Health Information Technology Adoption in California Community Health Centers

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Abstract

Objectives—National and state initiatives to spur adoption of electronic health record (EHR) use and health information exchange (HIE) among providers in rural and underserved communities have been in place for 15 years. Our goal was to systematically assess the impact of these initiatives by quantifying the level of adoption and key factors associated with adoption among community health centers (CHCs) in California.

Study Design—Cross-sectional statewide survey.

Methods—We conducted a telephone survey of all California primary care CHCs from August to September 2013. Multiple logistic regressions were fit to test for associations between various practice characteristics and adoption of EHRs, Meaningful Use (MU)–certified EHRs, and HIE. For the multivariable model, we included those variables which were significant at the $P = .10$ level in the univariate tests.

Results—We received responses from 194 CHCs (73.5% response rate). Adoption of any EHRs (80.3%) and MU–certified EHRs (94.6% of those with an EHR) was very high. Adoption of HIE is substantial (48.7%) and took place within a few years (mean = 2.61 years; SD = 2.01). More than half (54.7%) of CHCs are able to receive data into the EHR, indicating some level of interoperability. Patient engagement capacity is moderate, with 21.6% offering a personal health record, and 55.2% electronic visit summaries. Rural location and belonging to a multi-site clinic organization both increase the odds of adoption of EHRs, HIE, and electronic visit summary, with odds ratios ranging from 0.63 to 3.28 (all P values <.05).

Conclusions—Greater adoption of health information technology (IT) in rural areas may be the result of both federal and state investments. As CHCs lack access to capital for investments,

continued support of technology infrastructure may be needed for them to further leverage health IT to improve healthcare.

California has an unusually active health information technology (IT) environment. In addition to the national investment in electronic health records (EHRs) and health information exchange (HIE) through the Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH), over the last 15 years, private and state initiatives have aimed to improve digital infrastructure for the safety net through community health centers (CHCs). However, there has been little systematic effort to assess the impact of these policy and funding drivers on the general adoption of health IT among CHCs. The purpose of this study was to: 1) examine the level of adoption of EHRs and HIE among CHCs in California, and 2) assess the relationship among health IT adoption and key practice characteristics. To this end, we conducted the first statewide survey of health IT adoption in CHCs in California after HITECH. Results will contribute to the understanding of health IT issues faced by CHCs and may interest policy makers that wish to improve adoption and effective use in the safety net.

Health IT, including EHRs and HIE, is a core component of the US government's strategy to improve quality and reduce costs of care.[1,2] EHRs replace the paper charts used by providers to record a patient's information, and HIE is the electronic sharing of clinical data among unaffiliated providers, who may be using EHR products from different vendors, caring for the same patient.[3,4] Through HITECH and other programs, federal and state governments have invested substantial sums to promote health IT adoption among hospitals and eligible professionals, and have provided direct funding to CHCs.[5] CHCs, which include federally qualified health centers (FQHCs), other primary care clinics, and free clinics, are a vital part of the safety net for the underserved, uninsured, and indigent. HITECH funding for CHCs was offered in the form of "Meaningful Use" (MU) incentives to eligible professionals working at CHCs, as well as regional extension centers to assist with adoption, and grants to states to promote HIE.[6]

Two recent national studies found that more than 90% of FQHCs had adopted EHR use, a substantial increase since the passage of HITECH.[7,8] One of those studies found that 50% had adopted a basic EHR (defined as having 7 computerized capabilities such as maintaining patient problem and medication lists, incorporating laboratory results into the EHR, and entering prescription orders electronically), and one-third were capable of meeting MU Stage 1 requirements.[8]

Of the articles found in a recent systematic review of publications about HIE,[9] only 4 studies collected data related to attitudes and barriers of CHCs, and none focused solely on this type of provider.[10–13] One of these studies, by Yamin et al, highlighted unique challenges, including a shortage of staff and IT resources to implement HIE. Yamin and colleagues also pointed out that "the needs of the safety net population and its providers were not explicitly addressed, and some CHCs believed they were overlooked as important data providers." CHCs may be at risk of falling behind in adoption of HIE, thus impacting quality of care and creating a digital divide in healthcare services.[14]

While previous studies have focused on health IT adoption among FQHCs, we did not find any that addressed all types of CHCs; hence, the focus of this paper is health IT adoption in CHCs in California. California represents a particularly active health IT landscape, with 16 communities organizing HIE among unaffiliated health organizations and 14 enterprises conducting HIE within an integrated delivery network.[15] In addition, a number of state-level programs have focused on health IT adoption in CHCs since the 1990s. One such program was the Tides Foundation's Community Clinics Initiative, which supported EHR implementation and expansion.[16] Another program, the California Telehealth Network's Broadband Technology Opportunity Program, provided connectivity, equipment, technical assistance, and education to rural communities to promote adoption of broadband-enabled telemedicine and telehealth.

