Adoption and Use of Electronic Health Records by Rural Health Clinics: Results of a National Survey

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EXECUTIVE SUMMARY

Introduction

Electronic health records (EHRs) are a critical tool for managing and documenting the quality of care provided to patients and coping with the demands of health reform and practice transformation models such as patient-centered medical homes and accountable care organizations. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 committed $30 billion to support the meaningful use of EHRs and provide financial incentives to encourage the phased implementation of EHRs by qualified health care providers. This paper reports the extent of EHR implementation and use in a randomly selected sample of Rural Health Clinics (RHCs) surveyed in 2013.

Methodology

To understand EHR adoption and use by RHCs, we undertook a focused survey using a random sample of 1,479 RHCs drawn from the Centers for Medicare and Medicaid Services Provider of Services file. The survey was administered electronically by the University of Southern Maine's Survey Research Center for all sample clinics with an email address for the identified contact. The survey took 15 minutes to complete for RHCs with an EHR and six minutes for those without an EHR. We obtained 875 completed surveys for a response rate of 59.2 percent.

Findings

The results of this study reflect growing use of EHR technology by RHCs with 71.6 percent of RHCs reporting EHR adoption and implementation. Provider-based RHCs report lower rates of EHR adoption (65.1 percent) than independent RHCs (77.8 percent). Although EHR adoption rates by RHCs are consistent with physician EHR adoption documented in recent studies, 17.8 percent of RHCs report having no EHR in place. Among this group (n=155), 12.9 percent had no plans to adopt an EHR and 28.4 percent had a time horizon of more than 12 months for adoption.

In terms of using their EHRs to improve quality, safety, and efficiency, and reduce health disparities, RHCs performed best on measures focused on clinical care and patient management. They did less well on conducting drug formulary checks, transmitting laboratory orders electronically, reporting ambulatory clinical quality measures, implementing clinical decision support rules, and generating patient registries. In terms of engaging patients in their care and

improving care coordination, RHCs did well on providing clinical summaries for each office visit and summary care records for patients transferred to other settings of care, but less well on sending patient reminders for follow up and preventive care and exchanging clinical information with other providers. Independent RHCs performed better than their provider-based RHCs on conducting drug formulary checks, incorporating lab results as structured data, reporting clinical quality measures, implementing clinical decision support rules, providing clinical summaries, providing summary care records, and exchanging key clinical information. Provider-based RHCs only exceeded the performance of independent RHCs on the electronic transmission of laboratory test orders.

Given provider-based clinics' presumed access to the resources of their parent hospitals, our findings of lower EHR adoption and use among provider-based clinics are somewhat counterintuitive. Although our study does not allow us to explain these findings, we suggest two possible reasons for the differences in EHR adoption rates. One is that parent hospitals may have adopted EHRs that are better suited to the needs of the inpatient setting than their provider-based RHCs. Under this scenario, hospitals may need to invest in a second EHR or modify their existing EHR to support their clinics but have yet to do so. Another possible explanation is that hospitals may have developed a phased implementation strategy, with EHR implementation in their provider-based clinics scheduled to take place after implementation is completed in the inpatient setting. Based on the results of our two RHC surveys, this pattern of lower EHR adoption in provider-based RHCs deserves further study.

Conclusions

This study demonstrates that RHCs are approaching parity with other physician practices in terms EHR adoption and use. This is not to say, however, that RHCs no longer need technical assistance and support. Some groups of RHCs, such as provider-based clinics, report lower rates of EHR adoption than other clinics. At the same time, RHCs are not exhibiting consistently high performance on all core meaningful use functions. With the conclusion of federal funding for the Regional Extension Center program, it is important to identify and provide other sources of technical assistance and support to assist all RHCs in adopting EHR technology and maximizing its use to improve clinical care and efficiency. This ability to maximize EHR use will be vital to enabling RHCs to participate in the evolving healthcare market.

INTRODUCTION

Electronic health records (EHRs) are a critical tool for managing and documenting the quality of care provided to patients and coping with the demands of health reform and practice transformation models such as patient-centered medical homes and accountable care organizations. The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 committed $30 billion to support the meaningful use[i] of EHRs and provide financial incentives to encourage the phased implementation of EHRs by qualified health care providers.[1,2] This paper reports the extent of EHR implementation and use in a randomly selected sample of 1,479 Rural Health Clinics (RHCs) surveyed in 2013.

RHCs are a vital source of primary care services, with more than 4,000 clinics serving rural communities.[3] Despite their importance to rural communities, relatively little is known about the extent to which RHCs have adopted and are using EHRs to manage their clinical operations. A 2011-2012 survey conducted by the Maine Rural Health Research Center focused on the adoption and meaningful use of EHRs by RHCs.[4] The study found that 59.0 percent of the 225 responding RHCs had an EHR in use, with 51.6 percent reporting its use in more than 90 percent of their practice.[4] That study focused very specifically on the performance of a small sample of RHCs on the Stage One meaningful use measures and, as such, involved a very detailed and extensive survey instrument. To gain a better understanding of EHR adoption and use by a wide range of RHCs, we undertook this follow-up survey with a significantly larger sample of clinics (1,479) and focused primarily on a more narrowly targeted set of questions involving core meaningful use functions (but not specifically the Stage One measures). Throughout this paper, we compare findings from the present study to our earlier study of EHR adoption and meaningful use by RHCs where appropriate.

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[i] The HITECH Act established the following requirements for meaningful use of certified EHR technology: (1) use of EHR technology in a meaningful manner; (2) electronic exchange of information to improve quality and coordination of care; and (3) submission of clinical quality measures and other measures as identified by the Secretary. These requirements were supplemented by a meaningful use framework adapted from the national priorities established by the National Priorities Partnership: (1) improving quality, safety, efficiency, and reducing health disparities; (2) engaging patients and families in their health care; (3) improving care coordination; (4) improving population and public health; and (4) ensuring adequate privacy and security protections for personal health information.[2]

BACKGROUND AND POLICY CONTEXT

Through the HITECH Act, Congress established the adoption and meaningful use of EHRs as a national policy priority to modernize the U.S. healthcare system with the goals of improving its quality and efficiency, and supporting new delivery and payment models.[5-7] To encourage hospitals and eligible providers (EPs)[ii,8] to invest in and apply EHR technology to improve care delivered to patients, the HITECH Act established meaningful use incentive programs for Medicare and Medicaid providers.[9] To qualify for either Medicare or Medicaid Stage One meaningful use incentives, EPs were originally required to meet the standards for 15 core measures[10, iii] assessing their use of EHR functions.[iv,11,12] EPs must also choose and meet the requirements for five of the ten menu measures.[v,vi,10,12,13]

