POLICY

Primary Care Capacity as Insurance Coverage Expands: Examining the Role of Health Information Technology

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ABSTRACT

Objectives

Under the Affordable Care Act, many newly insured Americans have the challenge of establishing care with a primary care physician (PCP). We sought to examine whether health information technology (HIT) use in primary care practices was associated with anticipated capacity to accept new patients.

Study Design

Secondary analysis of a cross-sectional survey of Michigan PCPs from the specialties of pediatrics, internal medicine, and family medicine, conducted from October to December 2012. HIT use was considered independently for 8 types of HIT and in aggregate as a total count of HIT in use. Primary care capacity was assessed as self-reported capacity to accept new patients.

Results

Of 739 respondents, 83% reported they anticipated capacity to accept new patients. In multivariable analysis, we found that physicians using a greater number of HITs were significantly less likely to anticipate capacity to accept new patients (adjusted odds ratio [OR] = 0.86; 95% CI, 0.76-0.97). PCPs with higher HIT use were also less likely to accept patients with private insurance (adjusted OR 0.87; 95% CI, 0.77-0.97), but not with Medicaid (adjusted OR 0.94; 95% CI, 0.84-1.05) or Medicare (adjusted OR 0.91; 95% CI, 0.83-1.01). Among individual HITs, electronic health records (adjusted OR 0.54; 95% CI, 0.30-0.96) and electronic access to admitting hospital records (adjusted OR 0.46; 95% CI, 0.22-0.96) were the only HITs significantly associated with lower anticipated primary care capacity.

Conclusions

PCPs using a greater number of HITs were less likely to anticipate capacity to accept new patients. Implementation of HIT and other practice innovations must be carefully coordinated to optimize capacity to care for the newly insured.

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Millions of Americans who have recently gained insurance coverage through the Patient Protection and Affordable Care Act (ACA) now face the challenge of establishing care with a primary care provider (PCP). For coverage to translate to access, primary care providers will need adequate capacity to accept new patients. Efforts have long been under way to increase primary care capacity, with a principal emphasis on expanding the primary care workforce.[1] More recently, innovations in primary care practices, such as improvements in clinic work flow and care coordination, have also been introduced to improve both capacity and efficiency of care.[2,3] Many of these innovation efforts have included the implementation of health information technology (HIT), such as electronic health records (EHRs), patient portals, and reminder systems.

Since the passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009, HIT has been widely promoted as potentially cost- and time-saving for practices, and the early stages of "meaningful use" of these technologies have been heavily incentivized. While some studies have shown improvements in practice efficiency associated with use of EHR and other HIT resources,[4-8] others have shown decreases in efficiency or mixed results.[9-20] It is conceivable that improvements in efficiency could allow primary care physicians to see more patients in the office, thus increasing their overall capacity. In fact, this very idea has been espoused by the Office of the National Coordinator for Health Information Technology.[21] Nonetheless, empirical data to support the connection between HIT use and primary care capacity are limited, and it is possible that adjusting to newly implemented HITs may instead cause physicians to limit their efficiency and have reduced capacity to see patients. Our objective was to examine whether use of HIT in primary care practices was independently associated with anticipated capacity to accept new patients.

Take-Away Points

Health information technology (HIT) has been widely touted for its potential to improve primary care practice efficiency and capacity, but this study's findings call into question whether this is occurring.

- Physicians using a greater number of HITs were significantly less likely to anticipate capacity to accept new patients.
- In an era of concurrent HIT and insurance coverage expansions, policy makers must weigh the unintended consequences of each in order to optimize capacity to care for the newly insured.

METHODS

Study Design

We performed a secondary analysis of data from the Center for Healthcare Research & Transformation and the University of Michigan Child Health Evaluation and Research Unit 2012 Survey of Michigan Physicians. The purpose of this cross-sectional survey was to understand the challenges PCPs face in their practices during the era of health reform, with a focus on anticipated capacity to care for newly insured residents. Questions were developed by members of the research team experienced in survey design (MR, MUP, MMD). Survey questions were piloted with primary care physicians and modified to optimize respondent understanding.

Between October and December 2012, surveys were mailed to PCPs across the state of Michigan. Potential participants received up to 3 mailings, and a $5 incentive was included in the first mailing to encourage response. The study was granted exempt status by the University of Michigan Medical School Institutional Review Board, as it included only de-identified data.