Blue Shield of California Foundation was an early funder of EHR and HIE readiness, planning, and implementation for CHCs; and UnitedHealthcare also offered grants for health IT innovation in rural and underserved communities. Finally, the HITECH-funded, state-designated HIE in California collaborated with a regional quality improvement organizations to offer assistance to rural communities with the EHR adoption process and provided several rounds of rural HIE grants and technical assistance. Thus, California is likely a leading state for health IT resources for CHCs. Understanding progress here may offer insights to inform other state and national strategies.

The purpose of this paper is to assess the level of adoption, and related factors, of EHRs and HIE among CHCs to inform future policy efforts to promote the use of health IT in California and nationwide.

METHODS

Sample and Administration

A publicly available database of CHC sites and administrative contacts was obtained from the Office of Statewide Health Planning and Development (OSHPD), which licenses CHCs. The OSHPD database includes safety net clinics, including primary care clinics and free clinics—some of which may also be federally qualified health centers (FQHCs)—but does not include physician-owned clinics or those covered solely by a hospital license. A starting set of 1059 CHCs was obtained. Specialist and single-issue centers (eg, oncology, dialysis) and headquarters or administration-only locations of a multi-site CHC were excluded. To assure a site met inclusion criteria, an Internet search was conducted and, if needed, a phone call was placed to ascertain the scope of care services. CHCs were grouped according to parent organization, if applicable, and only 1 survey per parent group (randomly selected from among locations) was attempted until the entire sample was attempted twice; this allowed for the greatest reach of opinions from different organizations. Screening resulted in 264 eligible sites. Respondents targeted were clinic site managers or administrators who had oversight of day-today delivery of services and would therefore have insight into how health IT was used in the clinic. An external survey firm collected the data through a computer-assisted telephone interviewing (CATI) software application used by 8 interviewers in a central location in San Francisco. Data collection occurred during August and September

2013. The study was approved by the San Francisco State University committee for human subject protection.

Survey Instrument

The questions analyzed for this paper were part of a larger telephone survey of 44 items. The items included for analysis in this report were newly constructed based on investigator experience and literature review.

EHR Adoption

Two measures of EHR adoption were determined based on "yes" responses to: "Does your clinic have an electronic health record system, also known as an EHR?" and "Is your organization currently using an EHR certified for meaningful use?" MU was described as: "In 2011, Medicare and Medi-Cal began offering financial incentives for physicians to adopt, implement, or upgrade computerized medical records systems (also known as electronic health records or electronic medical records) and use them meaningfully in practice. A certified EHR is one that is approved by the federal government to allow providers to obtain meaningful use incentive payments." Based on the timing of the survey, the question refers only to MU Stage 1.

HIE Adoption

HIE adoption was determined by a "yes" response to: "Does your clinic currently send or receive any electronic patient health information, not including claims or billing, externally, that is with other locations that are not under the same parent organizations? In other words, external locations are separate legal entities or unaffiliated organizations." We also asked about the length of time the organization had conducted HIE, how they accessed incoming electronic data (ie, view it in a website or portal, receive it into the EHR, or both), the external organizations with which they exchanged data (hospitals, physician offices, pharmacies, laboratories, other clinics, radiology/imaging centers, patients' personal health record systems, public health agencies, and other), and the types of data they exchanged (e.g., lab orders, lab test results, radiology orders, radiology results, patient summary care records, inpatient clinical notes, inpatient medication lists, inpatient problem lists, discharge summaries, ambulatory clinical notes, ambulatory medication lists, ambulatory problem lists, referrals, and clinical summaries). Two items explored the importance of HIE: "How much of a priority is implementing electronic health information exchange, compared with the other initiatives you currently have going on in your clinic, on a scale of 1 to 7 with 1 being the lowest priority and 7 being the highest priority?" and "How important is health information exchange, which is the electronic sharing of patient health information, to your clinic's mission, on a scale of 1 to 7 with 1 being not at all important and 7 being extremely important?"

Patient Engagement

Patient engagement was assessed with dichotomous responses to: "Do you offer an online personal health record (PHR) to your patients?" and "Do you provide visit summaries electronically to your patients?"