An EHR is an important tool for clinical care management, and is central to a practice's quality measurement, reporting, and improvement efforts. The reporting of quality metrics underlie the value-based purchasing and pay-for-performance initiatives established under the Affordable Care Act, the HITECH Act, and programs such as the Centers for Medicare and Medicaid Services' (CMS's) Physician Quality Reporting System (PQRS).[14,15] The adoption and meaningful use of EHRs will be increasingly important to RHCs if they are to remain

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[ii] Under the Medicare incentive program, EPs include doctors of medicine, osteopathy, dental surgery, podiatry, optometry, and chiropractic. Under the Medicaid incentive programs, EPs include physicians (primarily doctors of medicine and doctors of osteopathy), nurse practitioners, certified nurse-midwives, dentists, and physician assistants who furnish services in a Federally Qualified Health Center or Rural Health Clinic that is led by a physician assistant.[8]

[iii] The 15 core measures included the use of computerized provider order entry; prescribing using electronic tools (e-prescribing); external reporting of clinical quality measures; implementing clinical decision support rules; providing patients with electronic copies of health information on request; providing clinical summarizes for each office visit; performing drug-drug and drug-allergy checks; recording demographic information; maintaining up-to-date problem, active medication, and active medication allergy lists; recording and charting changes in vital signs; recording smoking status; documenting capacity to exchange key clinical information among providers of care; and protecting electronic health information.[10]

[iv] Since the implementation of the program, the core measures set has been amended by updating some of the measure definitions and eliminating two core measures (i.e., documenting the capability to exchange key clinical information among providers and reporting clinical quality measures externally).[11,12]

[v] The 10 menu measures included conducting drug formulary checks; incorporating lab test results as structured data; generating lists of patients by specific conditions (disease registries); sending patient reminders for preventive and follow-up care; providing patients with timely electronic access to their health information; using certified EHR technology to identify and deliver patient-specific education resources; conducting medication reconciliations; providing summary care records for each transition of care/referral; and documenting the capability to transmit electronic data to immunization registries/systems and to syndromic surveillance systems/public health agencies.

[vi] As with the core measures, CMS has made changes to the menu measures including elimination of the measure requiring providers to provide patients with timely electronic access to their health information, as elements of this measure were combined into the core measure requiring providers to provide patients with electronic copies of their health information upon request.[12,13]

competitive participants in the evolving healthcare market. EHR adoption is widely understood to be an essential element for inclusion in accountable care organizations, patient centered medical homes and health plan provider networks offered on state and national health insurance marketplaces.[16-18] Further supporting the importance of EHR adoption by RHCs was the release of final rules allowing RHCs to be recognized as Essential Community Providers for purposes of contracting with Qualified Health Plans (QHPs) sold in Federally Facilitated Marketplaces in 2016.[vii,19]

The rate of EHR adoption among providers has increased significantly in recent years.[6,20] According to Hsiao and colleagues, approximately 35 percent of office-based physicians used any type of EHR in 2007 compared to close to 72 percent in 2012.[20] As of July 2013, CMS reported that close to 60 percent of EPs had successfully attested to meaningful use of their EHRs and had received either a Medicare or Medicaid incentive payment.[6]

Although the overall rate of EHR adoption is growing, gaps persist in the rates of adoption across physician practice types.[20] In 2012, physician practices with 11 or more physicians were more likely to adopt an EHR (89.5 percent) compared to practices with three to five physicians (71.9 percent) and solo practices (54.5 percent). Similarly, organizationally-owned physician practices were more likely to have implemented an EHR than individual physicians or physician groups. Practices owned by HMOs had the highest rate of adoption (97.2 percent) followed by community health centers (81.0 percent); practices owned by health systems, academic medical centers, other hospitals, and other health care corporations (80.0 percent); and physicians/physician group practices (66.5 percent). Primary care physicians were somewhat more likely than non-primary care physicians to have implemented an EHR in 2012 (74.9

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vii Qualified Health Plans (QHPs) sold in Federally Facilitated Marketplaces must contract with at least 30 percent of the essential community providers (ECPs) in their service areas. To comply with this minimum threshold, must contract with at least one ECP in each of six ECP categories (i.e., Federally Qualified Health Centers, family planning providers, hospitals, Indian health care providers, Ryan White providers, and other ECP providers). Effective January 1, 2016, RHCs may qualify as other ECPs provided that they meet the following requirements: 1) based on attestation, the RHC accepts patients regardless of ability to pay and offers a sliding fee schedule; or is located in a primary care Health Professional Shortage Area (geographic, population, or automatic); and 2) accepts patients regardless of coverage source (i.e., Medicare, Medicaid, CHIP, private health insurance, etc.). The other category of ECP providers includes STD Clinics, Tuberculosis Clinics, Rural Health Clinics, Black Lung Clinics, Community Mental Health Centers, Hemophilia Treatment Centers, and other entities that serve predominantly low-income, medically underserved individuals. As QHPs are only required to contract with one provider from each category, the ability to document quality and performance through the use of an EHR may make RHCs more attractive providers to QHPs.

percent compared to 68.8 percent). The previous gap in EHR adoption between urban (metropolitan) and rural (nonmetropolitan) areas narrowed substantially by 2012 (to 72.0 percent and 69.5 percent, respectively), due perhaps to the accelerated rates of EHR adoption among rural providers described by Hsiao and colleagues.[21] Although EHR adoption among family physicians increased from 36.9 percent in 2006 to 68.0 percent in 2011, Xierali and colleagues found that practicing in a medically underserved or geographic health professional shortage area and being an international medical graduate were additional practice characteristics negatively associated with EHR adoption.[22]

Although the overall rates of adoption are important, it is equally important to understand the extent to which providers are using their EHRs, particularly the more advanced functions consistent with the evolving standards of meaningful use. The percentage of primary care physicians with a fully functional system rose to 27.9 percent in 2012.[20] Using data from the Commonwealth Fund International Health Policy Survey of Primary Care Physicians (restricted to respondents from the United States), Audet, Squires, and Doty found that, in general, primary care physicians expanded their EHR capacity between 2009 and 2012.[23] Solo practices lagged behind larger practices (e.g., groups with multiple physicians, participants in integrated delivery systems, or participants in resource sharing arrangements with other practices) in EHR adoption, and were less likely to use the advanced features of their systems.

