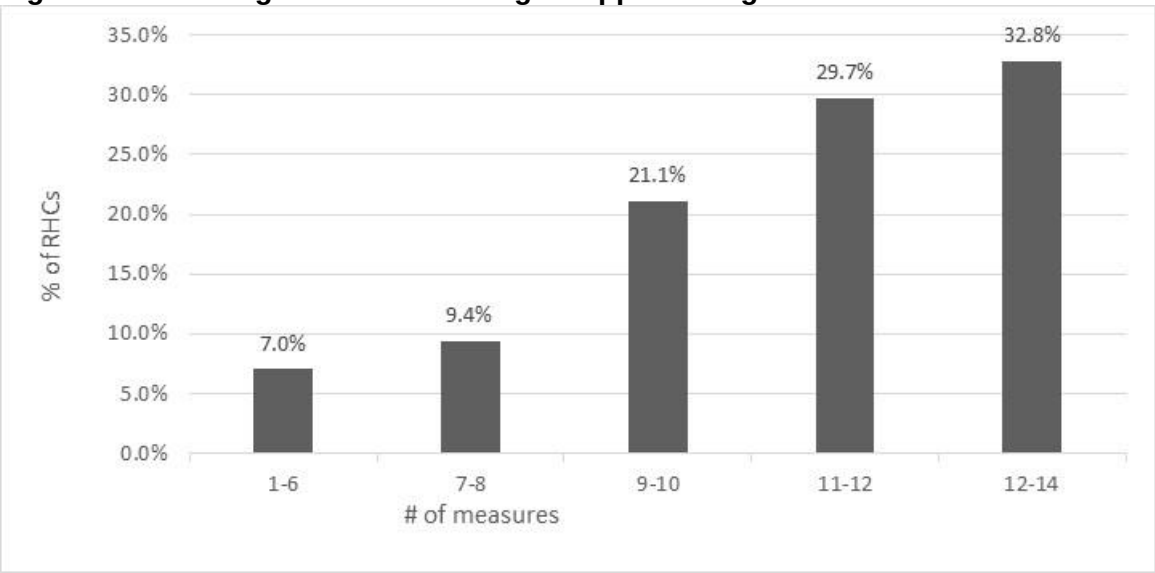
RHC performance on core measures set: As previously discussed, Stage 1 meaningful use requires an eligible provider to meet the threshold standards for each of the 14 measures in the core set and a minimum of five measures from the menu set. As noted, the Stage 1 core measures set originally included 15 core measures, however, the measure on the capacity to exchange information between providers was dropped beginning in 2013. As we collected data on this measure before it was eliminated, we present the results in Table 10. This measure was not used, however, in the calculation of the percentage of RHCs likely to achieve Stage 1 meaningful use as presented in the conclusion of this paper. The following section reviews the performance of survey respondents with an EHR with respect to the original 15 measures in the core set.

With the exception of their performance on reporting quality measures (44.6 percent) and the implementation of clinical decision support rules (55.7 percent), our survey results indicate that RHCs do well on the core measures related to the category of ***improving quality, safety, efficiency, and reducing health disparities***, with 78.4 percent to 93.4 percent of RHCs reporting that they have met the criteria for the remaining nine measures in this category. An additional 2.5 percent to 9.6 percent of RHCs are approaching, but have yet to meet, the threshold criteria for these nine measures. In addition, 6.6 percent and 4.1 percent of RHCs, respectively, are approaching the threshold on reporting quality measures and implementing decision support rules. It is likely that the performance of clinics that have not met the threshold criteria will improve as they gain experience with their EHRs.

Clinics perform less well on the measures in the remaining three categories (***engaging patients and families in their health care, improving coordination of care, and protecting the privacy and security of personal health information***) with 48.8 to 66.7 percent of clinics meeting the threshold criteria for the measures in these categories. An additional 6.5 percent and 14.1 percent, respectively, of clinics are approaching but have not yet met the threshold criteria for providing eHealth summary information and clinical summaries to their patients. The remaining two measures (performing a test of information exchange capabilities and protecting personal health information) require a yes/no response and, as such, there is no threshold response as clinics either meet the standard or they do not.