Sample

Five hundred Michigan physicians from each of 3 primary care specialties (pediatrics, internal medicine, and family medicine) were randomly selected from the American Medical Association (AMA) Physician Masterfile, a comprehensive list that includes both AMA members and nonmembers, for a total of 1500 physicians in the original sample. Physicians who responded but reported they were not practicing primary care (eg, retired, or exclusively practicing inpatient medicine) were excluded from the analysis.

Measures

Primary Care Capacity. The primary outcome was PCPs' assessment of their future capacity to accept new patients. Participants were asked, "If the number of Michigan patients with insurance coverage increases in the future, will you have the capacity to accept additional patients?" with yes/no response options (see **eAppendix A**, available at **www.ajmc.com**) for all relevant questions from the survey instrument. For those who responded yes, we also asked about ability to expand practice capacity by payer type (eg, for patients with private insurance, Medicaid, or Medicare) and examined this as a secondary outcome.

HIT use. The primary predictor variable was PCPs' use of HIT. Participants were asked whether they utilized any of 8 types of HIT (see eAppendix A): EHRs, patient registries, electronic prescribing, Web portals for patients to schedule their own appointments, Web portals for patients to request prescription refills, reminder/recall systems to contact patients about recommended services, state immunization registry participation, and electronic access to admitting hospital records. A panel of stakeholders from the Michigan State Medical Society and the Michigan Osteopathic Association was convened to develop survey items that corresponded to meaningful use and patient-centered medical home initiatives that primary care physicians faced at the time of the survey. After consensus-building among panel participants, the HIT types that best represented current incentives for implementation in primary care practices were selected for inclusion in the survey. We examined each HIT type independently, and also in aggregate by creating an index of HIT use. The index was defined as a total count of the number of HITs currently in use by the physician.

Covariates. Survey items included physician demographic characteristics such as gender, specialty, number of years in practice (<10 years, 10-20 years, or >20 years, categorized for the multivariable analysis as either ≤20 or >20 years), and self-reported weekly visit volume (categorized as ≤100 or >100 patients seen per week per physician), as well as practice characteristics such as size (number of physicians in practice considered as a continuous variable), self-reported current payer mix, and zip code of the practice.

For payer mix, we created a composite variable to determine the predominant payer for the practice. A payer (eg, private insurance, Medicaid, or Medicare) was considered predominant if a physician had only 1 payer type that constituted more than 30% of the physician's patient population. We defined a "mixed" payer category for those practices with more than 1 payer representing greater than 30% of patients, or with no predominant payer representing at least 30% of patients. We assessed urbanicity of the practice setting by linking Federal Information Processing Standard county codes obtained from self-reported zip codes to the US Department of Agriculture Economic Research Service 2013 Urban Influence Codes. Urban Influence Codes provide a standard 12-point classification scheme to distinguish counties by population density and proximity of the population to the largest town or city, allowing categorization into metropolitan (Urban Influence Codes 1-2) and nonmetropolitan (Urban Influence Codes 3-12) counties.[22]

Statistical Analysis

We used standard descriptive statistics to characterize physician respondents' baseline characteristics, as well as their overall use of HIT and anticipated capacity to accept new patients. We then used logistic regression to perform bivariate analyses of associations between predictor variables and the primary outcome of capacity, as well as the secondary outcome of capacity by payer type. To examine the independent relationship between HIT use and primary care capacity after adjusting for covariates, we conducted multivariable logistic regression analysis and expressed the results as adjusted odds ratios (ORs) with 95% confidence intervals. Using the same estimation model, we also obtained the adjusted predicted probability of capacity to accept new patients at different numbers of HIT in use. A 2-sided P <.05 was considered statistically significant. We included the physician-, practice- and community-level covariates mentioned above in order to control for potential confounders. The unit of analysis was the physician.

In order to examine possible moderation of the HIT/capacity relationship by practice size, we subsequently included an interaction term between HIT use and practice size in the logistic regression model. We assessed the main relationship within each group (eg, within small practice size) and compared that between groups (small vs large practice size).