Practice Characteristics

All CHCs were located in California and were defined as urban or rural based on the Rural-Urban Commuting Area–mapped zip code of the local site. The sites were categorized according to size based on the number of full-time equivalent (FTE) billing providers, including physicians, nurse practitioners, physician assistants, and certified nurse midwives (small, 1 FTE; medium, 2 to 5 FTEs; large, >5 FTEs). Other characteristics included being part of a multi-site clinic organization, recognition as a patient-centered medical home (PCMH), and the level of such recognition.

Analysis

Multivariable logistic regressions were fit to test for associations between adoption outcomes and various practice characteristics. The adoption outcomes consisted of: 1) EHR, 2) MU–certified EHR, 3) HIE, and 4) offering PHR or electronic visit summaries to patients. The covariates were multi/single-site, PCMH recognition, size in FTEs, and rural/urban (location). Before fitting the multivariable model, we performed univariate tests using χ^2 or Fisher's exact test to test for univariate associations between the covariates and the outcome variables, as well as for associations between each of the covariates to assess multicollinearity. Fisher's exact test was used when the contingency table contained cells with fewer than 5 observations. Only those variables that were significant at the 0.1 level in the univariate tests were included in the multivariable model. All analyses were performed using SAS software version 9.4 (SAS Institute, Cary, North Carolina).

RESULTS

Surveys were completed in an average of 26 minutes by 194 CHCs—a response rate of 73.5%. Most respondents were senior administrators (n = 78) or day-to-day managers (n = 95), with the remainder being positions that were clinical (n = 10), technical (n = 2), or financial (n = 2). Table 1 summarizes outcomes and practice characteristics. Adoption of any EHR and MU–certified EHR is very high among the respondents. A substantial minority have adopted HIE with a mean of 2.61 years of conducting HIE (SD = 2.01; range = 0–10). Furthermore, more than half of CHCs provide electronic visit summaries, but only 20% offer a PHR. About a third have PCMH recognition, most at level 1. One-fifth are participating in an accountable care organization (ACO). A majority (54.7%) receive electronic data in the EHR while the remainder have view-only access.

CHCs exchange data with a wide variety of partners, most frequently labs, pharmacies and hospitals (Figure 1). The types of data most frequently exchanged are those that are typically shared among those same partners: lab orders and results, discharge summaries, and radiology orders and results (Figure 2). Medications, problem lists, and notes are less frequently shared.

Multicollinearity

There was a very strong association between PCMH and multi-site organization (*P*<.001). Hence, we dropped the PCMH covariate from the multivariable models. There was no other indication of multicollinearity (all *P* values >.13).

Univariate Tests

Using Fisher's Exact Test, there was a significant association between EHR use and PCMH, multi-site, FTEs, and geography (P values = .0139, .0025, .0001, and .007, respectively). None of these characteristics were significantly associated with MU-certified EHR (P values = .15, .12, .72, and 1.00, respectively).

There was a significant association between HIE and location (P = .002) and a weakly significant association with multi-site structure (P = .07). There were no significant associations between HIE and PCMH status, level, or FTEs (P values = .63, .42, and .66, respectively).

Logistic Regressions

The logistic regressions that yielded significant or near-significant results are shown in Table 2. No significant effects were found in the multiple regression models for offering PHR.

For the EHR model, small practices were only 13% as likely to have adopted an EHR system compared with large practices, while medium-sized practices were about 31% as likely. Multi-site CHCs were more than 3 times likelier to use EHRs compared with single-site CHCs; urban CHCs were only about 12.5% as likely to use EHRs compared with rural. For the MU–certified EHR model, multi-site CHCs were about a quarter as likely to be certified compared with single-site CHCs, and urban CHCs were about 50% as likely to be certified compared with rural CHCs, though this is not significant after controlling for multi-/single-site status.

For the HIE model, Additionally, multi-site CHCs were 2.45 times more likely to use the electronic visit summary model than single-site CHCs, and urban CHCs used this model about 37% as often as rural CHCs.

DISCUSSION

EHR adoption in California CHCs is similar to national estimates.[8] However, almost all California CHCs that use EHRs are using those that are MU–certified, compared with one-third of CHCs nationally. California CHCs also have a high rate of attestation to MU Stage 1.

Almost half of California CHCs have adopted HIE, and most implemented it after the advent of HITECH and MU incentives. They are exchanging data with a diverse group of partners; the most frequently exchanged data—lab and radiology orders and results, and discharge summaries—match the type of data generated by the most frequent exchange partners: labs and hospitals. The less-frequent problem lists, medication lists, and clinical notes are also important to continuity of care. Much of this exchange is still accomplished through view-only access, although more than a third receive data in the EHR—an indicator of interoperability. Given the importance of interoperability for new care models such as PCMH and ACO, the lack of integration is concerning and may hinder HIE progress.