Figure 4 summarizes the extent to which respondents have met or are approaching the threshold for the 14 measures in the core set.

Figure 4. Percentage of RHCs Meeting or Approaching Threshold on Core Measures Set

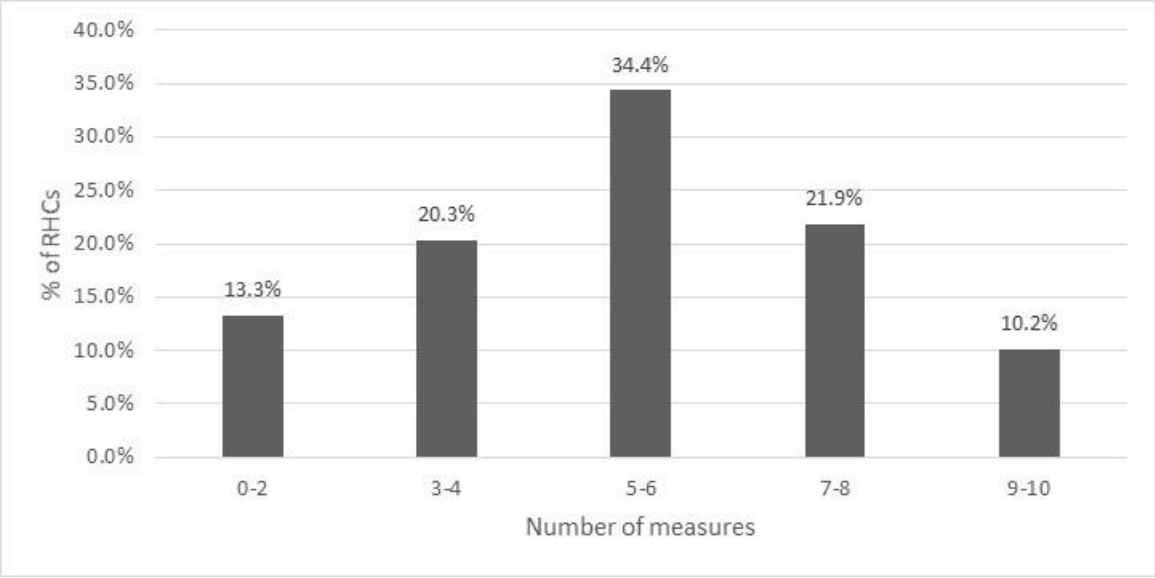


Includes only those RHCs actively using their EHRs (n = 128) and does not include those RHCs that have acquired but not yet implemented their EHRs (n=35).

RHC performance on menu measures set: The results of responding clinics' performance on the menu set are summarized in Table 11. In general, survey participants performed less well on the menu measures set than they did on the core measures. The results were also less consistent across the categories of measures.

Clinics performed best on the measures related to incorporating lab results (77.4 percent meeting the threshold and another 12.9 percent approaching the threshold); providing summary of care records (68.3 percent meeting the threshold and another 7.5 percent approaching the threshold); providing patient education resources (57 percent meeting the threshold and another 15.7 percent approaching the threshold); medication reconciliation (63.3 percent meeting the threshold and another 5 percent approaching the threshold); drug formulary checks (67.2 percent meeting the threshold); and using the EHR to produce patient lists/registries (63.6 percent meeting the threshold). Performance fell off to approximately 50 percent or less for the remaining measures, with the weakest performance for the two measures (immunization registries and syndromic surveillance) in the ***population and public health performance improvement*** category.