The proportion of responses with missing data was less than 5% for all individual items. To address missing values in the final multivariable model (12% in aggregate), we performed multiple imputation by using a chained equation[23,24] and generated 10 replications of the imputed data set. We repeated our main multivariable analysis with the imputed data sets and observed similar results to the analysis using the non-imputed data set (ie, with no significant difference in effect size or confidence intervals). The results reported here are from the original, non-imputed dataset.

To assess goodness of fit, we checked the final model with both the area under the curve method (C statistic = 0.69) and the Hosmer-Lemeshow goodness of fit test (which was nonsignificant, suggesting good model fit). All analyses were performed using STATA version 13 (Stata Corp, College Station, Texas).

RESULTS

Survey respondents (N = 739, response rate = 49%) were similar to the original sample of physicians from the AMA Physician Masterfile (see **eAppendix B**). While the response rate is lower than in surveys of nonphysicians, it is consistent with other surveys of physicians with small financial incentives. The respondents included an approximately equal number of men and women (356 women, or 48%), with similar representation from each of the 3 specialties (**Table 1**). Most physician respondents had been in practice for more than 10 years (76%) and saw fewer than 100 patients in a typical week (66%). Sixty-one percent of physician respondents practiced in settings with fewer than 6 physicians. Many practices accepted a diversity of payer types, with 43% of practices having no predominant payer. The majority of respondents' practices (85%) were located in urban areas.

In aggregate, PCPs used a mean of 5.1 HITs (SD = 1.9) in their practices. Among these, the most common HIT in use was electronic prescribing (89% of PCPs). The least common HIT in use was a Web portal for patients to schedule their own appointments (21% of PCPs) (**Figure 1**).

Overall, 83% of PCPs reported they would have capacity to accept new patients in the future. In bivariate analyses, with each incremental increase in the number of HITs in use, there were significantly lower odds of self-reported primary care capacity (OR = 0.87; 95% CI, 0.78-0.97).

In multivariable analysis adjusting for physician-, practice- and community-level covariates, the odds of self-reported primary care capacity decreased by 14% with each additional HIT in use (adjusted OR = 0.86; 95% CI, 0.76-0.97) (ORs reported in **Table 2** and predicted probabilities of capacity presented in **Figure 2**). Among other covariates, greater number of years in practice was significantly associated with lower odds of capacity. Physicians who specialized in pediatrics, had a high visit volume, or had a predominantly Medicare payer mix had significantly greater odds of capacity.

For the secondary outcome of capacity by payer type among respondents who reported they had capacity to accept new patients, we found that greater use of HITs was associated with significantly lower odds of anticipated capacity to accept privately insured patients (adjusted OR 0.87; 95% CI, 0.77-0.97) (Table 2). However, use of HIT was not significantly associated with lower odds of anticipated capacity to accept patients with either Medicaid (ad-

Table 1. Characteristics of Primary Care Physician Respondents

	n (%) (N = 739)
Physician characteristics	
Female gender	356 (48%)
Specialty	
Family medicine	242 (33%)
Internal medicine	207 (28%)
Pediatrics	290 (39%)
Years in practice	
<10 years	172 (24%)
10-20 years	263 (36%)
>20 years	293 (40%)
Weekly visit volume (patients seen/week)	
≤100	482 (66%)
>100	243 (34%)
Practice characteristics	
Practice size (median No. providers, SD)	4 (62)
Current payers accepted[a]	
Private	623 (87%)
Medicaid	439 (61%)
Medicare	406 (57%)
Predominant payer mix[b]	
Private	219 (32%)
Medicaid	85 (12%)
Medicare	90 (13%)
Mixed	302 (43%)
Community-level covariates	
Urbanicity	
Urban	628 (85%)
Non-urban	111 (15%)

[a]Proportion of practices currently accepting patients with listed insurance payer types.
[b]Composite variable of all current payers: payer is considered predominant for the practice if >30% of physician's patients have this payer type and <30% of patients have any other payer type. "Mixed" includes practices with more than 1 payer representing >30% of patients, or practices with <30% of patients for each payer type.

justed OR 0.94; 95% CI, 0.84-1.05) or Medicare (adjusted OR 0.91; 95% CI, 0.83-1.01).