Some studies of EHR adoption and use have focused primarily on the functionality of EHR systems adopted by physicians[20,24] and less on how physicians actually use EHRs in their practices. More recent studies, including our earlier survey of RHCs, have focused on the extent to which primary care and other physicians are using the more complex functions of their EHRs and may be approaching meaningful use.[4,7,23,25]

Using the Medicare EHR Incentive Program EPs Public Use File, Wright and colleagues examined the meaningful use performance of EPs who had successfully attested for Medicare incentives through May 31, 2013.[viii, 25] They found that EPs performed well on all 15 core measures required to establish the EP as a "meaningful user" of EHR technology, with the most common response for all measures being the 90 to 100 percent compliance category. The five

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[viii] To successfully attest for Stage One meaningful use incentives, EPs must meet the criteria for all 14 core measures and five of ten menu measures.

menu measures most commonly chosen for attestation included: implementing drug formulary checks; incorporating clinical lab test results into the EHR; submitting data to immunization registries; generating lists of patients by specific conditions; and using EHR technology to identify and provide patient-specific education resources. The least commonly selected menu measures were: sending patient reminders for preventive/follow-up care; providing summary care records for transitions of care/referrals; and submitting syndromic surveillance data to public health agencies. Respondents also performed well on their chosen menu measures with 90 to 100 percent compliance being the most common response for all but one measure.

Audet and colleagues found that primary care providers' EHR capacity had expanded significantly since 2009, with the greatest growth in the areas of order entry management, sending prescriptions to pharmacies electronically, and electronic ordering of lab tests.[23] Areas that lagged behind other domains included EHR use for decision support, sending patient reminders, generating information about each patient, and exchanging patient information. The authors also identified gaps in EHR capacity between solo and larger practices. Similar gaps in implementation and use by large and small practices were described by Rao and colleagues, who also noted the need for ongoing technical assistance and support, particularly for smaller practices, after selection and installation in order to maximize EHR use to manage and improve the quality of clinical care.[7]

As noted earlier, in a previous study on the meaningful use of EHRs by RHCs we found that 59.0 percent of study participants had an EHR in place. We also found that RHCs performed best on the category of core measures focused on day-to-day clinical care activities (i.e., improving quality, safety, efficiency, and reducing health disparities), with a substantial percentage (78.4 to 93.4 percent) reporting that they had met the threshold criteria for nine of the 11 measures in this category.[4] RHCs performed less well on two measures from this category involving the reporting of quality measures (44.6 percent) and implementation of clinical decision support rules (55.7 percent). Study participants performed less well on the measures in the remaining three categories of: (1) engaging patients and their families in their health care; (2) improving coordination of care; and (3) protecting the privacy and security of personal health information. Consistent with the study by Audet, et al,[23] RHCs in our earlier study did less well overall on the menu measures. Study participants performed best on measures related to incorporating lab results, providing summary care records, providing patient education resources, reconciling

medications, performing drug formulary checks, and using the EHR to produce patient registries.[4] They performed less well on the two data reporting measures (i.e., immunization registries and syndromic surveillance) in the population and public health performance improvement categories.

STUDY METHODOLOGY

To gain a better and updated understanding of EHR adoption and use by RHCs, we undertook a shorter, more focused survey using a substantially larger sample population than our earlier survey. We drew a random sample of 1,600 RHCs from the Second Quarter 2010 CMS Provider of Services file. To encourage a better response rate, we developed a web-based instrument that could be completed in 15 minutes or less for RHCs with an EHR and six minutes or less for RHCs without an EHR. The goal was to obtain data on RHC EHR adoption and use from a large cross section of clinics.

The lack of a detailed, up-to-date RHC contact list has been a substantial challenge in past surveys of RHCs. The CMS Provider of Services file is the primary source for RHC contact information. This file, updated quarterly by CMS, contains addresses, telephone numbers, and other basic data on each RHC. It does not include contact information for clinic owners or administrators. We worked with the National Rural Health Resource Center (NRHRC) in Duluth, MN to collect detailed contact information (i.e., name, position, telephone number, and email address) for either the clinic owner and/or administrator from as many RHCs as possible, with a primary focus on clinics that were randomly selected for our sample. Various resources were used to update our clinic list including state licensing agencies, State Offices of Rural Health, state Primary Care Offices, state RHC associations, and the National Association of Rural Health Clinics. Despite the use of available RHC state and national resources, NRHRC staff had to call a substantial number of clinics to obtain necessary contact information. After extensive work, we obtained current contact information for all but 41 clinics of our original sample of 1,600 RHCs. These 41 were omitted from the sample, as we determined they were no longer active RHCs. This left us with an initial usable sample of 1,559 clinics. As we worked through the survey, an additional 80 clinics were excluded from the sample as they had closed, had a phone number that was no longer in service, or had terminated participation in the RHC program. After eliminating

the 80 clinics from the starting sample of 1,559 RHCs, we were left with a usable sample of 1,479 clinics.

The survey was administered electronically by the University of Southern Maine's Survey Research Center using Snap Surveys for all sample clinics with an email address for the identified contact person. For clinics with an identified contact but without an email address, calls were placed to the contacts in order to administer the survey by phone. The instrument was pre-tested with a small set of RHCs to confirm estimated completion time and validate the questions. Prior to fielding the instrument, a description of the survey was sent to each State Office of Rural Health, state RHC association, and the National Association of Rural Health Clinics. Each organization was asked to share information on the survey and encourage participation by their constituents.

To boost the response rate, an extensive follow up system was implemented involving multiple email and telephone reminders for clinics that did not respond to the original survey invitation. Data collection for the survey took place from February 2013 through November 2013. We obtained 875 completed surveys for a response rate of 59.2 percent. As clinics did not respond to every question, the reported "n" varies across questions. For clarity, we report the actual number of clinics responding to each question.

Survey Respondent Characteristics: Overall, the characteristics of our survey respondents were generally similar to the overall population of RHCs based on key characteristics found in the CMS Provider of Services file (Table 1). While provider-based, government-owned, and non-profit clinics were slightly overrepresented in our sample, the only statistically significant difference was in the geographic distribution of survey respondents, with more respondent clinics located in the Northeast and Midwest and fewer clinics located in the South. Although these differences are unlikely to impact the overall results of the study as it applies to the full population of RHCs, they may limit its potential use to estimate regional differences in EHR adoption and use.

