10-2011

Factors Impacting Use of Information Technology by Physicians in Private Practice

Jim DeMello
Western Michigan University, james.demello@wmich.edu

Satish P. Deshpande
Western Michigan University, satish.deshpande@wmich.edu

Factors Impacting Use of Information Technology by Physicians in Private Practice

Jim DeMello, DBA
Haworth College of Business
Kalamazoo, MI 49008-5429
Phone: (269) 387-5759
Fax: (269) 387-5839
james.demello@wmich.edu

Satish P. Deshpande PhD
Haworth College of Business
Western Michigan University
Kalamazoo, MI 49008-5429
Phone: (269) 387-5067
Fax: (269) 387-5710
satish.deshpande@wmich.edu

Abstract: This research examines the impact of various factors on the use of IT in clinical practice, prescriptions, and patient information. This was done using a national sample of 3425 physicians who worked in a solo or group practice in the United States. Besides the extent of use of electronic medical records by physicians and number of physicians in practice, none of the other factors consistently impacted the use of IT in clinical practice, prescriptions, and patient information, respectively. The results of this study highlight the need to develop specific strategies to increase the use of information technology in healthcare.

INTRODUCTION

Heath information technology (HIT) has been identified as a necessary tool in the battle to improve the efficiency, quality and delivery of health care in the United States (Payton, Pare, LeRouge, & Reddy, 2011). In spite of the explosion of applications of information technology at work in various sectors of the US economy, it is rather surprising that healthcare remains one of the few industries which still rely heavily on paper records (Gates & Roeder, 2011). The federal government through the Office of the National Coordinator for Health Information Technology (ONC) has been actively pushing for the rapid transition of healthcare information and communication into the 21st century. The potential for quality, accuracy, and cost improvements is tremendous and preliminary studies show that many benefits like improvements in accuracy, quality, and can accrue to different stakeholders like institutions, patients, and providers (Blumenthal, 2010; Goldzweig, Towfigh, Maglione, & Shekelle, 2009).

Unfortunately, in spite of the overwhelming evidence regarding the positive effects of HIT innovations like electronic health records (EHR) on the quality and efficiency of health care, there is still considerable skepticism about adopting the technology among health care providers, especially those in private practice settings (Buntin, Burke, Hoaglin, & Blumenthal, 2011). In fact, a recent report indicated that although the USA spends around $2 trillion per year on healthcare (16% of GDP, $6697 per capita) only about 15% of its physicians use EHRs to manage patients' health information. This compares with a roughly 29% utilization rate of physicians in the European Union (Maharajah and McIntyre, 2010). Since 2009, the Obama Administration has made an unprecedented attempt to promote the adoption of EHRs and spur the development of further innovations in health care delivery systems. This includes passage of the Health Information Technology for Economic and Clinical Health (HITECH) Act into law in 2009 (as part of the American Recovery and Reinvestment Act), committing

approximately $27 billion as incentive payments to hospitals and care providers, establishing various programs and centers to promote, coordinate, and supervise the development and implementation of innovative payment, health care delivery models, and health information systems in the United States (Buntin et al., (2011).

Preliminary reviews on the effects of health information technology innovations have revealed positive benefits, especially for larger organizations that were early adopters of the technology (DesRoches, Campbell, Rao, Donelan, Ferris, & Jha, 2008; Jha, DesRoches, Campbell, Donelan, Rao, & Ferris, 2009). But, there were significant negative reactions from health care providers regarding the start-up costs and loss of patient contact time that would result as a consequence of adopting the technology (Bates, 2005; Georgiou, Westbrook, Braithwaite, Idema, & Ray, 2007; Georgiou & Westbrook, 2009). These kinds of reactions have resulted in a significantly slower than anticipated rate of adoption of the Health IT systems by some types of health care providers.