Figure 5. Percentage of RHCs Meeting or Approaching Threshold on Menu Measures Set



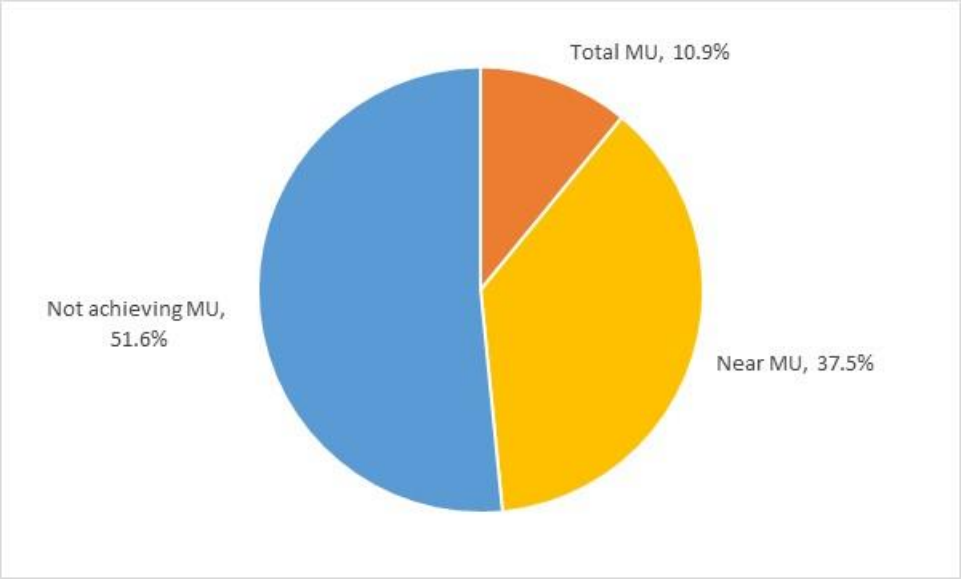
Includes only those RHCs actively using their EHRs (n = 128) and does not include those RHCs that have acquired but not yet implemented their ERHs (n=35).

Figure 5 summarizes the extent to which respondents have reached the threshold or are approaching the threshold for the 10 measures in the menu set. Almost 67 percent of responding RHCs met or were approaching the threshold for five or more of the menu criteria. Although eligible providers are only required to meet the criteria for five of the ten menu set measures to achieve Stage 1 meaningful use, most of the Stage 1 menu measures will become core measures with higher thresholds under the Stage 2 criteria to demonstrate meaningful use. As the Stage 2 measures for eligible providers could be effective as early as calendar year 2014 for early demonstrators (2011 or 2012) of meaningful use, it is important to note that more than two-thirds of responding clinics have met or are approaching the threshold criteria for the minimum five measures necessary to achieve Stage 1 meaningful use, with slightly over 10 percent reporting activity on nine to ten measures. The number and percentage of responding clinics meeting the standard for each of the ten menu set measures is shown in Table 11.

Likelihood of RHCs achieving meaningful use of their EHRs: Finally, we estimated the percentage of clinics likely to achieve Stage 1 meaningful use of their EHRs based on meeting the criteria for all fourteen measures in the core set and meeting the criteria on five of the ten measures in the menu set. We also estimated the percentage of clinics that are *"near"* meaningful use by virtue of having implemented the activities (and approaching or meeting the threshold) for ***12 of the 14 core measures*** and four of five menu measures. Of the 128 clinics

reporting their performance on the full set of core and menu measures, close to 11 percent (14 clinics) have met the standards for meaningful use and approximately 38 percent (48 clinics) are near to achieving meaningful use based on either meeting or approaching the threshold criteria as described above (see Figure 6). It is likely that this second group will eventually meet meaningful use as they gain experience with their EHRs.

Figure 6. Progress of RHCs on Stage 1 Meaningful Use (MU)



"Near" meaningful use clinics are those that have met or are approaching the threshold criteria for 12 of the 14 core measures and four of five menu measures.

Conclusions

Moving forward, it is clear that some RHCs are unlikely to adopt an EHR or will struggle with implementation. Approximately 25 percent of responding clinics have not adopted an EHR and close to 17 percent of that group have no plans to implement an EHR or are unsure of their plans. As noted earlier, a significant proportion of this group (close to 64 percent) are very small clinics with few providers. This is a group that would benefit from the services of their local REC in terms of assessing the feasibility of acquiring and implementing an EHR.