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

	Survey Respondents	All RHCs
Overall Number of RHCs	875	3,798
% Independent RHCs	50.6%	54.3%
% Provider-Based RHCs	49.4%	45.7%
Location in Census Region*		
Northeast	4.3%	3.6%
Midwest	46.1%	39.1%
South	32.1%	39.5%
West	17.5%	17.9%
Ownership Type		
Government Owned	18.3%	16.7%
For Profit	42.2%	45.5%
Non-profit	39.5%	37.8%

*Differences significant at p ≤ .001

FINDINGS

Electronic Health Record Adoption

Internet Access: High speed internet access is considered by most health information technology (HIT) experts to be a prerequisite for effective EHR use, particularly for meaningful use objectives such as exchanging patient information electronically, providing electronic copies of health information or clinical summaries as requested by patients, e-prescribing, providing patients with electronic access to their records, or submitting data electronically to immunization registries or public health agencies[26] It is also necessary for the electronic submission of insurance claims. Given identified broadband internet access issues in rural communities, we asked respondents about their access to broadband (i.e., high-speed) internet service.[26] Broadband internet service includes such high-speed transmission technologies as Digital Subscriber Line (DSL), cable modem, fiber optic, wireless, satellite, and broadband over power lines (BPL). The vast majority had access to one or more high speed internet technologies (Table 2). Slightly less than 2 (1.8) percent of RHCs reported having no internet access at all and 0.6 percent reported having dial-up internet access. Almost 9 (8.9) percent of respondents were unsure of the type of internet access available in their clinics.

Table 2. Clinic Internet Access

	All RHCs (n=867)	Independent RHCs (n=439)	Provider-Based RHCs (n=428)
DSL**	31.1%	38.0%	24.1%
Cable**	11.7%	15.5%	7.7%
Fiber optic/dedicated internet access (T1)**	35.2%	26.7%	43.9%
Wireless (3g/4g)*	25.0%	21.6%	28.5%
Satellite	1.2%	1.8%	0.5%
Dial-up	0.6%	0.2%	0.9%
No internet access	1.8%	1.6%	2.1%
Not sure	8.9%	7.1%	10.8%

Column percentages total more than 100 percent because clinics were asked to "check all that apply"
Independent, provider-based, and total differences significant at $^*p \leq .05$, and $^{**}p \leq .001$

Adoption of Electronic Health Records by RHCs: Overall, 71.6 percent of clinics reported use of their EHR by some providers and staff, with 63.2 percent indicating use by 90 percent of their practice (Table 3). Independent RHCs were more likely than provider-based RHCs to have an EHR in use (77.8 vs. 65.1 percent); this gap appears to have narrowed since our earlier survey (68.6 vs. 46.9 percent). Another 10.7 percent of RHCs had purchased but not yet implemented their EHRs. Close to 18 (17.8) percent of clinics reported having no EHR in place compared to 24.9 percent of RHCs in our earlier study.

Table 3. Implementation of Electronic Health Records*

	All RHCs (n=871)	Independent RHCs (n=441)	Provider-Based RHCs (n=430)
EHR in use	71.6%	77.8%	65.1%
For more than 90 percent of Practice	63.2%	69.6%	56.5%
For some providers and staff	8.4%	8.2%	8.6%
Purchased but not in use yet	10.7%	7.0%	14.4%
No EHR	17.8%	15.2%	20.5%

*Independent, provider-based, and total differences significant at $p \leq .001$

Most commonly implemented EHRs: Survey participants reported use of a wide range of EHR platforms with over 93 different vendors represented. The ten most commonly used EHR vendors were:

1. Allscripts (n=96)
2. Epic (n=65)
3. NextGen (e=64)
4. EClinicalWorks (n=54)
5. McKesson (e=46)
6. Computer Programs and Systems, Inc. (CPSI) (n=39)
7. Healthland (n=33)
8. e-MDs (n=30)
9. GE/Centricity (n=28)
10. Cerner (n=22)

By way of comparison, a study conducted by KLAS, a healthcare technology research group, identified a list of EHR vendors that deliver a good product and useful customer service to small practices of up to 10 physicians.[27] In order of popularity, these systems included: athenahealth; SRSsoft, Practice Fusion; CureMD; Amazing Charts; e-MDs; SOAPware; Aprima Medical Software; Greenway Medical Technologies; Medical Informatics Engineering; and Quest Diagnostics.

Among the RHCs responding the survey, the most commonly used versions of EHR software included:

1. eClinicalWorks - eClinicalWorks 8.0 (n=47)
2. Epic Systems Corporation - EpicCare Ambulatory EMR Summer 2009 (n=43)
3. NextGen Healthcare Information Systems, Inc. - NextGen EHR 5.6 (n=39)
4. Healthland, Inc. - Physician Practice Documentation (PPD) 9.0.0 (n=29)
5. McKesson Provider Technologies - Practice Partner 9.3 (n=24)
6. e-MDs - e-MDs Solution Series 6.3 (n=23)
7. AllscriptsMisys, LLC - Allscripts Professional EHR 9.0 (n=21)
8. athenahealth, Inc. - athenaClinicals 9.15.1 (n=15)
9. Cerner Corporation - Cerner Millennium Powerchart/PowerWorks EMR 2007.19 (n=12)
10. Tie - Greenway Medical Technologies, Inc. - PrimeSuite 2011 (n=11) and NextGen Healthcare Information Systems, Inc. - NextGen EMR 5.5 (n=11)

Many respondents did not provide details on the specific versions of their EHR software. As a result, the relative rankings may vary. Nevertheless, this information suggests some of the key EHR players in the RHC market.

Plans to Upgrade or Change Primary EHR: A 2013 survey of 17,000 EHR users by Black Book Rankings found that as many as 17 percent of physician practices were considering upgrading or replacing their EHRs.[28] Another study conducted by KLAS found that half of all EHRs sold to physicians are replacements.[29]

In our study, clinics with an EHR were asked whether they had plans to upgrade or change their primary EHR (Table 4). Overall, 28.3 percent of respondents planned to upgrade or change their systems, with 14.1 percent of clinics planning to upgrade within the next 6 months, 8.9 percent within the next 7-12 months, and 5.3 percent in more than 12 months.

Table 4. Plans to Upgrade or Change Primary EHR*

	All RHCs (n=711)	Independent RHCs (n=371)	Provider-Based RHCs (n=340)
Yes, within next 6 months	14.1%	15.6%	12.4%
Yes, 7-12 months from now	8.9%	7.8%	10.0%
Yes, in more than 12 months	5.3%	5.1%	5.6%
No plan	60.9%	61.7%	60.0%
Not sure	10.8%	9.7%	12.1%

*Differences not significant

Adoption Plans of RHCs without an EHR: Clinics without an EHR (n=155) were asked about their plans to adopt an EHR as well as the timing of those plans. Overall, 17.4 percent of clinics without an EHR planned to adopt and implement one within the next six months, and 26.5 percent planned to do so within seven to twelve months (Table 5). Over 28 (28.4) percent of these clinics reported an adoption time horizon of more than 12 months. Finally, 12.9 percent had no plans to adopt an EHR and 14.8 percent did not know their clinic's adoption plans. Provider-based clinics were much more likely than independent clinics to report an adoption plan (84.1 vs. 56.7 percent), while independent clinics were more likely to report having no such plan (23.9 vs. 4.6 percent).

