



# HHS Public Access

Author manuscript

*J Health Care Poor Underserved*. Author manuscript; available in PMC 2016 August 30.

Published in final edited form as:

*J Health Care Poor Underserved*. 2016 February ; 27(1): 327–338. doi:10.1353/hpu.2016.0016.

## Disparities in Primary Care EHR Adoption Rates

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### Abstract

This study evaluates electronic health record (EHR) adoption by primary care providers in Georgia to assess adoption disparities according to practice size and type, payer mix, and community characteristics. Frequency variances of EHR “Go Live” status were estimated. Odds ratios were calculated by univariate and multivariate logistic regression models. Large practices and community health centers (CHCs) were more likely to Go Live (>80% EHR adoption) than rural health clinics and other underserved settings (53%). A significantly lower proportion (68.9%) of Medicaid predominant providers had achieved Go Live status and had a 47% higher risk of not achieving Go Live status than private insurance predominant practices. Disparities in EHR adoption rates may exacerbate existing disparities in health outcomes of patients served by these practices. Targeted support such as that provided to CHCs would level the playing field for practices now at a disadvantage.

### Keywords

Health information technology; electronic health records; health disparities; Medicaid

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The Health Information Technology for Economic and Clinical Health Act (HITECH) was enacted in February 2009 as part of the American Recovery and Reinvestment Act and has invested over 35 billion dollars in efforts across the United States to build a Health

Information Technology (HIT) infrastructure and encourage the “Meaningful Use” of electronic health records (EHRs).<sup>1</sup> Federal meaningful use criteria highlight quality measures that are implemented over three stages in an effort to advance the utilization of EHRs and improve clinical outcomes and overall population health.<sup>2</sup> Providers and hospitals that meet these criteria can receive Medicaid or Medicare incentive payments. Bruken et al. projected that over 90% of general, family and internal medicine physicians could qualify for these meaningful use incentives.<sup>3</sup> Since 2009, U.S. EHR adoption rates have jumped from an estimated 15% to over 60% in 2012. Hospital adoption rates increased from 16.1% to 38.1% during the same time period.<sup>4</sup> However, a 2011 Commonwealth Fund International Health Policy Report shows that the U.S. continues to lag behind more experienced countries such as Sweden and New Zealand where nearly all primary care doctors are using electronic patient records.<sup>5</sup>

This drive to adopt HIT is associated with health reform efforts to improve access and overall clinical outcomes. HIT that is successfully integrated into clinical workflows has the potential to improve patient safety and quality of care while helping to eliminate variations in care that lead to health disparities.<sup>6</sup> National HIT policies and plans explicitly include support for community-level activities to assure that certified EHR and other HIT innovations are disseminated broadly, especially to primary care providers who treat underserved populations. Therefore, we undertook this study to evaluate the adoption of EHR systems across various practices grouped by characteristics associated with challenges in adopting electronic health records, in order to assess potential low adoption rates in solo or small-group practices, those in underserved rural areas, and those serving predominantly Medicaid or uninsured patient populations.

## Methods

### Data collection and description

This study was conducted using data collected through the Health Information Technology Research Center (HITRC) customer relationship management (CRM) tool.<sup>7</sup> This CRM software is utilized by the Georgia Health Information Technology Regional Extension Center (GAHITEC) and by each of the 62 Office of the National Coordinator (ONC) sanctioned Regional Extension Centers (REC) across the U.S. Under the HITECH Act, RECs were established in every state across the U.S. with the goal of providing technical assistance to over 100,000 providers to adopt EHRs and achieve MU criteria. The CRM tool captures regional and national data on providers of the extension centers. This study presents findings from data collected from medical practices participating in the GAHITEC program. Captured data include provider and practice demographics, EHR implementation information, and technical assistance measures. Practice demographic information includes but is not limited to: practice specialty/focus, provider numbers, and location. Information is obtained from practice managers, providers, and GAHITEC technical teams serving these practices. All information is entered into the CRM tool by trained GAHITEC staff. We combined these GAHITEC data with ZIP-code level contextual data from 2010 U.S. census data (2010 Census Summary File 1) and 2007–2011 American Community Survey 5-Year Estimates data.

Providers eligible to participate in the ONC REC program included medical doctors, physician assistants and nurse practitioners. Eligible participating practices included Pediatric, Family Medicine, Internal Medicine, and Obstetrics and Gynecology medical practices. The majority of practices had 10 or fewer providers and were mostly clustered in and around the Metro Atlanta area, but the analysis also included practices in other metropolitan and rural geographic locations throughout Georgia. Providers participating in the GAHITEC program first had to sign an agreement to actively participate and cooperate with REC staff for the adoption of a certified EHR system. They also agreed to strive to meet meaningful use criteria. Providers who had already implemented EHR systems could also participate by first agreeing to upgrade their existing system to meet the criteria.