Patient engagement remains low in California: 55.2% of CHCs provide electronic visit summaries compared with 85% in a national study of FQHCs.[8] FQHCs are a subset of CHCs, which may account for some of the difference; however, the magnitude of difference warrants further investigation. The ability to provide electronic summaries and PHRs are important functions that will be necessary for advanced stages of MU and PCMH.

Perhaps not surprising, is that multi-site and larger CHCs have greater odds of health IT adoption, since they may have greater access to resources and financing. Counterintuitively, we found that rural sites have adopted HIE much more frequently than urban sites. The heavy emphasis on health IT adoption by California funders, state-designated HIE, and regional extension centers may explain this difference. As rural providers are often the primary or only health providers in the community, and the residents are disproportionately dependent on public health insurers, adoption of HIE and EHR may have a disproportionate impact on healthcare in these communities. These findings suggest that the policies and programs intended to promote health IT adoption in rural areas may have had a positive impact. When these results are taken along with those of another study in California—one that found that nurse practitioners and physicians with high percentages of Medicaid patients had lower odds of using EHRs[17]—the continuing need for adoption in urban areas is clear. In contrast, an Arizona statewide study found physician practices with 20 or more Medicaid patients were 5.2% *more* likely to be able to transmit EHRs to at least 1 healthcare provider outside of their practice.[18] Assistance in health IT adoption is still needed for urban and smaller CHCs.

Limitations

Although the study benefitted from a high response rate, those who responded to the survey were mainly in urban settings. Rural CHCs may be smaller with fewer staff, and managers may be less available to participate. Although the results indicate higher adoption in rural CHCs, this should be interpreted cautiously because the study was conducted in the midst of a number of state and federal initiatives aimed at enhancing health IT adoption and PCMH readiness. Further study after these initiatives have been completed would be advisable in order to assess the progress toward healthcare goals. The state's CHCs are performing well in health IT—perhaps due to state-level programs on health IT adoption—but this may not be generalizable to a nationally representative population.

As with all surveys, self-report bias is a concern. However, because there are currently no well-known sources of objective data on health IT adoption in all CHCs, statewide data collection remains important. In addition, the sampling strategy was designed to limit overrepresentation of multi-site organizations, but it's unclear if this was a source of bias.

California CHCs have achieved a high level of adoption of EHRs and HIE. However, for continuity of care and patient engagement, they lag in the exchange of robust clinical data beyond lab and radiology orders and results. In order to stave off the digital divide and health disparities, more effort is needed, especially in urban, small, and single-site CHCs. Particular attention needs to be paid to HIE with a wide variety of clinical partners beyond hospitals and labs, including physician practices and public health departments. With the sunsetting of MU and Health Resources and Service Administration funds for PCMH

readiness, and the closure of HITECH-funded regional extension centers, other programs need to fill the gap. Programs that focus on Medicaid HIE, and the adoption and use of technology among underserved patients to support their active participation in health, are critically important, because CHCs have fewer options for capital-intensive and infrastructure development efforts than other types of providers.

CONCLUSIONS

The health IT capabilities that have been adopted are consistent with the requirements of national policy strategies. State-level programs may also have enhanced adoption, especially among rural CHCs. Findings suggest that further investigation into the levers that have prompted health IT adoption will be useful, especially for those who will be shaping future policies about expanding health IT to include more forms of health data across more healthcare stakeholders.