Table 5. Plans to Acquire and Implement an EHR*

	All RHCs (n=155)	Independent RHCs (n=67)	Provider-Based RHCs (n=88)
Yes, within next 6 months	17.4%	16.4%	18.2%
Yes, within 7-12 months	26.5%	20.9%	30.7%
Yes, in more than 12 months	28.4%	19.4%	35.2%
No	12.9%	23.9%	4.6%
Not sure	14.8%	19.4%	11.4%

*Independent, provider-based, and total differences significant at $p \leq .01$

Based on our original sampling frame of 3,798 clinics, an estimated 676 either did not have an EHR in place or were not in the process of implementing an EHR at the time of our survey. Of

this group, an estimated 379 had no or uncertain plans to implement an EHR or did not have plans to implement an EHR in the immediate future (less than one year). An estimated 297 RHCs had plans to implement an EHR within the coming year (data not shown).

Barriers/Challenges to EHR Acquisition and Implementation: Numerous studies have described the barriers to EHR adoption by small physician practices including insufficient capital; prohibitive start-up costs; costs of ongoing maintenance and support; loss of productivity and revenue caused by implementation; lack of technical expertise; lack of knowledge about best practices; unrealistic expectations regarding the implementation process; privacy concerns; and changes in work processes and habits.[22,30-34] As shown in Table 6, the most commonly reported barriers to acquisition and implementation among survey respondents without an EHR were the cost to acquire and maintain an EHR (71.9 percent), lack of capital to purchase an EHR (50.7 percent), and concerns about productivity and income loss during the implementation phase (44.5 percent). Lack of physician/provider support and lack of resources for staff education and training were barriers for 25.3 percent and 21.2 percent of all clinics, respectively. Lack of internal knowledge and technical resources were problems for 19.9 percent of respondents overall. The cost to acquire and maintain a system, lack of capital, lack of resources for staff education and training, and lack of internal knowledge and technical resources were greater barriers for provider-based than for independent RHCs.

Table 6. Barriers to EHR Acquisition and Implementation*

	All RHCs (n=146)	Independent RHCs (n=65)	Provider-Based RHCs (n=81)
Cost to acquire and maintain	71.9%	69.2%	74.1%
Lack of capital to purchase an EHR	50.7%	47.7%	53.1%
Lack of physician/provider support	25.3%	24.6%	25.9%
Lack of resources for staff education and training	21.2%	16.9%	24.7%
Concerns about security/privacy	11.0%	13.9%	8.6%
Concerns about productivity or income loss during transition	44.5%	46.2%	43.2%
Lack of internal knowledge and technical resources	19.9%	16.9%	22.2%

Column percentages total more than 100 percent because clinics were asked to "check all that apply"
*Differences not significant

Meaningful Use Incentives

Impact of Meaningful Use Incentives: Under CMS's EHR Incentive Programs, EPs may qualify for either Medicare or Medicaid incentive payments by demonstrating meaningful use of certified EHR technology.[35] Although EPs may qualify for both incentive programs, they can only receive an incentive payment from one program during a given year and must choose the program they wish to participate in during the registration process. Within group practice settings, each EP in the practice may qualify for an incentive payment if they demonstrate meaningful use.[8] Most EPs will maximize their incentive payments through participation in the Medicaid incentive program, assuming they meet the program's eligibility criteria related to service to Medicaid beneficiaries and other vulnerable individuals.[ix]

RHCs are reimbursed differently than private physicians under Medicare, and the differences in reimbursement methodology affect their eligibility for Medicare EHR incentive payments. Medicare reimburses RHCs for a cost-based, all-inclusive rate per covered visit for a defined set of physician and non-physician outpatient services, which cover the majority of services provided by RHC providers.[36,x] RHCs submit claims for RHC services through Part A Medicare Administrative Contractors (MACs) and non-RHC services through Medicare Part B.[12,37-39] As RHC clinicians typically do not submit many Part B claims, they are not normally eligible for Medicare meaningful use incentives, which are based on Medicare Part B billings.

Clinicians who provide over 50 percent of their total encounters through the RHC are eligible for Medicaid meaningful use incentives, as long as they practice in an RHC with a minimum of 30 percent of its volume attributable to "needy" individuals.[xi,40] This is not necessarily a

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[ix] To qualify for a Medicaid EHR incentive payment, an EP must meet one of the following criteria: 1) have a minimum 30 percent Medicaid patient volume; have a minimum 20 percent Medicaid patient volume and be a pediatrician; or practice predominantly in a Federally Qualified Health Center or Rural Health Clinic and have a minimum 30 percent patient volume attributable to needy individuals.

[x] The defined set of RHC services includes: physician services; services and supplies incident to the services of a physician; NP, PA, certified nurse-midwife (CNM), clinical psychologist (CP), and clinical social worker (CSW) services; services and supplies incident to the services of a NP, PA, CNM, CP, and CSW; Medicare Part B covered drugs furnished by and incident to services of a RHC provider; and visiting nurse services to the homebound in an area where CMS has certified that there is a shortage of Home Health Agencies (CMS 2014). Claims for the defined set of RHC services are submitted to Medicare Part A in the Uniform Bill-04 (UB-04) format using a defined set of Revenue Codes, while claims for non-RHC services are submitted to Medicare Part B on the CMS 1500 form using current procedural terminology codes. Non-RHC services include the technical component for diagnostic services such as x-rays or EKGs, laboratory services, and professional services rendered in an inpatient setting.

[xi] Needy individuals include those receiving medical assistance from Medicaid or the Children's Health Insurance Program; uncompensated care from the EP; or services at either no cost or reduced cost based on a sliding scale.

disadvantage, as the Medicaid meaningful use incentives provide greater flexibility in terms of adoption date and a higher maximum payout ($63,750 over six years compared to $44,000 over five years from Medicare). Also, unlike Medicare meaningful use incentives, Medicaid meaningful use incentives do not decline for the first five years based on the year of adoption.[12]

We asked clinics with EHRs whether any of their EPs anticipated applying for Medicare or Medicaid meaningful use incentives (Table 7). Not surprisingly, considerably more EPs were expected to apply for Medicaid incentives than for Medicare (24.9 vs. 7.6 percent). Slightly more than 19 (19.4) percent indicated that they expected different EPs in their clinics to apply for either Medicare and/or Medicaid incentives. A greater percentage of EPs at independent RHCs (27.9 percent) were expected to apply for Medicaid meaningful use incentives than at provider-based clinics (21.6 percent). In comparison, a greater percentage of EPs at provider-based clinics (22.8 percent) were expected to apply for either Medicare and/or Medicaid incentives than independent clinics (16.4 percent).[xii] Twenty three percent reported that their EPs had already applied for and/or received meaningful use incentives, with independent RHCs more likely to have done so (30.1 percent) compared to provider-based clinics (15.3 percent).