## Definitions

**Go Live status**—The implementation of EHR systems within the provider's practice was indicated by a “Go Live” status, which indicated that the provider's practice had installed a certified EHR system that demonstrated the ability to capture data, perform e-prescribing and do clinical quality reporting functions. Qualifying EHR systems must have demonstrated ONC certification which documents the security, functionality, and capability of the technology to help practices meet meaningful use criteria. By meeting the “meaningful use” criteria for a required level of EHR functionality, the providers are then able to qualify for Medicaid or Medicare incentive payments. While most practices tend to adopt the technology as a practice and not as individuals, the Medicaid and Medicare incentive programs and the ONC REC program require each provider to register and comply with meaningful use criteria on an individual level (perhaps because individual providers within a practice could work outside of the EHR system and remain paper-based). Therefore our data were collected based on provider compliance and not practice level compliance. In December of 2012, GAHITEC was entering the final year of its four year ONC funded REC program with a total number of 3,964 providers. This represented approximately 50% of the 8,000 priority primary care providers in Georgia (estimated number of providers who serve a significant portion of underserved populations as targeted by the ONC program) and nearly 25% of the estimated 15,563 total primary care providers within Georgia. Over 80% of these providers were listed at Go Live status and nearly 30% of the providers had obtained the meaningful use criteria for the REC program. The evaluation in this research is based on three years of collected data of a four-year REC program.

**Provider and practice characteristics**—The unit of analysis is the individual provider, each of whom is then grouped for analysis into sub-groups by provider characteristics, practice type, and payor mix. Provider characteristics and practice types are based on the original categories as outlined by ONC. Practice types within the data set include community health centers (FQHCs), small private practices of one–10 providers, large group practices with over 10 providers, public hospital clinics (hospital owned practices), rural health clinics (RHCs) and other underserved settings (providers in free clinics and county public health units and other clinics that serve high levels (at least 30%) of Medicaid and uninsured patients and do not fit within other clinic categories as previously defined). RHCs are somewhat unique entities which are typically private practices that have sought RHC designation because they are in primary care shortage areas and have hired nurse

practitioners or physician assistants to expand the primary care workforce in these areas. If they meet RHC criteria, they then receive a preferential reimbursement rate from Medicare. We have found in previous work that RHC designation can be a marker for practices which are in high-need areas, but which are not receiving the federal grant funding or other technical support afforded to federally qualified health centers (FQHCs). There are 99 federally-designated RHCs in Georgia.

**Provider**—The term “Provider” refers to physicians, nurse practitioners and physician assistants. Data that are entered into the CRM tool for each practice includes the number of providers within that practice.

**Provider's practice by payer mix**—The original data set downloaded from HITREC CRM contained each provider's patient composition by payer mix. The largest proportion of insurance covered patients in the provider's practice determined the category of insurance seen as dominant. For example, if 50% or more of the patients were covered by Medicaid, then the provider's category would be Medicaid dominant. The definition is similar for Medicare-dominant, private insurance-dominant and uninsured-dominant practices.

**Community characteristics**—Community characteristics are based on the census data at ZIP code level. African American predominant communities were defined as greater than 50% African American population divided by the total population in the ZIP code in the 2010 decennial Census, and likewise with other populations. A low-income community was defined by the percentage of individuals living in families with income below the poverty level on the 2007–2011 American Community Survey 5-Year Estimates data.<sup>8</sup> At the ZIP code level across Georgia, the average proportion of the population in families with incomes below the poverty level was 11.95%. ZIP codes with “percent below poverty” above the mean for ZIP codes were categorized as low-income (high-poverty) communities.

## Statistical methods

Frequency variances of Go Live status among sub-groups of providers of various practice types and different community characteristics were estimated using the Chi Square test. The unadjusted odds ratio for Go Live status was estimated through a univariate logistic regression model using the provider sub-group variable as a single predictor. Adjusted Odds ratios for Go Live status were calculated by a multivariate logistic regression model adjusted for provider sub-groups related to practice types, community demographic types, community income types, and Insurance dominant types. The reference groups were providers serving in community health centers, private insurance dominant practices, non-African American dominant communities and relative low-poverty communities. Data were imported into SAS format and analyzed by SAS 9.2 (SAS Institute, Cary, NC). The level of Statistical significance was set at .05 and all tests were two-tailed.