Among individual HIT types examined, electronic health records (adjusted OR 0.54; 95% CI, 0.30-0.96) and electronic access to admitting hospital records (adjusted OR 0.46; 95% CI, 0.22-0.96) were each significantly associated with lower odds of self-reported capacity (Table 3). All other HIT types examined (electronic prescribing, state immunization registry, patient registry, reminder/recall system, and Web portals to either request refills or schedule appointments) were not significantly associated with anticipated capacity.

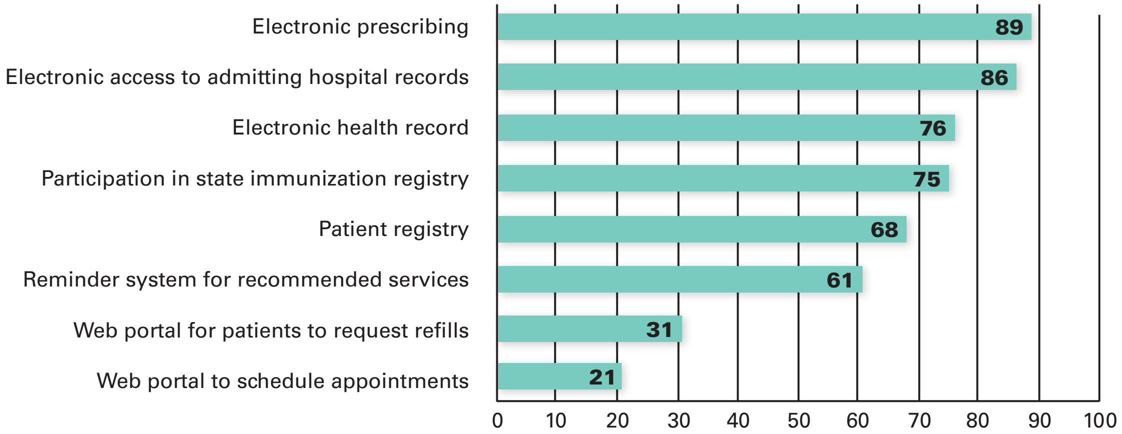
We also examined possible variation in the association between HIT use and capacity by practice size. We found that in smaller practices (1 to 5 physicians), the inverse relationship remained significant (adjusted OR 0.83; 95% CI, 0.71-0.97), while in larger practices (>5 physicians) the association was not present (adjusted OR 0.95; 95% CI, 0.79-1.15).

DISCUSSION

In this cross-sectional study of a representative sample of Michigan primary care physicians, we found that physicians using a greater number of health information technologies were significantly less likely to anticipate capacity to accept new patients. PCPs with higher HIT use were also specifically less likely to accept patients with private insurance, but not with Medicaid or Medicare. Among individual HITs examined, electronic health records and electronic access to admitting hospital records were significantly associated with lower anticipated primary care capacity. Additionally, we found that the inverse association of HIT use and capacity may be more apparent in small versus large practices.

Our findings have a few possible interpretations. First, it is plausible that use of technologies may lead to decreased physician efficiency, and that decreased efficiency leads to decreased capacity to see additional patients. Several prior studies have found either increased time per patient encounter or decreased physician or practice productivity associated with HIT use.[10,12,18] One small study also showed downstream negative impact on patients' ability to access care.[12] However, other studies,[4-8] including one review of the literature,[6] have instead found improved physician productivity with HIT use. In one study of 42 primary care practices across the United States between 2006 and 2009, while there was improved physician productivity associated with EHR use in large practices, there was decreased productivity in small practices, suggesting this association may depend on practice size or other characteristics.[7] Our results suggest a similar practice-size-related phenomenon in this statewide sample of primary care physicians. Furthermore, previous studies have defined "efficiency" or "productivity" in myriad ways—including as time spent per patient encounter, work relative value units, overall "work burden" of physicians, care utilization, practice revenue, and patient visit volume—which may partly explain the mixed results in the literature.