LITERATURE REVIEW

A recent review of 154 studies on the effect of health information technology on various desired outcomes (e.g., including quality, efficiency, and provider satisfaction) found that 62% of the studies concluded that HIT was associated with improvements in one or more aspects of care, with no aspects worse off. In addition, 92% (142 out of 154) of the studies were either positive or the authors drew a positive conclusion overall but pointed out at least 1 negative aspect of HIT (Buntin *et al*., 2011). The negative findings included issues such as: longer times taken for e-prescribing versus hand-written prescriptions (Hollingworth, Devine, Hansen, Lawless, Comstock, & Wilson-Norton, 2007); lack of proper leadership and implementation of health IT in a small rural hospital leading to an increase in patient care, medication, and procedure errors (Spetz & Keane, 2009); inhibition of provider-patient interaction during ward rounds caused by use of EHR rather that paper charts (Morrison, Jones, Blackwell, & Vuylsteke, 2008); work-flow problems at a pathology lab after electronic receipts of orders (Georgiou et al., 2007, Georgiou and Westbrook, 2009); unsuccessful implementation of HIT systems due to variability in computer literacy and information systems (Trivedi, Daly, Kern, Grannemann, & Sunderajan, 2009); impairment of nurse-physician medication collaboration caused by computerized provider order entry (Pirnejad, Niazkhani, van der Sijs, Berg, & Bal, 2008); and over-reporting of cases due to implementation of an e-reporting system (Centers for Disease Control and Prevention, 2008). Most of the negative findings point out to the need for a better assessment of the human element in HIT implementation. Specifically, there is a need for studies that document the challenging aspects of implementing health IT more specifically and how these challenges might be addressed (Buntin et al. 2011).

Most of the HIT research to date has focused on the effectiveness and utilization of EHR by health-care providers (Shea, & Hripcsak, 2010). Although recent reports indicate that the availability and use of EHR is increasing in the United States, the rate of increase is much slower than that required for reaching the goal set by the Obama Administration of a universal adoption and utilization rate by 2014. In particular, providers serving Hispanic or Latino patients who are uninsured or rely on Medicaid and primary care providers in private solo or small group practices have the lowest adoption rates (under 6%) compared with an adoption rate of 38.3% for providers in HMOs, faculty practice plans, and urgent care centers. In addition, hospital outpatient departments and community health centers exhibit much higher adoption rates than solo and partner practices. (Gibbons, 2011).

Besides slow adoption rates of EHRs, a number of other problems exist in the overall implementation of HIT in the United States. Some of the major barriers identified in the literature are: the preponderance of proprietary applications which typically support fragmentation in patient, people and process data and workflow aggregation; the perception that electronic health records (EHRs) are mainly to be used for internal organizational purposes with limited connections to external constituents, such as patients, external providers and public health agencies and researchers; widespread concerns regarding patient privacy tend to hinder the availability of content for public health and research initiatives; and the largely financial emphasis of the fee-for-service health delivery model that has prevented health care IT from focusing primarily on clinical functions (Payton et al. 2011).

For the health information technology systems and innovations to have widespread success it is imperative that there be "buy in" at all levels and across all types of health care providers. This in turn means that there is a need for understanding the level of availability, acceptance, barriers, and reasons why some physicians are reluctant to embrace the technology. This understanding will enable us to develop and implement appropriate systems and policies to minimize the barriers and negative reactions from health care providers. This paper is an attempt in that direction.

METHODS

Sample

The data for this study came from the Center for Studying Health System Change's (HSC) 2008 Health Tracking Physician Survey (HTPS). HSC is a Washington D.C based organization that aims to provide unbiased and dependable health care related information to policy makers. The 2008 HTPS replaced the four (1996-97, 1998-99, 2000-01 and 2004-05) Community Tracking Study (CTS) physician surveys conducted by HSC. While the CTS consisted of telephone interviews of physicians in 60 randomly selected U.S. communities, the 2008 HTPS was conducted by mail and used a national sample of physicians. The website http://www.icpsr.umich.edu/icpsrweb/HMCA/studies/27202 has detailed information on the 2008 HTPS.