Although support from the RECs would be helpful to this group, the barriers to the acquisition and implementation of an EHR (for those without an EHR) extend beyond information and technical support and include acquisition and maintenance costs, lack of capital, and concerns about loss of productivity and income during the implementation and learning phase. These are substantial barriers, particularly for the small clinics that account for close to two-thirds of those

clinics without an EHR, and are much harder to solve. Without an EHR, the ability of these clinics to survive in our evolving health care environment is likely to be compromised.

It is also clear that even those clinics that have adopted EHRs need additional technical assistance to support the expanded use of their EHRs. In general, clinics that have implemented and are actively using their EHRs do well on measures related to internal patient care (i.e., the measures related to improving, safety, and efficiency and reducing health disparities). Areas of needed support include: engaging patients and families in their health care (for measures related to sharing and accessing patient information); improving coordination of care through the exchange of patient information with other providers and medication reconciliation; protecting the privacy and security of personal health information; improving population and public health (for measures focused on reporting to disease and immunization registries); and improving quality of care by encouraging public reporting of quality measures and the use of clinical decision support rules. Their performance on the measures related to practice transformation and population health activities suggests the need for additional technical assistance and incentives to encourage RHCs to improve their performance in these areas and to prepare them for evolving pay for performance and population health reimbursement strategies.

Finally, it is worth noting that Stage 1 is the introductory phase of the three stage implementation of meaningful use. The requirements for the number of measures met and the level of performance increase with Stages 2 and 3, as do the expectations related to public reporting of quality data and improved outcomes. As such, this speaks to RHCs' need for additional technical assistance and support during Stage 1 to enhance their ability to use their EHRs to their fullest capacity. Doing so will provide a strong foundation to cope with the demands of Stages 2 and 3 meaningful use.

Limitations

Caution should be exercised in interpreting these results, particularly the results related to EHR adoption, as respondents are likely to be early adopters of technology. This may overstate the level of EHR use by RHCs, as it is likely that those RHCs that have not adopted an EHR were less likely to complete our survey. As reported in the study description, our response rate was 46.7 percent. Due to the small "n" for our analytic file, few of our findings are statistically significant and we have not reported p-values. In consideration of these factors: small sample,

moderate response rate, and possible response bias, our findings should be interpreted as a pilot study. As this paper is released, we are nearing completion of a more narrowly focused survey with a much larger sample. With more than 800 respondents and a higher response rate, we are hopeful that findings from that survey will be more robust.

Table 10. Stage One Meaningful Use Objectives: Core Set*

Goal(s)	Objective	Measure Specifications	% RHCs Attaining Threshold (n varies by row)	% RHCs Under Threshold (n varies by row)
Improve quality, safety, efficiency, and reduce health disparities	CPOE **(n=104)**	More than 30 percent of patients on meds with at least one CPOE order	88.5%	6.7%
	Drug-drug and drug allergy interactions **(n=125)**	Feature implemented/turned on (yes/no)	88.8%	N/A
	Up to date problem list **(n=121)**	More than 80 percent of patients have at least one entry (or an indication of no known problems) recorded as structured data	89.3%	9.1%
	ePrescribing (**n=125)**	More than 40 percent of prescriptions are transmitted using EHR	78.4%	9.6%
	Active medication list **(n=121)**	More than 80 percent of patients have at least one entry (or entry indicating that patient is not on medications) recorded as structured data	93.4%	6.6%
	Active medication allergy list **(n=121)**	More than 80 percent of patients have at least one entry (or entry indicating patient has no medication allergies) recorded as structured data	92.6%	7.4%
	Demographic information **(n=120)**	More than 50 percent of patients have demographics (preferred language, gender, race, ethnicity, date of birth) recorded as structured data	91.7%	2.5%
	Vital signs **(n=121)**	Vital signs (height, weight, BP, body mass index (BMI), growth charts for children 2-20 including BMI) are recorded as structured data for more than 50 percent of patients age two and over	84.3%	5.0%
	Smoking status **(n=121)**	More than 50 percent of patients 13 years old or older have smoking status recorded as structured data	84.3%	7.4%
	Quality measures **(n=121)****	Report ambulatory clinical quality measures to CMS or, in the case of Medicaid EPs, the states (yes/no)	44.6%	6.6%
	Clinical decision support **(n=97)***†**	Implement one clinical decision support rule relevant to specialty or high clinical priority with ability to track compliance with rule (yes/no)	55.7%	4.1%