Figure 1. Primary Care Physicians' Use of Health Information Technology



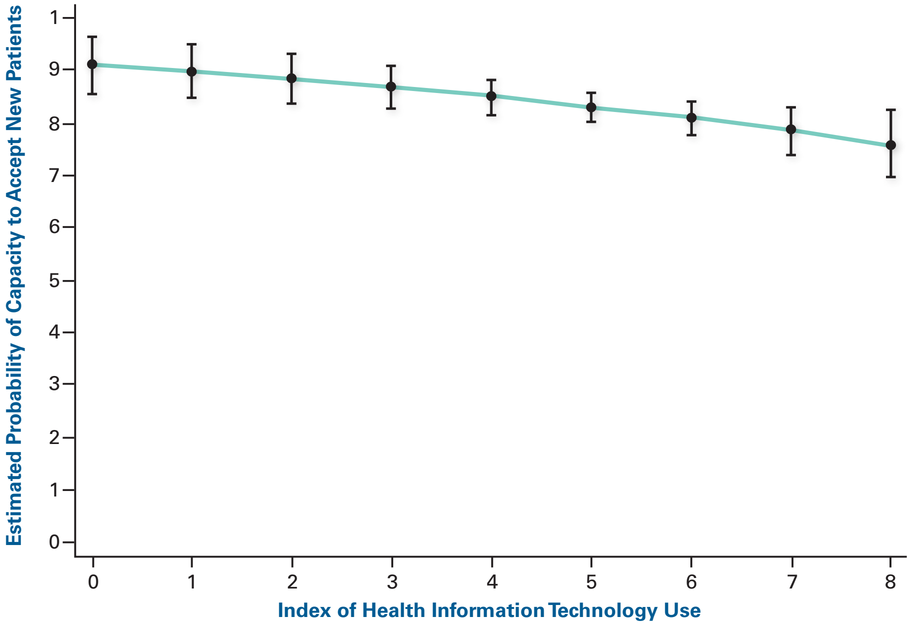
Primary care physician survey respondents' (N = 739) use of different health information technologies.

Table 2. Multivariable Logistic Regression Analysis of Health Information Technology Use and Primary Care Capacity

		Capacity to Accept New Patients by Payer Type		
	Adjusted Odds of Capacity to Accept New Patients[a] (95% CI)	Adjusted Odds of Capacity for Patients With Private Insurance Coverage[b] (95% CI)	Adjusted Odds of Capacity for Patients With Medicaid Coverage[c] (95% CI)	Adjusted Odds of Capacity for Patients With Medicare Coverage[d] (95% CI)
Index of health information technology use	0.86 (0.76-0.97)	0.87 (0.77-0.97)	0.94 (0.84-1.05)	0.91 (0.83-1.01)
Physician-level covariates				
Female gender	1.17 (0.74-1.84)	1.15 (0.74-1.79)	1.08 (0.71-1.64)	1.10 (0.75-1.62)
Specialty				
Family medicine	reference	reference	reference	reference
Internal medicine	1.06 (0.62-1.81)	1.07 (0.63-1.80)	0.97 (0.59-1.60)	1.13 (0.67-1.90)
Pediatrics	2.35 (1.35-4.07)	2.24 (1.31-3.84)	2.10 (1.27-3.46)	0.41 (0.26-0.64)
Number of years in practice				
≤20 years	reference	reference	reference	reference
>20 years	0.61 (0.39-0.94)	0.59 (0.39-0.91)	0.59 (0.39-0.89)	0.53 (0.36-0.77)
Weekly visit volume (patients seen/week)				
≤100	reference	reference	reference	reference
>100	1.77 (1.09-2.86)	1.88 (1.17-3.02)	1.16 (0.76-1.77)	1.42 (0.97-2.10)
Practice-level covariates				
Practice size (per physician in practice)	1.00 (0.99-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)	1.00 (0.99-1.00)
Predominant payer mix				
Private	reference	reference	reference	reference
Medicaid	1.44 (0.62-3.35)	1.15 (0.52-2.51)	2.08 (0.95-4.55)	1.53 (0.85-2.75)
Medicare	2.98 (1.26-7.01)	2.26 (1.01-5.07)	2.87 (1.33-6.19)	2.98 (1.30-6.84)
Mixed	0.99 (0.60-1.64)	0.94 (0.57-1.54)	1.21 (0.76-1.91)	0.93 (0.61-1.43)
Community-level covariates				
Urbanicity				
Urban	reference	reference	reference	reference
Non-urban	0.75 (0.42-1.34)	0.82 (0.47-1.43)	0.85 (0.50-1.46)	0.72 (0.44-1.19)

[a]N = 650 in analysis of association between health information technology use and overall odds of capacity.
[b]N = 642 in analysis of odds of capacity for patients with private insurance coverage.
[c]N = 642 in analysis of odds of capacity for patients with Medicaid coverage.
[d]N = 640 in analysis of odds of capacity for patients with Medicare coverage.