Table 7. Eligible Professionals Expected to Apply for Medicare or Medicaid Meaningful Use Incentives*

	All RHCs (n=700)	Independent RHCs (n=366)	Provider-Based RHCs (n=334)
Yes, Medicare	7.6%	7.9%	7.2%
Yes, Medicaid	24.9%	27.9%	21.6%
Yes, both (different EPs expected to apply for Medicare and/or Medicaid incentives)	19.4%	16.4%	22.8%
No	10.7%	8.7%	12.9%
Not sure	14.4%	9.0%	20.4%
N/A (EPs have already applied for and/or received incentives)	23.0%	30.1%	15.3%

*Independent, provider-based, and total differences significant at $p \leq .001$

Plans to Apply for Meaningful Use Incentives: Among respondents that expected their EPs to apply for Medicare and/or Medicaid meaningful use incentives, 58.8 percent planned to do so

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[xii] Medicare meaningful use incentives may be appropriate for those EPs practicing in RHCs that do not meet the minimum standards of service to needy individuals (30% of patient volume) and provide a significant amount of Part B services in inpatient settings or other non-RHC services.

within the next six months, 23.5 percent planned to do so within seven to twelve months, and 2.0 percent planned to do so more than 12 months from the date of the survey (Table 8). Independent clinics were more likely than provider-based clinics to expect their EPs to apply for meaningful use incentives within the next six months (63.0 vs. 54.2 percent), while provider-based clinics were more likely to expect their EPs to apply for meaningful use incentives within seven to twelve months (29.8 vs. 18.0 percent).

Table 8. Plans to Apply for Meaningful Use Incentives*

	All RHCs (n=357)	Independent RHCs (n=189)	Provider-Based RHCs (n=168)
Within next six months	58.8%	63.0%	54.2%
Within seven to twelve months	23.5%	18.0%	29.8%
More than twelve months from now	2.0%	1.6%	2.4%
Do not plan to apply	1.4%	1.6%	1.2%
Not sure	14.3%	15.9%	12.5%

*Differences not significant

Sources of Technical Assistance and Support

Beginning in February 2010, the Office of the National Coordinator (ONC) for Health Information Technology, with funding appropriated under the HITECH Act, established 62 Regional Extension Centers (RECs) nationwide to provide technical assistance and support to providers to hasten their adoption and implementation of EHRs and to assist them in achieving meaningful use.[41,42] In February 2011, ONC committed $12 million in supplemental funding to provide additional support to priority providers including small group practices of 10 or fewer providers, and practices associated with Critical Access Hospitals, Federally Qualified Health Centers, RHCs, and other ambulatory providers serving uninsured, under-insured, and medically underserved populations.[43] REC services were available to all providers, including those that either had or had not yet adopted an EHR. For those providers without an EHR, primary services included needs assessments, product selection, and assistance with installation. For those providers with an EHR in place, REC services focused on providing assistance in managing the internal practice and business changes necessary to optimize the use of their EHRs.[42]

Funding for the REC program was authorized through April 2014 with the expectation that RECs would be self-sustaining by the end of the funding cycle.[12,37-39] Approximately 55 RECs

requested one year "no-cost extensions" to use any remaining funds in their budgets to continue their work through April 2015. With the termination of federal funding in April 2015, their future and ability to achieve self-sustainability is far from certain.

RECs are not the only source of technical assistance used to support EHR adoption. Many providers utilize technical assistance from a variety of sources including hospital and/or healthcare systems of which they may be a part, networks, consultants, internal staff, and state HIT organizations. To understand the different resources used by RHCs to adopt and implement their EHRs, we included questions on the extent to which RHCs utilize the RECs and other resources in their areas.

Technical Assistance and Support Received from Health Information Technology Regional Extension Centers: Almost one third (32.5 percent) of clinics with an EHR and 37.0 percent of those without an EHR reported using their designated REC for technical assistance related to either the identification and purchase of an EHR and/or implementation of an EHR after acquisition (Table 9). In contrast, 37.0 percent of RHCs with an EHR and 40.3 percent of RHCs without an EHR did not receive technical assistance or support from their area REC. The remaining clinics (30.5 percent with an EHR and 22.7 percent without an EHR) were either unsure if they had used their REC for technical assistance or were unaware of the REC program.

Among clinics with an EHR, independent RHCs (36.5 percent) were more likely than their provider-based counterparts (28.1 percent) to have received technical assistance from their REC. The opposite was true for clinics without an EHR; provider-based RHCs were more likely than their independent counterparts to have received technical assistance or support from their REC. These patterns of REC use are consistent with the findings of our prior survey.

Table 9. Technical Assistance or Support Received from HIT Regional Extension Center*

	All RHCs (n=855)		Independent RHCs (n=433)		Provider-Based RHCs (n=422)	
	With EHR (n=701)	W/O EHR (n=154)	With EHR (n=367)	W/O EHR (n=66)	With EHR (n=334)	W/O EHR (n=88)
Yes	32.5%	37.0%	36.5%	33.3%	28.1%	39.8%
No	37.0%	40.3%	34.3%	43.9%	39.8%	37.5%
Not sure or not aware of REC program	30.5%	22.7%	29.2%	22.7%	32.0%	22.7%

*Differences not significant

Other Sources of Technical Assistance and Support: It was not uncommon for RHCs to access multiple sources of technical assistance to support their EHR adoption and implementation. The most common sources of technical assistance included EHR vendors (45.1 percent), in-house staff (29.9 percent), and parent hospitals/systems (27.4 percent) (Table 10). The use of these support services varied by clinic type, with independent RHCs relying more heavily on vendor support and provider-based RHCs relying more on their parent hospitals/systems and in-house staff. Other important sources of technical assistance included hospital or provider networks (15.3 percent), private technical assistance contracts (12.5 percent), state HIT organizations (11.9 percent), and state Quality Improvement Organizations (QIOs) (5.1 percent). Independent clinics relied more heavily on private technical assistance contracts and state HIT organizations while provider-based clinics relied more heavily on hospital/provider networks and state QIOs. With minor exceptions, these patterns of technical assistance and support received were consistent across RHCs with and without an EHR (results not reported).