The 2008 HTPS dataset used in this study consists of 4720 completed surveys based on a list of physicians provided by the American Medical Association. These surveys were conducted between February 2008 and October 2008. Not included in the survey were residents, fellows, federal employees, foreign medical school graduates who are temporarily licensed to practice in the United States and specialists whose primary focus was not direct patient care. The 2008 HTPS Methodology Report at http://www.hschange.com/CONTENT/1085/1085.pdf has comprehensive information on the methodology used to collect the data. It provides detailed information on issues like the instrument design, target population, and stratification process. Only those physicians who worked most of their time in a solo or group practice were included in our study. Thus, those physicians who worked mostly for HMO's, hospitals, medical schools, or other classifications were not included in this study. Therefore of the 4,720 completed surveys in the dataset, we only considered 3425 physicians who worked in a solo or group practice for this study.

Dependent Variable

Use of IT in clinical practice, use of IT in prescriptions, and use of IT in patient information were the three dependent variables in this study. These three constructs were measured on the following scale: 3=IT available and used, 2=IT available and not used, 1=IT not available. Use of IT in clinical practice was measured using six items. These items covered use of IT for obtaining recommended guidelines, decision support for diagnostic and treatment recommendations, generating reminders for clinicians about preventive services, generating reminders for other needed patient follow-up, generating reminders to patients about preventive services, and emailing patients about clinical issues. Use of IT in prescriptions was measured using four items that examined use of IT to obtain information on potential patient drug interactions, obtain information on formularies, write prescriptions, and transmit prescriptions to pharmacy. Use of IT in patient information was measured using six items. These items examined the use of IT to access patient notes, order diagnostic tests, view results of diagnostic tests, exchange clinical data and images with other physicians, exchange clinical data and images with hospitals and laboratories, and access information on patients' preferred language. Detailed information on the items that make up our dependent and independent variables are available at http://www.icpsr.umich.edu/icpsrweb/HMCA/studies/27202.

Independent Variable

Independent variables used in this study were grouped in four categories. They are practice-related factors, physician-related factors, minority patients, and revenue sources. The scale used to measure the independent variables and their brief descriptions are presented in Table 1. Practice-related factors comprised of three factors:

Competitive situation of practice, number of physicians at practice, and use of electronic medical records. Physician-related factors included demographic variables like age, race/ethnicity, and sex of physicians. It also included factors like annual income of physicians, if primary care physician, and degree of ownership in the practice. Minority patient consisted of three independent variables. They were percent of Hispanic patients, percent of African American patients, and percent of Asian/Pacific Islanders. Revenue sources had three factors. They are percent revenue from Medicare, percent revenue from Medicaid, and if the practice received any financial assistance from health plans and others organizations tied to IT systems adopted by the practice.

Variables	**Description**	**Scale**
Competitive situation	Pressure to attract and retain patients	3=very competitive, 2= somewhat competitive, 1= not at all competitive
Number of physicians	Number of physicians in main practice	Categories of 1,2-3, 4-10, 11-50, 51-100, 101 (top coded)
Electronic medical records	Use of electronic medical records	0=all paper, 1=part electronic part paper, all electronic
Age	Age in years	1= >67, 2=67-63, 3=62-58, 4=57-53, 5=52-48, 6=47-43, 7=42-38, 8=<38
Physician race/ethnicity	Race of respondent	1=Hispanic, 2=White, 3=Black, 4=Asian or Pacific Islander, 5=other/mix
Male	Gender of respondent	1=male, 0=female
Income	Categories of Income	6=more than $300K, 5= $250,001 to $300K, 4=$200,001 to $250K, 3=$150,001 to $200K, 2=$100,001 to $150K, 1=less than $100K
Primary care physician	Primary care physician	1=primary care physicians, 0=specialist
Ownership in practice	Share of ownership in practice	2= full owner, 1=part owner, 0=employee and independent contractor
African American patients	% of African-American patients	Categories of 0%, 1-25%, 26-50%, 51% (top code)
Hispanic patients	% of Hispanic patients	Categories of 0%, 1-25%, 26-50%, 51% (top code)
Asian/Pacific Is patients	% of Asian/Pacific Islander patients	Categories of 0%, 1-25%, 26% (top code)
Medicare revenue	% of practice revenue from Medicare	Categories of 0%, 1-25%, 26-50%, 51-75%, 76%-100%
Medicaid revenue	% of practice revenue from Medicaid	Categories of 0%, 1-25%, 26-50%, 51-75%, 76%-100%
Financial incentive to use IT	Financial incentive received to use IT systems	1=yes, 0=no.