Goal(s)	Objective	Measure Specifications	% RHCs Attaining Threshold (n varies by row)	% RHCs Under Threshold (n varies by row)
Engage patients and families in their health care	eHealth summary/information **(n=121)**	More than 50 percent of patients requesting an electronic copy of their health information (including diagnostic test results, problem list, medication lists, and medication allergies) receive it within three business days	57.9%	6.5%
	Clinical summaries **(n=121)**	For more than 50 percent of office visits, patients receive a visit summary within three business days	48.8%	14.1%
Improve care coordination	Information Exchange **(n=120)‡**	Has performed at least one test of its capability to exchange key clinical information among providers of care and patient authorized entities electronically (yes/no)	52.5%	N/A
PHI Privacy / Security protection	Protect personal health information (PHI) **(n=120)**	Conduct or review a security risk analysis per 45 CFR 164.308(a)(1), implement security updates as necessary, and correct security deficiencies (yes/no)	66.7%	N/A

Source: CMS. Eligible Professional Meaningful Use Table of Contents: Core and Menu Set Objectives, Stage 1. 2013, June 26.[22]

*Table does not include responses for clinic not using the function specified by the measures or did not know the answer. As a result, the rows total less than 100%

** Respondents in the "Under Threshold" category are those reporting quality measures using paper records not their EHRs.

***Respondents in the "Under Threshold" category are those using clinic decision support rules but are unable to track compliance with the rule.

†This question was only asked of Wave 2 survey respondents. A different version of the question was asked in Wave 1 and the results are not comparable.

‡Beginning in 2013, this measure was no longer required to achieve Stage 1 meaningful use.

Table 11. Stage One Meaningful Use Objectives: Menu Set*

Goal(s)	Objective	Ambulatory Measure Specification	% RHCs Attaining Threshold (n varies by row)	% RHCs Under Threshold (n varies by row)
Improve quality, safety, efficiency, and reduce health disparities	Drug formulary checks **(n=125)**	Implemented this function and has access to at least one internal or external formulary during the entire EHR reporting cycle (yes/no)	67.2%	N/A
	Lab results **(n=124)**	More than 40 percent of clinical lab test results (results are either positive/negative or numerical format) are incorporated as structured data	77.4%	12.9%
	Patient lists/registries **(n=121)**	Generate at least one patient list based on a specific condition for QI, reduction of disparities, research, or outreach (yes/no)	63.6%	N/A
	Patient reminders **(n=121)**	More than 20 percent of patients 65 or older or 5 years or younger were sent an appropriate reminder for preventive/follow up care	46.3%	N/A
Engage patients and families in their care	eAccess **(n=121)**	At least 10 percent of patients are provided with electronic access to their health information within four business days of being updated in the EHR	36.4%	9.1%
	Patient education resources **(n=121)**	More than 10 percent of patients are provided patient-specific educational resources using EHR technology	57.0%	15.7%
Improve care coordination	Medication reconciliation **(n=120)**	Medication reconciliations are performed for more than 50 percent of patients transitioned from another source of care into the care of the EP	63.3%	5.0%
	Summary of care record **(n=120)**	Provide summary of care record for more than 50 percent of patients transitioned/referred to another setting of care	68.3%	7.5%
Improve population and public health	Immunization registries **(n=120)**	Performed at least one test of capacity to submit electronic immunization data to immunization registry (unless no registry is capable) and follow up submission if the test is successful (yes/no)	39.2%	N/A
	Syndromic surveillance **(n=120)**	Performed at least one test of capacity to submit electronic syndromic surveillance data to public health agencies (unless no public health agency is capable) with follow-up submission if the test is successful (yes/no)	9.2%	N/A

*Table does not include responses for clinic not using the function specified by the measures or did not know the answer. As a result, the rows total less than 100%. *Source: Centers for Medicare and Medicaid Services. Eligible Professional Meaningful Use Table of Contents: Core and Menu Set Objectives, Stage 1. 2013, June 26.*[22]

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Maine Rural Health Research Center
Recent Working Papers

WP50. Talbot, J.A., & Coburn, A.F. (2013, March). *Challenges and Opportunities for Improving Mental Health Services in Rural Long-Term Care*.