Table 10. Technical Assistance and Support Received

	All RHCs (n=822)	Independent RHCs (n=416)	Provider-Based RHCs (n=406)
Parent hospital/system***	27.4%	18.8%	36.2%
Hospital or provider network**	15.3%	11.5%	19.2%
Vendor support*	45.1%	49.5%	40.6%
Private TA contract***	12.5%	17.8%	7.1%
Support from state or local entity (e.g., State HIT Coordinator)	11.9%	12.7%	11.1%
In-house support (e.g., part- or full-time staff with HIT training or hands on expertise)*	29.9%	26.2%	33.7%
State Quality Improvement Organizations	5.1%	4.6%	5.7%
Do not (and have not) received TA at this time	8.9%	9.6%	8.1%
Not sure	13.6%	12.3%	15.0%

Column percentages total more than 100 percent because clinics were asked to "check all that apply"
Independent, provider-based, and total differences significant at *p ≤ .05, **p ≤ .01, and ***p ≤ .001

Patterns of EHR Use by RHCs

Given the growing adoption of EHR technology among primary care providers and RHCs, our final set of questions focused on how RHCs are using their EHRs and whether they are meeting

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key meaningful use criteria. To achieve our goal of maximizing response rate, we narrowed our focus to 20 key measures of EHR use consistent with the evolving meaningful use framework. As a result, we did not collect data on five of the Stage One meaningful use measures, including reporting of syndromic surveillance data, use of electronic immunization registries, medication reconciliation, patient education resources, and providing patients with access to their health information within four business days of the information being available to the EP. While this limits our ability to assess whether RHCs are likely to fully achieve Stage One meaningful use, we can describe RHC's primary use of EHRs and compare that with other studies of EHR use by primary care providers.

We grouped the 20 measures of EHR use into the following three categories (Table 11):

- Category 1 - Improving quality, safety, and efficiency, and reducing health disparities;
- Category 2 - Engaging patients and families in their health care; and
- Category 3 - Improving care coordination.

Within Category 1, RHCs performed best on measures related to completing medication orders (95.9 percent); using computerized physician order entry (CPOE) systems to order laboratory and radiology studies (88.5 percent); conducting drug-drug interactions and drug-allergy checks (84.0 percent); maintaining up-to-date problem lists (94.0 percent); transmitting prescriptions electronically (93.6 percent); incorporating clinical lab test results as structured data (81.7 percent); maintaining active medication (95.8 percent) and medication allergy lists (96.5 percent); capturing patient demographic information (98.2 percent); recording and charting vital signs (97.4 percent); and recording smoking status (95.5 percent). Clinics do less well with conducting drug formulary checks (61.1 percent); transmitting laboratory orders electronically (66.0 percent); reporting ambulatory clinical quality measures (57.7 percent); implementing at least one clinical decision support rule (61.0 percent); and generating patient lists/registries for quality improvement, population health management, or patient outreach (69.0 percent).

Within Category 2, RHCs performed well on the use of their EHRs to provide clinical summaries to patients for each office visit (81.9 percent) but performed less well on the use of their EHRs to send appropriate patient reminders for preventive and follow-up care (46.3 percent). Under Category 3, RHCs performed well on the use of their EHRs to provide summary care records for patients transitioned to another care setting (81.9 percent), but performed less well on the testing

or use of their EHRs' capability to exchange clinical information with other providers (64.0 percent). These findings are consistent with studies describing provider performance on the Stage One core and menu set measures, as well as with our earlier study of RHC meaningful use.[4,7,23,25]

Although independent and provider-based clinics performed relatively similarly on a number of the meaningful use measures in our set, there were some differences. Independent RHCs performed better than provider-based RHCs on measures related to conducting drug formulary checks (64.5 versus 55.9 percent); incorporating lab results as structured data (84.2 versus 78.6 percent); reporting clinical quality measures (60.6 versus 54.1 percent); implementing at least one clinical decision support rule (65.4 versus 55.7 percent); providing clinical summaries (88.3 versus 74.3 percent); providing summary care records (85.0 versus 78.2 percent); and exchanging key clinical information (68.3 versus 58.8 percent). Provider-based RHCs only exceeded the performance of independent RHCs on one key characteristic: transmitting laboratory test orders electronically at 70.8 and 62.1 percent, respectively.

DISCUSSION AND CONCLUSIONS

The results of this study reflect growing use of EHR technology by RHCs. The finding that 71.6 percent of RHCs have adopted and implemented an EHR represents a substantial increase over the 59.0 percent of clinics that had adopted and implemented an EHR at the time of our earlier survey in 2011-2012. These findings are also consistent with other recent studies of office-based physicians that found significant increases in EHR adoption by physicians (69 to 72 percent for all physicians and up to 75 percent for primary care physicians).[20,44] An additional 10.7 percent of our respondents had purchased but not yet implemented their EHRs.

Over 28 (28.3) percent of RHCs with an EHR report plans to upgrade or change their primary EHR. This figure is consistent with industry studies that estimate between 7 and 35 percent of physician practices are considering upgrading or replacing their EHRs. Further investigation is warranted to determine why these RHCs are considering a change and what systems they are moving to. This information would be useful to other RHCs that are considering EHR adoption or are currently dissatisfied with their own systems.

Although RHC EHR adoption rates are in line with those of other primary care practices, there are some areas of concern. For example, provider-based RHCs report a lower EHR adoption rate

than independent clinics (65.1 percent compared to 77.8 percent). Moreover, 17.8 percent of RHCs report having no EHR in place. Among this group (n=155), 12.9 percent had no plans to adopt an EHR and 14.8 percent were unsure of their plans. Further, 28.4 percent of RHCs without an EHR reported a time horizon of more than 12 months for EHR adoption. RHCs that have not adopted an EHR are at risk for being left behind in terms of EHR meaningful use and their ability to participate in evolving pay for performance and practice transformation initiatives. The reasons behind the first group's lack of plans to adopt an EHR and the second group's relatively long term adoption plans also warrant further exploration.

In terms of using their EHRs to improve quality, safety, efficiency, and reduce health disparities, RHCs performed best on measures related to clinical care and patient management. They did less well on conducting drug formulary checks; transmitting laboratory orders electronically; reporting ambulatory clinical quality measures; implementing at least one clinical decision support rule; and generating patient registries. In terms of engaging patients in their health care and improving care coordination, RHCs did well on measures related to providing clinical summaries for each office visit and summary care records for patients transmitted to other settings of care. They did less well on using their EHRs to send patient reminders for follow up and preventive care and to exchange clinical information with other providers. As the expectations for meaningful use evolve, RHCs and other EPs will be expected to demonstrate expanded use of their EHRs for clinically important functions. As such, it is important that RHCs improve their performance on all Stage 1 meaningful use measures as a foundation for meeting the more rigorous Stage 2 and Stage 3 standards.