Table 1: Information on Independent Variables

ANALYSIS

Statistical analysis on the data was done using SPSS-17. Cronbach's alpha was calculated for our three dependent variables. In addition, frequency distribution, means and standard deviations were calculated for various items that made up our dependent variables. Zero-order correlations were done to examine the relationships between the dependent and independent variables. In addition, ordinary least square multiple regression analysis was used to examine the effect of each independent variable on our four dependent variables.

RESULTS

Table 2 presents characteristics of the sample. Two out of three respondents were 48 years old or older. Three out of four respondents were male physicians. Over 70% of the respondents were White, non-Hispanic. A majority of the respondents' income was over $150,001. Table 3 presents the availability and usage of IT for clinical practice, prescription drugs, and patient information by physicians. Among clinical practice related items, IT was available and used by 78% of the physicians to get information on recommended guidelines and 60% of physicians to get decision support. A majority of the other clinical practice related items were not available to the physicians. Among prescription drugs related factors, 65% of the physicians used IT to get information on patient prescription drugs interactions. None of the other prescription drugs related IT factors were available to a majority of physicians. Among patient information related factors, 71% of the physicians used IT to view lab and diagnostic test results. A majority of the other patient information items were not available or not used. Table 4 presents zero-order correlations among the variables. In addition, it presents Cronbach's alpha of constructs on the diagonal in parenthesis. They ranged from .76 to .82 which are considered satisfactory.

Table 5 presents ordinary least square regression analysis results for our dependent variables. Among practice-related factors, number of physicians in practice and use of electronic medical records has a significant positive impact on the three uses if IT. Competitive situation in practice only had a significant impact on use of IT in clinical practice. Among physician-related factors, age impacted use of IT in clinical practice and patient information. On the other hand income and ownership in practice significantly impacted use of IT for patient information. Primary care physician status significantly impacted use of IT in clinical practices and prescription. Physician race or sex had no significant impact on the use of IT. Among minority patients, physicians with Hispanic patients were significantly less likely to use IT for clinical practice or prescription. On the other hand, physicians with Asian or Pacific Islander patients were significantly more likely to use IT for clinical practice or prescription. Those with higher practice revenue from Medicare were less likely to use IT for patient information. On the other hand those with higher practice revenue from Medicaid were more likely to use IT for clinical practice and patient information. Financial incentives to use IT had a significant positive impact on use of IT for prescriptions.

Age (in years)	**N**	**(%)**
more than 67	237	(6.9)
67-63	271	(7.9)
62-58	443	(12.9)
57-53	594	(17.3)
52-48	603	(17.6)
47-43	516	(15.1)
42-38	447	(13.1)
less than 38	314	(9.2)
Women	816	(23.8)
Men	2609	(76.2)
Race		
Hispanic	180	(5.3)
White, non-Hispanic	2532	(73.9)
Black/African American	103	(3.0)
Asian or Pacific Islander	486	(14.2)
Other/Mix	41	(1.2)
Not ascertained/Refused	83	(2.4)
Income		
less than $100,000	463	(13.5)
$100,001 to $150,000	737	(21.5)
$150,001 to $200,000	636	(18.6)
$200,001 to $250,000	466	(13.6)
$250,001 to $300,000	368	(10.7)
more than $300,000	755	(22.0)
Sample size	3425	

Table 2: Characteristics of Sample

Variables	N	IT not available	IT available and not used	used	Mean	SD
IT in clinical practice						
Get info on recommended guideline	3371	19	2.7	78	2.59	.79
Get decision support	3332	35	5	60	2.25	.94
Remind clinician on previous service	3354	66	7	27	1.60	.88
Remind clinician on follow-up	3330	66	6	29	1.63	.90
Remind patients on previous service	3341	68	6	26	1.59	.88
Comm with patients by e-mail	3332	71	13	16	1.45	.76
IT in prescription drugs						
Get info on pat RX interaction	3339	33	3	65	2.32	.93
Get info on formularies	3340	54	8	38	1.84	.94
Write prescriptions	3363	61	5	35	1.75	.94
Transmit RX to pharmacy	3355	65	5	30	1.65	.91
IT in patient information						
Access patient notes	3349	49	2	49	2.00	.99
Order lab, other diagnostic tests	3350	50	4	47	1.97	.98
View lab, diagnostic test result	3350	26	3	71	2.45	.88
Exchange clinical data w/ other phys	3350	59	4	37	1.78	.95
Exchange clinical data w/ hosp & lab	3345	56	5	40	1.84	.96
Access info on pat prefer language	3336	83	6	11	1.28	.65