## Results

Table 1 shows the distribution of providers within various practice types and the predominant insurance coverage for their patients. Providers within private practice groups of one–10 providers and large group practices accepted more private insurance patients

compared with providers in community health centers (2.1%), rural health clinics and other clinics serving underserved populations (21.7%). The payer mix of providers in community health centers were more likely to be classified as uninsured dominant, while only 1.2% of those in private practices were classified as uninsured dominant type. Most providers in rural health clinics (RHCs) and other underserved practices served mostly Medicaid patients, and no providers in rural health clinics or other underserved setting practices were classified as uninsured-dominant.

Table 2 shows the distribution of providers by practice type and their community types by EHR adoption rates (Go Live status). Providers within large group practices and community health centers were more likely to achieve Go Live status (> 80% EHR adoption), while only half (53.3%) of those in RHCs and other underserved settings had achieved the same. A lower proportion (68.9%) of providers in Medicaid predominant practices had achieved Go Live status compared with providers for which other insurance types were predominant. With regard to the characteristics of communities in which the provider served, no significant differences in practices achieving Go-Live status were found between practices located in high-proportion African American ZIP codes compared with practices located in other areas, or between high-poverty ZIP codes and low-poverty ZIP codes.

Table 3 shows the crude and adjusted odds ratios (ORs) of Go Live status for providers within various practice types. The crude ORs indicated that RHCs and other underserved settings had nearly five times the odds of providers not having adopted EHR (not having achieved Go-Live status). Providers serving in public hospital clinics and private practices of one–10 providers had nearly two times the chance of not yet having implemented EHRs compared with those in larger group practices. Providers serving predominantly Medicaid patients had a 47% higher chance of not achieving Go Live status compared with providers in practices with predominantly private insurance coverage for their patients. The adjusted ORs in multivariate analysis showed the same pattern. Even after adjusting for covariates, providers in RHCs and other underserved settings had more than five times the chance of not having achieved Go Live status compared with those in large private group practices. Medicaid predominant providers had a 32% higher chance of not having implemented EHR compared with providers in private insurance-serving practices. Community characteristics were not significant in either univariate or multivariate analysis.

## Discussion

Our data show a lag in EHR adoption among some but not all providers in practices serving the underserved. Providers in smaller private practices of one–10 providers, public hospital clinics, and RHCs were less likely to have achieved go-live status, as were providers with a payer mix dominated by Medicaid patients. On the other hand, providers in community health centers (also known as federally-qualified health centers or FQHCs) had relatively high rates of adoption. Despite statistical significance, the go-live rate differences between CHCs and large groups may not be large enough to be meaningful. However an absolute 10-percentage point differential in adoption rates between small private groups and CHCs, or between public hospitals and large practice groups, could represent a real gap in the diffusion of important technological innovation.

Although 65% of U.S. patient visits nationwide occur in small practices, our study shows that providers in smaller practices (one–10 providers) have twice the chance of not implementing EHR systems as providers in larger practices (10 providers). These findings are consistent with previous research.<sup>1</sup> Rao et al. reported that solo and two physician practices cited financial reasons as a primary barrier to early adoption.<sup>9</sup> Less than 2% of solo and two physician practices were shown to have fully functional EHRs in this study compared to the 13% of group practices (11 or more physicians). While our study did not specifically address solo practices, they are included within our small practice category and may face similar barriers. Ramaiah et al. found that primary care physicians, who are disproportionately represented in small practices, tended to have more complex workflows and were less likely to have adopted EHRs compared to specialty physicians.<sup>10</sup>

Adoption of EHRs is only the first step. Ryan et al. found that, even after adoption, only those small practices that were exposed to extensive technical assistance were able to show improvement in limited quality measures, with a 21%–46% difference in specific EHR functionalities between groups.<sup>11</sup> Slower adoption among primary care physicians and smaller practices could complicate the increased demands projected for the primary care workforce, as previously uninsured segments of the population achieve health insurance coverage under the Affordable Care Act.<sup>12</sup> A survey of 544 small practices by Ancker et al found EHR implementation success to be associated with practices that treated fewer Medicaid and uninsured patients.<sup>13</sup>