Independent RHCs performed better than provider-based clinics on conducting drug formulary checks, incorporating lab results as structured data, reporting clinical quality measures, implementing at least one clinical decision support rule, providing clinical summaries, providing summary care records, and exchanging key clinical information. Provider-based clinics only exceeded the performance of independent RHCs on the electronic transmission of laboratory tests orders. These differences also warrant further exploration.

Given provider-based clinics' presumed access to the resources of their parent hospitals, our findings of lower EHR adoption and use among provider-based clinics are somewhat counterintuitive. Although our study does not allow us to explain these findings, we suggest two

possible reasons for the differences in the rates of EHR adoption. One is that parent hospitals may have adopted EHRs that are better suited to the needs of the inpatient setting than their provider-based RHCs. Under this scenario, hospitals may need to invest in a second EHR or modify their existing EHR to support their clinics but have yet to do so. Another possible explanation is that hospitals may have developed a phased implementation strategy, with EHR implementation in their provider-based clinics scheduled to take place after implementation is completed in the inpatient setting. Based on the results of our two RHC surveys, this pattern of lower EHR adoption in provider-based clinics deserves further study.

This study demonstrates that RHCs are approaching parity with other physician practices in terms of their rates of EHR adoption and use. However, this is not to say that RHCs no longer need technical assistance and support. Some groups of RHCs, such as provider-based clinics, report lower rates of EHR adoption than other clinics. At the same time, RHCs are not exhibiting consistently high performance on all Stage 1 meaningful use measures. With the conclusion of federal funding for the REC program, it is important to identify and provide other sources of technical assistance and support to assist all RHCs in adopting EHR technology and maximizing its use to improve clinical care and efficiency. This ability to maximize EHR use will be vital to enabling RHCs to participate in the evolving healthcare market.

Table 11. Meaningful Use of Electronic Health Records by Rural Health Clinics

Goal(s)	Objective	Measure Specifications	All RHCs	Independent RHCs	Provider-Based RHCs
Category 1: Improving quality, safety, efficiency, and reducing health disparities	CPOE (n=468)	Completes medication orders and/or prescriptions (for patients with at least one medication in their medication list) using EHR's CPOE functions	95.9%	97.6%	94.1%
	CPOE (n=469)	Uses CPOE function in EHR to order laboratory and/or radiology tests	88.5%	86.4%	90.9%
	Drug-drug and drug-allergy interactions (n=612)***	Implemented EHR functions to conduct drug-drug interactions and drug-allergy checks	84.0%	86.4%	81.1%
	Up to date problem list (n=616)	Maintains up-to-date problem list of current/active diagnoses recorded as structured data	94.0%	95.3%	92.5%
	ePrescribing (n=620)*	Transmits prescriptions electronically using e-prescribing functions in EHR	93.6%	94.7%	92.1%
	Drug formulary checks (n=614)*	Conducts drug formulary checks with access to at least one internal or external drug formulary	61.1%	65.4%	55.9%
	Lab tests (n=621)	Transmits orders for laboratory tests electronically using EHR	66.0%	62.1%	70.8%
	Lab test results (n=611)	Incorporates clinical lab test results (whose results are in a positive/negative or numerical format) ordered by clinic providers into EHR as structured data	81.7%	84.2%	78.6%
	Active medication list (n=621)**	Maintains active medication list for patients seen with at least on entry (or an indication that the patient is not currently prescribed any medication) recorded as structured data	95.8%	96.2%	95.4%
	Active medication allergy list (n=622)*	Maintains an active medication allergy list for patients seen with at least one entry (or an indication that the patient has no known medication allergies) recorded as structured data	96.5%	97.7%	95.0%
	Demographic information (n=621)	Captures patient demographic information (preferred language, gender, race, ethnicity, date of birth, etc.) as structured data t	98.2%	98.2%	98.2%
	Vital signs (n=619)*	Records and charts vital signs (i.e. height, weight, blood pressure, calculate and display body mass index, plot and display growth charts for children 2-20 years, including BMI, etc.) for patients age 2 and older as structured data	97.4%	98.5%	96.1%
	Smoking status (n=621)	Records smoking status for patients age 13 and older as structured data	95.5%	96.2%	94.6%

Goal(s)	Objective	Measure Specifications	All RHCs	Independent RHCs	Provider-Based RHCs
	Quality measures (n=619)	Reports ambulatory clinical quality measure to CMS, state, or other quality measurement and reporting system	57.7%	60.6%	54.1%
	Clinical decision support (n=615)**	Implemented at least one clinical decision support rule along with the ability to track compliance with that rule (Drug-drug and drug-allergy interaction alerts cannot be used to meet this meaningful use objective)	61.0%	65.4%	55.7%
	Patient lists/registries (n=612)	Generate condition-specific lists of patients to use for quality improvement, reduction of disparities, and/or outreach (or at least generate one report listing patients with a specific condition)	69.0%	70.3%	67.3%
Category 2: Engaging patients and families in their health care	Patient reminders (n=613)	Send appropriate reminders to patients (age 65 or older and/or age 5 or younger) for preventive and/or follow-up care	46.3%	47.9%	44.4%
	Clinical summaries (n=614)***	Provides clinical summaries for patients for each office visit	81.9%	88.3%	74.3%
Category 3: Improving care coordination	Summary care record (n=609)	Provide summary care record (either electronically or in paper format) for patients transitioned or referred to another setting or provider of care	81.9%	85.0%	78.2%
	Information exchange (n=613)	Exchanges key clinical information (e.g., problem list, medication list, medication allergies, and diagnostic test results) among providers of care and external patient-authorized entities (or has at least performed one test of its ability to do so)	64.0%	68.3%	58.8%

Independent, provider-based, and total differences significant at $^*p \le .05$, $^{**}p \le .01$, and $^{***}p \le .001$

This study assessed the status of survey participants on EHR adoption and use. As such, the survey instrument did not attempt to replicate the Stage One Meaningful Use Measure questions.

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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. The 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. That body of research has helped reveal the effects of policy and health system organization and financing on rural health access. The Center is committed to enhancing policymaking and improving the access, delivery and financing of rural health services by effectively linking its research to the policy development process through appropriate dissemination strategies. The Maine Rural Health Research Center focuses on barriers to health access for rural residents and related topics, including insurance coverage, Medicaid, behavioral health, long term services & supports, and challenges faced by rural providers (rural health clinics & critical access hospitals) in delivering and sustaining services.