Table 3: Availability and Usages of IT by Physicians

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Use of IT in clinical practice	(.77)																	
2. IT prescription	0.58	(.76)																
3. IT patient information	0.53	0.61	(.82)															
4. Competitive situation	0.02	-0.03	0.01	1.00														
5. Number of physicians	0.14	0.16	0.24	0.04	1.00													
6. Electronic medical records	0.39	0.54	0.60	-0.04	0.21	1.00												
7. Age	0.04	-0.01	0.02	0.07	0.00	-0.03	1.00											
8. Physician race/ethnicity	0.13	0.11	0.14	-0.06	0.06	0.16	0.07	1.00										
9. Male	-0.03	0.00	0.03	0.06	-0.04	0.01	-0.10	-0.22	1.00									
10. Income	0.00	-0.01	0.13	0.11	0.07	0.07	-0.06	0.05	0.27	1.00								
11. Primary care physician	0.11	0.13	0.02	-0.17	0.05	0.03	0.04	0.08	-0.15	-0.44	1.00							
12. Ownership in practice	-0.07	-0.10	-0.17	0.05	-0.33	-0.14	0.02	-0.24	0.14	-0.02	-0.11	1.00						
13. African American patients	-0.02	-0.02	-0.01	0.06	-0.02	-0.03	0.08	0.02	-0.01	-0.02	-0.05	0.01	1.00					
14. Hispanic patients	-0.04	-0.05	0.00	0.09	0.01	-0.03	-0.02	-0.05	0.03	0.01	-0.01	0.07	0.02	1.00				
15. Asian/Pacific Is patients	0.10	0.05	0.03	0.08	0.03	0.01	0.25	0.03	-0.10	-0.02	0.06	0.03	-0.02	0.19	1.00			
16. Medicare revenue	-0.04	-0.05	0.03	0.04	0.00	-0.03	0.05	-0.07	0.14	0.09	-0.09	0.01	0.04	-0.12	-0.12	1.00		
17. Medicaid revenue	0.05	0.01	0.05	0.00	-0.01	0.01	0.10	0.04	-0.07	-0.10	0.12	-0.05	0.14	0.21	0.01	-0.19	1.00	
18. Fin incentive to use IT	0.07	0.17	0.10	-0.01	0.04	0.13	0.01	0.06	-0.07	-0.03	0.13	-0.07	-0.07	-0.04	0.09	-0.04	0.02	1.00

Listwise N=2424. Correlations above .04 and below -.04 are significant at $p \leq .05$ (two-tailed). Cronbach's alphas are presented on the diagonals in parenthesis.

Table 4: Zero-Order Correlations Among the Variables

Variable	IT clinical practice B	(SE)		IT prescription B	(SE)		IT patient info B	(SE)	
Practice-related factors									
Competitive situation of practice	.043	(.016)	*	.002	(.017)		.016	(.015)	
Number of physicians at practice	.062	(.001)	**	.049	(.001)	**	.101	(.000)	**
Electronic medical records	.360	(.014)	**	.501	(.015)	**	.560	(.013)	**
Physician-related factors									
Age	.053	(.006)	**	.011	(.006)		.033	(.006)	*
Physician race/ethnicity	.012	(.014)		-.019	(.015)		.023	(.013)	
Male	-.004	(.028)		.028	(.030)		.020	(.026)	
Income	.027	(.007)		-.016	(.008)		.089	(.007)	**
Primary care physician	.101	(.025)	**	.095	(.027)	**	.031	(.023)	
Ownership in practice	.027	(.016)		.007	(.017)		-.047	(.015)	**
Minority patients									
African American	-.012	(.001)		.004	(.001)		.005	(.001)	
Hispanic	-.051	(.001)	**	-.044	(.001)	**	.010	(.001)	
Asian or Pacific Islander	.085	(.002)	**	.042	(.002)	*	.017	(.002)	
Revenue sources									
Medicare	-.010	(.000)		-.022	(.001)		.051	(.000)	**
Medicaid	.049	(.001)	*	.002	(.001)		.051	(.001)	**
Financial incentives got for IT	.001	(.045)		.097	(.049)	**	.020	(.042)	
F	36.403	**		77.445	**		110.727	**	
Adjusted R square	.173			.306			.391		
N	2543			2601			2560		