The contrast in implementation success rates between providers in RHCs and FQHC/CHCs in our analyses is striking. Both represent practice settings which are federally-designated as serving underserved patient panels. However, CHCs receive federal grant funding to provide care to the uninsured, while RHCs only receive enhanced Medicare reimbursement rates for expanding the available primary care workforce in the rural community by adding nurse practitioners or physician assistants to the practice.<sup>14</sup> In addition, over the past four years various federal programs have provided FQHCs with additional funds to assist with EHR implementation and other HIT infrastructure, which may help account for their higher rate of EHR adoption despite their high-Medicaid / high-uninsured patient mix. While CHCs were still 1.6 times more likely than large private group practices not to have achieved EHR go-live status, RHCs were more than 5.5 times more likely not to have implemented an EHR. Therefore, RHCs are a specific sub-set of rural practices with unique EHR adoption patterns related to their high-need / low-resource profile. Although previous analysis of national survey data by Singh et al. showed that practices in rural areas actually had 3.7 times higher rates of adoption than those in urban areas, our data suggest that RHCs have a uniquely higher chance of not adopting EHR, and may be different in this respect from other practices in rural areas.<sup>15</sup>

Providers that began implementing EHR earlier have reached higher levels of EHR functionality, which may in turn lead to more optimal usage and performance related to quality of care, patient safety, and chronic disease outcomes.<sup>16</sup> In contrast, rural health providers and those serving high-Medicaid populations seem to be at risk of lower functionality and integration even after initial implementation of EHR systems.<sup>8</sup> Adoption of EHR is an ongoing process that continuously evolves through system upgrades,

interoperability, and continued education and training of staff. Maximization of EHR capability will be important to these providers not only to qualify for meaningful use incentives, but also to meet other quality initiatives, including patient-centered medical home (PCMH) certification. Failure to achieve these goals can result in adverse payer mix and lower reimbursement rates, resulting in a vicious cycle of diminished revenues and lack of capital to invest in EHR upgrades and other practice improvements. Werner et al. demonstrated a 39% lag in quality improvement trends in high-Medicaid serving hospitals compared with hospitals serving low proportions of Medicaid clients.<sup>17</sup>

These patterns may limit the equitable implementation and potential benefits of EHR systems in addressing population health disparities. Samai et al. showed that Hispanic and Black patients who received care from physicians who used EHRs with clinical decision support had improved blood pressure control and no disparity in outcomes, compared to whites who received care from providers without EHRs.<sup>18</sup> However, Hing et al. found that Black and Hispanic/Latino patients who were uninsured or enrolled in Medicaid were less likely than privately-insured patients to have primary care physicians with EHRs.<sup>18</sup> Minority patients are also significantly less likely to use electronic patient portals for patient education and self management than Whites. Our analyses showed no difference in EHR adoption rates among providers in high-poverty ZIP codes versus those in low-poverty areas. These findings were counterintuitive, and contrast with our finding of adoption lag among providers in Medicaid-predominant practices. It appears to be the characteristics of practices which seem to drive inequalities in adoption, rather than the social determinant characteristics of the local community and its population. Further research is needed to understand the role of neighborhood-level poverty vs. practice-specific economic factors that influence adoption and full implementation of EHR.

This study has significant limitations. Provider characteristics and practice type categories were limited by categories of data input established at the outset of the program, and some mis-classification of practice type and patient mix is possible, since these data are self-reported by providers. There are differences in the timetable for adoption and meaningful use in the Medicaid program compared to the Medicare program, which might also have affected differences in adoption rates. This study did not address provider preferences or other contributing factors that may represent additional barriers to or enablers of EHR adoption.

Most importantly, we were able to survey only providers participating in the Georgia HIT Regional Extension Center (HIT-REC) program. Non-participating providers in Georgia may have different EHR adoption patterns. We also cannot assume that the Georgia HIT-REC providers are representative of national EHR adoption patterns. However, within Georgia we did enroll more than one-fourth of all primary care providers in the state, and roughly half of those in small practices or serving the underserved. This study focused on the practices which were engaged in assistance by a federally funded regional extension center program. The conclusions of our study will be most relevant to those evaluating the impact of this program, and other programs which are designed to promote implementation of beneficial technologies. These programs may need to adopt different strategies or provide additional support to practices with characteristics that suggest a higher risk for lagging in

adoption of these new technologies. We would advise caution in over-generalizing from this study to the broader range of practices not currently targeted by these programs.

## Conclusion

The Office of the National Coordinator (ONC) has been successful through its work with the nation's 62 Regional Extension Centers to aid over 130,000 providers with the adoption of EHRs. Health Information Exchanges (which were almost nonexistent in 2009) are now being structured in every state to integrate and enable providers to exchange patient information. These efforts have led to increased access to and adoption of HIT among various types of medical practices, but perhaps somewhat less so in those that serve underserved populations.

As we often see with other forms of technology innovation, increased availability of HIT does not necessarily mean that all communities will receive equal benefit. This study shows that continued disparities remain among smaller practices and practices serving rural and other underserved communities, even as EHR implementation increases rapidly across the nation. Targeted support such as that provided to FQHC/CHCs can level the playing field for practices at greatest risk of delays in adoption of innovative technology.