WP 49. Anderson, N., Neuwirth, S., Lenardson, J.D., & Hartley, D. (2013, June). *Patterns of care for rural and urban children with mental health problems*.

WP48. Gale, J.A., Lenardson, J.D., Lambert, D., & Hartley, D. (2012, March). *Adolescent alcohol use: Do risk and protective factors explain rural-urban differences*. (Working Paper #48).

WP47. Published as: Ziller, E.C., Lenardson, J.D., & Coburn, A.F. (2012). Health care access and use among the rural uninsured. *Journal of Health Care for the Poor and Underserved*, *23*(3), 1327-1345.

WP46. Anderson, N., Ziller, E.C., Race, M.M., Coburn, Andrew F. (2010). *Impact of employment transitions on health insurance coverage of rural residents*.

WP45. Lenardson, J.D., Ziller, E.C., Lambert, D., Race, M.M., & Yousefian, A. (2010). *Access to mental health services and family impact of rural children with mental health problems*.

WP44. Hartley, D., Gale, J., Leighton, A., & Bratesman, S. (2010). *Safety net activities of independent Rural Health Clinics*

WP43. Gale, J., Shaw, B., Hartley, D., & Loux, S. (2010). *The provision of mental health services by Rural Health Clinics*

WP42. Race, M., Yousefian, A., Lambert, D., & Hartley, D. (2009, September). *Mental health services in rural jails*.

WP41. Lenardson, J., Race, M., & Gale, J.A. (2009, December). *Availability, characteristics, and role of detoxification services in rural areas*.

WP40. Published as: Ziller, E.C., Anderson, N.J., & Coburn, A.F. (2010). Access to rural mental health services: Service use and out-of-pocket costs. *Journal of Rural Health*, *26*(3), 214-24. doi : 10.1111/j.1748-0361.2010.00291.x

WP39. Lambert, D., Ziller, E., Lenardson, J. (2008). *Use of mental health services by rural children.*

WP38. Morris, L., Loux, S.L., Ziller, E., Hartley, D. *Rural-urban differences in work patterns among adults with depressive symptoms.*

WP37. Published as: Yousefian, A., Ziller, E., Swartz, J., & Hartley, D. (2009). Active living for rural youth: Addressing physical inactivity in rural communities. *Journal of Public Health Management and Practice: Special Issue on Rural Public Health, 15*(3), 223-231.

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WP 35a. Lenardson, J. D., & Gale, J. A. (2007, August). *Distribution of substance abuse treatment facilities across the rural-urban continuum*.

WP35b. Published as: Lambert, D., Gale, J.A., & Hartley, D. (2008, Summer). Substance abuse by youth and young adults in rural America. *Journal of Rural Health, 24*(3), 221-8.

WP34. Published as: Ziller, E.C., Coburn, A.F., Anderson, N.J., & Loux, S.L. (2008). Uninsured rural families. *The Journal of Rural Health, 24*(1), 1-11.

Established in 1992, the Maine Rural Health Research Center draws on the multidisciplinary faculty and research resources and capacity of the Cutler Institute for Health and Social Policy within the USM Muskie School of Public Service. Rural health is one of the primary areas of research and policy analysis focus within the Institute, and the Center builds upon the Institute's strong record of research, policy analysis, and policy development that addresses critical problems in health care.

The Maine Rural Health Research Center's mission is to inform health care policymaking and the delivery of rural health services through high quality, policy relevant research, policy analysis and technical assistance on rural health issues of regional and national significance. For over 20 years, the Maine Rural Health Research Center’s research agenda has focused on some of the most intractable health access problems facing rural residents, especially those with mental health and substance abuse issues and those facing financial barriers due to lack of insurance and under-insurance.

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