**p≤0.01. *p≤0.05

Table 5: Regression Results

DISCUSSION

Much has been written about the financial and nonfinancial benefits of IT in healthcare organizations. Quality of care, managed growth, and improved business performance are some financial benefits identified by physicians. Nonfinancial benefits range from improved documentation and security to freeing up of storage room space to be used as patient examination rooms. One area that has received little attention involves the factors that impact the use of IT by physicians. This is the first nationwide study examining the impact of various practice-related factors, patient-related factors, minority patients, and revenue sources on detailed use of IT by healthcare providers in the areas of clinical practice, prescriptions, and patient information.

Among practice-related factors, the use of electronic medical records had the most significant impact on use of IT in clinical practice, prescriptions, and patient information. Clearly those practices who maintain medical records electronically are more likely to adopt IT for clinical practice, prescriptions, and access and maintain patient information. Unfortunately most medical practices still use paper records (Maharajah, & Macintyre, 2009). While paper records are inexpensive and convenient for physicians to enter data, they require a lot of storage space since many states require medical records to be maintained for a certain period of time. Electronic

records on the other hand require very little storage space, are easy to update and transfer, more legible, but have more security requirements.

The number of physicians in the practice was the other factor that had a significant positive impact on use of IT in clinical practice, prescriptions, and patient information. This suggests that large practices, thanks to their large revenue base, a larger portfolio of services, and a larger support staff are more likely to support the substantial investment and human capabilities needed to manage complex IT systems. Economies of scale also would enable large practices to lower the cost of IT implementation per physician. On the other hand, competitive situation of practice had only a significant impact on the use of IT in clinical practice. This suggest that physicians who work in practices where there is a lot of pressure to attract and retain patients are more likely to invest and adopt IT that make them more effective physicians. These activities include using IT to get recommended guidelines, get decision support, remind clinicians on previous service and follow up.

Among physician-related factors, younger physicians made a more significant use of IT in clinical practice and patient information. Previous research suggests that older physicians are less likely to adopt technology at the workplace (Cook, 2011). Some have suggested that since older physicians are less likely to have grown up using computers as a part of their daily life, they are less likely to use it as a part of their work life (Clayton, Pulver, & Hill, 1993). Implementation of IT at the workplace may impact workflow processes and culture. It is also possible that older physicians are skeptical towards any technology that would change the way they have practiced for years.

Physicians with higher income were significantly more likely to use IT for patient information only. On the other hand, primary care physicians are more likely to use IT for both clinical practice and prescription, but not patient information. It is interesting to note that physician income and primary care physician had a high significant negative correlation (r=-.44). This suggests that high income physicians were most likely to be specialists. Our results suggest that primary care physicians and specialists use IT for different purposes. While primary care physicians were more likely to use IT for issues like getting information on recommended guidelines, get decision support, get information on patient interaction, and write prescriptions, specialists (who typically were high income physicians) were more likely to use IT for issues like order and view diagnostic tests, exchange clinical data with labs, hospital and other physicians. Our correlation matrix also indicates that there was a significant negative correlation between physicians with ownership and number of physicians, use of medical records, and primary care physicians respectively. This suggests that physicians with ownership in practice tended to be specialists working in small practices that were less likely to use electronic medical records. Thus it is not surprising that our study found that physicians with ownership in practice were less likely to use IT for patient information.