## Acknowledgments

1. Department of Health and Human Services (Office of National Coordinator for HIT (ONC))
  - Grant number: 90RC0013
  - Project Name: National Center for Primary Care—Regional Extension Center for Health Information Technology in Healthcare
2. National Institutes of Health (National Institute on Minority Health and Health Disparities)
  - Grant Number: 1U54MD008173-01
  - Project Name: TCC for Health Disparities: Informing & Influencing Health Policy and Practice

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**Table 1**  
**Distribution of Providers Within Different Practice Types and Their Patient's Insurance Dominant Type**

<b>Practice type</b>	<b>Private Insurance dominant<sup>a</sup></b>	<b>Medicare patients dominant</b>	<b>Medicaid patient dominant</b>	<b>Uninsured dominant</b>
Community Health Center	7(2.1%)	8(2.4%)	138(40.5%)	188(55.1%)
Large Group Practices	746(72.1%)	63(6.1%)	204(19.7%)	22(2.1%)
Private practice of 1–10 providers	1118(49.0%)	490(21.5%)	645(28.3%)	28(1.2%)
Public Hospital	202(33.8%)	56(9.4%)	130(21.7%)	210(35.1%)
Rural Health Clinic and Other underserved setting	13(21.7%)	23(38.3%)	24(40.0%)	0

<sup>a</sup>Dominant means providers accepted most of patients from this kind of insurance type.

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**Table 2**  
**Provider/Community Characteristics and Ehr Adoption Rates (Go Live Status)**

	Go Live status		p
	No	Yes	
<i>Provider Characteristics</i>			
Practice type			<.01
Community Health Centers	60(17.6%)	281(82.4%)	
Large Group Practices	157(15.2%)	878(84.8%)	
Private practice of 1–10 providers	624(27.4%)	1657(72.6%)	
Public Hospital	157(26.3%)	441(73.8%)	
Rural Health Clinic and Other Underserved settings	28(46.7%)	32(53.3%)	
Insurance dominant type			<.01
Private Insurance dominant	490(23.5%)	1596(76.5%)	
Medicare patients dominant	121(18.9%)	519(81.1%)	
Medicaid patient dominant	355(31.1%)	786(68.9%)	
Uninsured dominant	60(13.4%)	388(86.6%)	
<i>Community Characteristics</i>			
African American dominant zip code area <sup>a</sup>			.77
Yes	259(23.2%)	856(76.8%)	
No	751(23.7%)	2425(76.4%)	
Poor family income area <sup>b</sup>			.78
Yes	606(23.4%)	1985(76.6%)	
No	404(23.8%)	1296(76.3%)	

<sup>a</sup>African American residents >50%.

<sup>b</sup>Percentage below poverty level below Georgia average.

**Table 3**

Multivariate analysis of provider/community characteristics and chance of not yet having implemented ehr (e.g., not achieving go-live status)

	Not Achieving Go-Live status			
	Crude OR, 95% CI	p	Adjusted <sup>a</sup> OR, 95% CI	p
<i>Provider Characteristics</i>				
Provider type				
ref=Large Group Practices	1.0		1.0	
Community Health Center	1.19(0.86,1.66)	.15	1.62(1.12,2.34)	<.01
Private practice of 1–10 providers	2.11(1.74,2.56)	<.01	2.18(1.79,2.66)	<.01
Public Hospital	1.99(1.55,2.55)	<.01	2.53(1.91,3.34)	<.01
Rural Health Clinic and Other underserved setting	4.89(2.87,8.35)	<.01	5.52(3.17,9.61)	<.01
Insurance dominant type				
ref= Private Insurance dominant	1.0		1.0	
Medicaid patients dominant	1.47(1.25,1.73)	<.01	1.32(1.11,1.57)	<.01
Medicare patients dominant	0.76(0.61,0.95)	<.01	0.62(0.50,0.79)	<.01
Uninsured patients dominant	0.50(0.38,0.67)	<.01	0.46(0.33,0.65)	<.01
<i>Community Characteristics</i>				
African American dominant zip code area <sup>b</sup>				
Ref=no	1.0		1.0	
yes	0.98(0.83,1.15)	.78	0.93(0.77,1.13)	.47
Poor family income area <sup>c</sup>				
ref=no	1.0		1.0	
Yes	0.98(0.85,1.13)	.78	1.01(0.85,1.20)	.88

<sup>a</sup> Adjusted for all provider and community characteristics.

<sup>b</sup> African American residents >50%.

<sup>c</sup> Percentage below poverty level below Georgia average.