■ **Figure 2.** Relationship Between Health Information Technology Use and Primary Care Capacity



Adjusted predicted probabilities of capacity to accept new patients at different numbers of health information technologies in use are estimated by using the primary multivariable logistic regression model reported in the first column of results in Table 2 (N = 650). 95% confidence intervals are presented as error bars.

■ **Table 3.** Primary Care Physicians' Capacity to Accept New Patients by Type of Health Information Technology Used: Multivariable Logistic Regression Analysis

Type of health information technology used	Adjusted[a] Odds of Capacity to Accept New Patients (95% CI)
Electronic prescribing	0.80 (0.37-1.75)
Electronic access to admitting hospital records	0.46 (0.22-0.96)
Electronic health record	0.54 (0.30-0.96)
Participation in state immunization registry	0.69 (0.39-1.21)
Patient registry	0.81 (0.51-1.30)
Reminder system to contact patients about recommended services	0.67 (0.43-1.06)
Web portal for patients to request refills	0.70 (0.44-1.09)
Web portal for patients to schedule appointments	0.86 (0.52-1.42)

[a]Adjusted model includes covariates of gender, specialty, years in practice, visit volume, practice size, predominant payer mix, and urbanicity.

Second, it is also possible that any potential decline in efficiency may be only temporarily associated with the HIT implementation period, as physicians take time to get accustomed to a new technology. A few studies have found that this implementation-related reduction in efficiency may last up to 12 months.[13,20] Because the timing of our survey in late 2012 corresponded to the end of the 2011-2012 rollout of meaningful use stage 1 incentives for EHR implementation, it is conceivable that our findings represent only a temporary implementation period effect. However, this timing of EHR incentive rollout and possible implementation period drop in productivity may not necessarily explain the additional inverse association we found between anticipated primary care capacity and other types of HIT, such as having access to admitting hospital records.

Third, it could be that practices with higher HIT use are generally well resourced and that these types of practices typically see more affluent patients. Such practices may have reservations about accepting newly insured patients, who are often of low socioeconomic status and may represent a different demographic than that typically seen in those practices.[25] In this way, HIT use may be a marker of well-resourced practices. However, we controlled for predominant payer mix, a variable related to overall practice resources, and continued to find a significant inverse association between HIT use and anticipated capacity.

In addition, it was surprising to find that greater HIT use was associated specifically with lower anticipated capacity for privately insured patients, but not with Medicaid or Medicare patients, particularly since private insurance frequently provides higher reimbursements than Medicaid or Medicare. We speculate about 2 possible explanations for this finding. First, with the increase of Medicaid reimbursement rates for primary care physicians to the level of Medicare reimbursement rates during this period, new patients with Medicaid or Medicare may have appeared more attractive due to a steadier and predictably high level of reimbursement. Second, as noted above, it is possible that practices with the resources to adopt HIT and with a typically higher proportion of privately insured patients may be less likely to accept new patients generally.

This study should be interpreted in the context of several potential limitations. First, our cross-sectional data limits inferences regarding causal relationships. We did not characterize the timeline of HIT implementation in our study, and it is possible practice efficiency and capacity could improve after HIT implementation. Nevertheless, given the national timeline of EHR meaningful use incentives noted above, it is likely that our findings represent the association of capacity with the first 1 to 2 years following HIT implementation. Second, we did not distinguish which HIT vendors were used by physicians, and given differences in user interface, different brands may have varying impacts on practice capacity. Third, it is possible that the variables of physician specialty and predominant payer mix were collinear (eg, internists are more likely to accept Medicare patients, and pediatricians are more likely to accept Medicaid patients), but there was no evidence of multicollinearity to suggest that our estimates of the HIT/capacity association were biased. Fourth, we relied on respondents' self-reported HIT use and likelihood of accepting new patients. While there is a potential for social desirability bias in both types of measures, surveys are the commonly used method for assessing these aspects of practice.[26] Fifth, we did have missing data in our multivariable model, but this was unlikely to have impacted the findings since our sensitivity analyses using multiple imputations demonstrated equivalent results. Furthermore, we considered conducting the analysis with hierarchical regression, but had insufficient objective data at the practice and community levels to inform the model. Therefore, we fit the model assigning practice-level and community-level characteristics as reported by each physician. Lastly, while our results are representative of primary care physicians in a large Midwestern state, they may not be generalizable to all US states.