Acknowledgments

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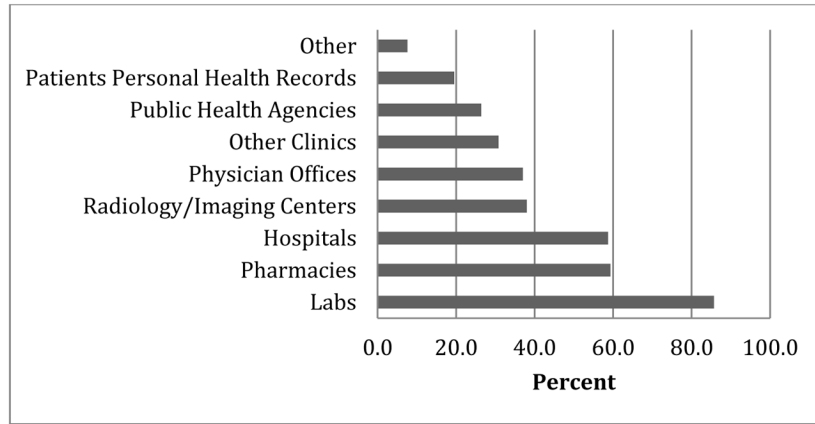
Figure 1.
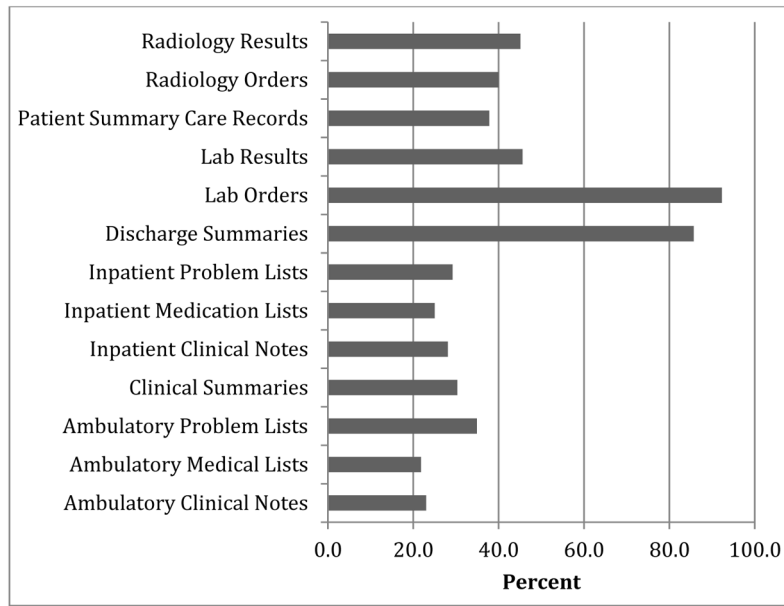Community Health Centers' Data Exchange Partners (N = 92)

Figure 2.
Types of Data Exchanged by Community Health Centers (N=92)

Table 1

Summary of Adoption and Practice Characteristics

Practice Characteristic	Yes (n)	%
HIE adoption		
Send/receive electronic patient health information	92 (189)	48.7
EHR adoption		
EHR implemented	155 (194)	80.3
MU–certified EHR implemented[a]	140 (148)	94.6
At least 1 provider attested to MU Stage 1	73 (92)	79.3
Patient engagement		
Online PHR offered to patients	41 (190)	21.6
Electronic visit summary provided	106 (192)	55.2
Other characteristics		
Achieved PCMH recognition	60 (178)	33.7
Level 1	17 (37)	46.0
Level 2	10 (37)	27.0
Level 3	10 (37)	27.0
Part of larger clinic organization (multi-site)	116 (191)	60.7
Geography		
Urban	159 (192)	82.8
Rural	33 (192)	17.2
Number of full-time equivalent billing providers		
1	29 (186)	15.6
2–5	84 (186)	45.2
>5	73 (186)	39.2

EHR indicates electronic health record; HIE, health information exchange; MU, Meaningful Use; PCMH, patient-centered medical home; PHR, personal health record.

[a] Among those who have implemented an EHR.

Table 2

Relationship of Practice Characteristics to Adoption of EHR and HIE

Response Variable	Covariate	_P_	Odds Ratio	95% CI
EHR	Size in number of FTE providers (small 1 vs large >5)	.006[a]	0.13	0.04–0.50
	Size in number of FTE providers (medium = 2–5 vs large >5)	–	0.31	0.08–1.22
	Part of clinic corporation (1 = yes vs 2 = no)	.004[a]	3.28	1.47–7.28
	Location (1 = urban vs 2=rural)	.048[a]	0.13	0.02–0.99
MU–certified EHR	Part of clinic corporation (1 = yes vs 2 = no)	.076	0.26	0.06–1.15
	Location (1=urban vs 2 = rural)	.56	0.53	0.06–4.56
HIE	Part of clinic corporation (1 = yes vs 2 = no)	.063	1.80	0.97–3.33
	Location (1 = urban vs 2 = rural)	.002[a]	0.25	0.11–0.60
Electronic visit summary	Part of clinic corporation (1 = yes vs 2 = no)	.004[a]	2.45	1.33, 4.50
	Location (1 = urban vs 2 = rural)	.023[a]	0.37	0.16–0.87

EHR indicates electronic health record; FTE, full-time equivalent; HIE, health information exchange; MU, Meaningful Use.

[a]Significant.