Our results indicate that medical providers with a large proportion of Hispanic patients are less likely to use IT for clinical practice or prescription. On the other hand, medical providers with large Asian/Pacific Islander patients are more likely to use IT for clinical practice or prescription. Asian-American are the wealthiest ethnic group in the United States and are more likely to have access to high-quality healthcare. It is possible that healthcare providers in large Hispanic populations are not financially able to adopt and/or support these IT systems. This can have a direct impact on physicians' ability to provide high quality medical care and increase disparities in treatment provided to Hispanic patients.

Physicians who work in practices that get a greater percent of their revenue from Medicaid were significantly more likely to use IT for clinical practice and patient information. Medicare covers retirees and has been criticized by physicians for inadequate reimbursement rates and excessive paperwork (Connolly, 2009). On the other hand, physicians who work in practices that get a major percent of their revenue from Medicare were more likely to use IT for patient information only. Medicaid on the other hand covers low income families and covered by state and federal funds. The recently passed 2010 Patient Protection and Affordable Care Act made more people eligible to be covered under Medicaid. U.S. Department of Health and Human Services' Centers for Medicare and Medicaid Services has highlighted the need for physicians to utilize various health IT tools (Gibbons, 2011). Interestingly, financial assistance given to practices by health plans and other organizations tied to IT systems significantly impacted the use of IT in prescriptions, but had no significant impact on use of IT in clinical practice or patient information. In order to increase IT adoption, it is important that IT incentives are sufficiently large and also aimed at specific outcomes and not frequency of usage. In addition, healthcare providers, insurance companies, and government agencies have to act as a team to ensure that financial incentives are aimed at the right places (Bernstein, Chollet, & Peterson, 2010).

One of the limitations of this study is that the data was collected before the passage of the 2010 Patient Protection and Affordable Care Act and the 2009 American Recovery and Reinvestment Act. Both these legislations may have had an impact on IT usage by physicians. Future Health Tracking Physician Surveys will enable researchers to use the results of our study as a baseline for examining the impact of these federal legislations on use of IT by physicians. Another limitation of this study is that since the data was self-reported, physicians may over report usage of IT due to social desirability bias. It is also possible IT usage may be more in urban practices than in rural practices. Future research needs to examine this issue. In spite of these limitations, this study has important implications for health care policy makers, health care managers, and researchers on the use of IT among physicians.

CONCLUSIONS

The extent of use of electronic medical records by physicians and number of physicians in practice were the only factors that positively impacted the use of IT in clinical practice, prescriptions, and patient information. While competitive situation of practice, age of physician, primary care physicians, Asian and Pacific Islander patients, and revenue from Medicaid positively impacted the use of IT in clinical practice, a large proportion of Hispanic patients had a negative impact on the use of IT in clinical practice. The use of IT prescriptions were positively influenced by primary care physicians, Asian and Pacific Islander patients, and financial incentives, they were negatively influenced by a large proportion of Hispanic patients. Finally use of IT for patient information was positively influenced by age and income of physician and proportion of revenue from Medicare and Medicaid. It was negatively influenced by the level of ownership in private practice.

REFERENCES

Bates, D.W. (2005). Physicians and ambulatory electronic health records. *Health Affairs (Millwood)*, *24*(5), 1180-1189.

Bernstein, J., Chollet, D., & Peterson, S. (2010). Financial incentives for health care providers and consumers. *Mathematica – Policy Reseach Inc*. Available at http://www.mathematica-mpr.com/publications/PDFs/Health/reformhealthcare_IB5.pdf

Blumenthal, D. (2010). Launching HITECH. *New England Journal of Medicine*, *362*(5), 382-385.

Buntin, M.B., Burke, M.F., Hoaglin, M.C., & Blumenthal, D. (2011). The benefits of health information technology: a review of the recent literature shows predominantly positive results. *Health Affairs*, *30*(3), 464-471.

Centers for Disease Control and Prevention. (2008). Effect of electronic laboratory reporting on the burden of Lyme disease surveillance—New Jersey, 2001-2006. *MMWR Morbidity and Mortality Weekly Report, 57(2)* 42-45.