The notion that HIT expansion necessarily translates into improved efficiency and capacity in primary care practices has been widely disseminated.[21] Our findings call into question whether this is occurring, at least during this early implementation time period. In an era of concurrent expansion of health information technology through the HITECH Act and expansion of insurance coverage through the ACA, policy makers must weigh the unintended consequences of each in order to maximize improvements in both healthcare quality and access. This is a challenging undertaking, and one best informed by data-driven approaches. Further research, such as additional physician surveys or simulated patient studies examining actual acceptance of new patients, is needed to better understand the impact of HIT implementation on access to primary care for newly insured individuals over time.

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eAppendix A. Relevant Questions from Survey Instrument

1. Do you utilize any of the following electronic services and supports?

		Yes	No
a.	Electronic health record	1	2
b.	Patient registry	1	2
c.	Electronic prescribing	1	2
d.	Web portal for patients to schedule own appointments	1	2
e.	Web portal for patients to request prescription refills	1	2
f.	Reminder/recall system to contact patients about recommended visits & services	1	2
g.	Michigan Care Improvement Registry (MCIR)	1	2
h.	Electronic access to records at hospital(s) where you admit patients	1	2

2. If the number of Michigan patients with insurance coverage increases in the future, will you have the capacity to accept additional patients?

1. Yes (Go to question 3)
2. No

3. By how much do you anticipate you will be able to expand your practice capacity?

		1-5%	6-10%	>10%	Not Sure
a.	Private	1	2	3	4
b.	Medicaid	1	2	3	4
c.	Medicare	1	2	3	4
d.	Military	1	2	3	4
e.	Self-pay	1	2	3	4

e**Appendix B.** Characteristics[a] of Survey Respondents and Original Sample

	Respondents (N = 739)	Total Sample (N = 1500)
	n (%)	
Physician characteristics		
Age (years)		
≤30	3 (<1%)	10 (<1%)
31-40	146 (20%)	330 (22%)
41-50	236 (32%)	508 (34%)
51-60	234 (32%)	436 (29%)
>60	119 (16%)	216 (14%)
Female gender	356 (48%)	732 (49%)
Degree		
MD	624 (85%)	1266 (84%)
DO	114 (15%)	234 (16%)
Specialty		
Family medicine	240 (32%)	500 (33%)
Internal medicine	206 (28%)	500 (33%)
Pediatrics	292 (40%)	500 (33%)
Years in practice		
<10 years	84 (11%)	191 (13%)
10-20 years	242 (33%)	538 (36%)
>20 years	412 (56%)	771 (51%)
Practice characteristics		
Solo practice	88 (12%)	157 (10%)
Two-physician practice	37 (5%)	63 (4%)
Group practice	498 (67%)	915 (61%)
Other practice type[b]	10 (1%)	23 (2%)
Unknown practice type	105 (14%)	342 (23%)

Community characteristics		
Urbanicity		
Urban	631 (85%)	1308 (88%)
Non-urban	107 (15%)	186 (12%)
Geographic regions of state		
Detroit	311 (42%)	648 (43%)
Southeast/non-Detroit	72 (10%)	149 (10%)
Southwest	51 (7%)	97 (6%)
Mid-State	59 (8%)	125 (8%)
Grand Rapids/Muskegon	104 (14%)	196 (13%)
Thumb region	62 (8%)	157 (11%)
Northern Lower Peninsula/ Upper Peninsula	79 (11%)	122 (8%)

[a]The characteristics above are derived from information provided in the original sample from the American Medical Association (AMA) Physician Masterfile.

[b]"Other practice type" includes employment in a health maintenance organization (HMO), medical school, government, or "other patient care" setting, as described in the AMA Physician Masterfile.