Clayton, P.D., Pulver, G.E., & Hill, C.L. (1993). Physician use of computers: is age or value the predominant factor?. *Proceedings of the Symposium of Computer Applications in Medical Care.* (pp. 301-305). Washington DC: JAMIA. PMC2233074

Connolly J. (2009, April 1). Doctors are opting out of medicare. *New York Times.* Available at http://www.nytimes.com/2009/04/02/business/retirementspecial/02health.html

Cook, B. (2011, January 10). Physician emr use passes 50% as incentives outweigh resistance. *American Medical News*, Retrieved from http://www.ama-assn.org/amednews/2011/01/10/bil10110.htm.

DesRoches, C.M., Campbell, E.G., Rao, S.R., Donelan, K., Ferris, T.G., & Jha, A. (2008). Electronic health records in ambulatory care -- a national survey of physicians. *New England Journal of Medicine*, *359*, 50-60.

Gates, M. L., & Roeder, P. W. (2011, April 1). A case study of user assessment of a corrections' electronic health record. *Perspectives in Health Information Management*, pp. 8:1b.

Georgiou, A., & Westbrook, J.I. (2009). Clinician reports of the impact of electronic ordering on an emergency department. *Studies in Health Technology and Informatics*, *150*, 678-682.

Georgiou, A., Westbrook, J., Braithwaite, J., Idema, R., Ray, S. & Forsyth R, et al. (2007). When requests become orders -- a formative investigation into the impact of a computerized physician order entry system on a pathology laboratory service. *International Journal of Medical Informatics*, *150*, 583-591.

Gibbons, M.C. (2011). Use of health information technology among racial and ethnic underserved communities. *Perspectives in Health Information Management*, *8*(1), Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/21307989

Goldzweig, C.L., Towfigh, A., Maglione, M., & Shekelle, P.G. (2009). Cost and benefits of health information technology: new trends from the literature. *Health Affairs (Milwood)*, *28*(2), 282-293.

Hollingworth, W., Devine, E.B., Hansen, R.N., Lawless, N.M., Comstock, B.A., Wilson-Norton, J.L. et al. (2007). The impact of e-prescribing on prescriber and staff time in ambulatory care clinics: a time motion study. *Journal of the American Medical Informatics Association*, *14*(6), 722-730.

Jha, A.K., DesRoches, C.M., Campbell, E.G., Donelan, K., Rao, S.R. & Ferris T.G.(2009). Use of electronic health records in us hospitals . *New England Journal of Medicine*, *360*(16), 1628-1638.

Maharajah, A., & Macintyre, A. (2010). Can educating physicians increase the adoption rate of electronic health records?. *Proceedings of the 17th annual international conference on advances in management (ICAM)* Atlanta, GA: ISSN; 1059-356-X

Morrison, C., Jones, M., Blackwell, A., & Vuylsteke, A. (2008). Electronic patient record use during ward rounds: a qualitative study of interaction between medical staff. *Critical Care*, *12*(6), R148.

Payton, F.C., Pare, G., LeRouge, C., & Reddy, M. (2011). Healthcare IT: Process, people, patients and inter-disciplinary considerations. *Journal of the Association for Information Systems*, *12*(2/3), ii-xiii.

Pirnejad, H., Niazkhani, Z., van der Sijs, H., Berg, M., & Bal, R. (2008). Impact of a computerized physician order entry system on nurse-physician collaboration in the medication process. *International Journal of Medical Informatics*, *77*(11), 735-744.

Shea, S., & Hripcsak, G. (2010). Accelerating the use of electronic health records in physician practices. *New England Journal of Medicine*, *362*(3), Retrieved from http://dx.doi.org/10.1056/NEJMp0910140

Spetz, J., & Keane, D. (2009). Information technology implementation in a rural hospital: a cautionary tale. *Journal of Healthcare Management*, *54*(5), 337-347.

Trivedi, M.H., Daly, E.J., Kern, J.K., Grannemann, B.D., & Sunderajan, P. (2009). Barriers to implementation of a computerized decision support system for depression: an observational report on lessons learned in "real world" clinical settings. *BMC Medical Inform Decision Making*, *9*, 6.