Racial Differences in the Usage of Information Technology: Evidence from a National Physician Survey

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Abstract

Information technology (IT) is a key mechanism for improving the quality of healthcare and containing costs, but racial differences in the utilization of IT among practicing physicians are unknown.

The current study, using a national physician survey (n = 6,628), investigated racial differences in the utilization of IT. White physicians and minority physicians were directly compared. We first conducted both descriptive and inferential analyses to detect the difference in IT utilization by race and then performed multiple logistic regressions to test whether race remains significant in relation to IT utilization. Results reveal racial differences in the usage of IT. Compared to their minority counterparts, white physicians underutilized a preventive service reminder system. On the other hand, white physicians favored utilizing electronic communications with patients and exchanging clinical data and images with other providers.

Key words: racial difference, drug formulary, information technology adoption, physicians

Introduction

Information technology (IT) is a key mechanism for improving the quality of healthcare[1–3] and reducing healthcare costs,[4-7] but the adoption rate of IT among medical providers has been relatively slow.[8] The IT adoption rate among hospitals and medical providers ranges from 1.5 percent to 29 percent, according to various studies.[9–13] Therefore increasing IT adoption among medical providers is an important objective as the U.S. government continues to report realized benefits of IT investments and utilization.[14,15] However, racial/ethnic differences in the use of IT at the physician level are poorly documented in the literature.

Understanding the potential role of physician race/ethnicity in the use of IT remains significant for at least one reason. In a 2003 report,[16] the Institute of Medicine (IOM) stressed the importance of eliminating racial disparities at the procedural and structural level, suggesting extra efforts to be made among medical providers. Much of the healthcare literature on racial disparities has reported findings at the patient level, and less serious effort has been made at the provider level. In a proposed causal model, van Ryn[17] contended that physician behaviors may contribute to racial/ethnicity disparities in the delivery of medicine, and several earlier studies offer similar observations.[18-20]

A review of the limited body of the literature suggests racial differences in the adoption and utilization of certain types of IT among practicing physicians. For example, surveying the utilization of IT among physicians (n = 4,302) in Florida, Menachemi and Brooks found that white physicians (18.3 percent) were more likely than minority physicians (16 percent of black physicians, 14.6 percent of Hispanic physicians, and 7.2 percent of Asian physicians) to electronically communicate with patients.[21] Using a nationally representative data survey, Pagán et al.[22] revealed a relatively low adoption rate of e-prescribing among Hispanic physicians.

The focus of this analysis is to shed light on the racial/ethnic differences in IT utilization and adoption among providers and contribute to improving the delivery of medicine. Health policymakers and practitioners need to understand if discrepancies exist in IT utilization/adoption when developing policies and allocating scarce resources. The present study therefore attempts to answer the following research questions: Is there racial disparity in the utilization of IT among practicing physicians? If so, which IT utilizations are favored by white physicians and minority physicians? Is physician race/ethnicity statistically significant in relation to IT utilizations when evaluated using a multivariate regression model, while adjusting for control variables?

Methodology

Data Source

To respond to the aforementioned research questions, the 2004–2005 Community Tracking Study (CTS) Physician Survey in the United States (obtained from the Inter-University Consortium for Political and Social Research) was analyzed.[23] The Center for Studying Health System Change, sponsored by the Robert Wood Johnson Foundation, has been conducting a physician survey since 1996. The first CTS physician survey was conducted in 1996, followed by the second round in 1998–1999 and the third in 2000–2001. A total of 6,628 physicians in the United States participated in this telephone survey, using computer-assisted telephone interviewing technology. Physicians were compensated $25 for their responses, which resulted in a 52.4 percent response rate. The survey was conducted between June 2004 and July 2005 and surveyed a list of physicians provided by the American Medical Association and the American Osteopathic Association. The study participants included U.S. physicians providing direct patient care for at least 20 hours a week. Physicians excluded from the survey included federal employees, specialists who did not provide direct patient care, foreign medical graduates with temporary licenses, residents, interns and fellows, and physicians who requested that their names not be disclosed to outsiders. A stratified random sampling technique was used to survey study participants. More detailed information on the data collection and methodology is provided elsewhere.[24]

Measurement

IT adoption/utilization was used as a single dependent variable in the study. The survey specifically asked: “In your practice, are computers or other forms of information technology (IT) used: (1) to obtain information about treatment alternatives or recommended guidelines?; (2) to obtain information on formularies?; (3) to generate reminders about preventive services?; (4) to access patient notes, medication lists, or problem lists?; (5) to write prescriptions?; (6) for clinical data and image exchanges with other physicians?; (7) for clinical data and image exchanges with hospitals and laboratories?; (8) to communicate about clinical issues with patients by e-mail?; and (9) to obtain information on potential patient drug interactions with other drugs, allergies, and/or patient conditions?” The response was categorical (yes = 1, no = 0).

Covariate variables included in the study consisted of the following. The variable for the first year of medical practice was measured with one question: “In what year did you begin medical practice after completing your undergraduate and graduate medical training?” The response ranged from 1 to 8 (1 = 1970 or earlier; 2 = 1971–1975; 3 = 1976–1980; 4 = 1981–1985; 5 = 1986–1990; 6 = 1991–1995; 7 = 1996–2000; and 8 = 2001 or later). The study participants were asked about race/ethnicity (whites = 1, others = 0). Respondents were asked whether they spent most of their patient care time in a primary care specialty (PCP) or not (yes = 1, no = 0). Ownership status was assessed by asking, “Are you a full owner (1), a part owner (2), or not an owner of this practice (3)?” The survey collected information about organization size with the question “How many physicians, including yourself, are in the practice?” The responses ranged from 1 to 200 physicians. Physicians working in the following settings were not asked this question: medical schools, universities, hospitals, state or local governments, or other situations such as an integrated delivery system (IDS), physician practice management company (PPM), management service organization (MSO), physician hospital organization (PHO), or locum tenens (temporary employment for physicians).Medical specialty (1 = internal medicine, 2 = family/general practice, 3 = pediatrics, 4 = medical specialties, 5 = surgical specialties, 6 = psychiatry, and 7 = OB/GYN), practice type (1 = solo physician or two physicians, 2 = group of three or more physicians, 3 = HMO, 4 = medical school, 5 = hospital based, 6 = other), and other personal factors such as gender and income were also controlled in the multivariate regression analysis.

Statistical Analyses

For the purpose of the study, white physicians (n = 5,048) were directly compared with minority physicians (n = 1,487). Of 6,628 physicians, 93 participants were eliminated because they either refused to answer (n = 68) or did not know the answer (n = 25). Thus, only 6,535 physicians were included in the analysis. Both standard descriptive and inferential statistics including t-test and chi-square statistics were calculated first to detect if there was a difference in IT utilization by race/ethnicity. Then, a multivariate logistic regression analysis was employed to test whether race/ethnicity would be significant in relation to different IT utilizations. Sociodemographic information and other variables (primary care physician status, ownership, and organization size) were controlled in the regression analysis. Stata 10.1 was used for all statistical analyses.[25] All analyses

were fully adjusted, using the Stata "svy" command set, to account for the complex survey design. Odds ratios (ORs) and confidence intervals (95 percent) are reported in the regression model. The research results are reported at a significance level of $p < .05$.

Results

Table 1 provides descriptive statistics containing all variables included in the analysis. The majority of the sample were male (75 percent) and white (78.1 percent) physicians. The average net income was between $150,000 and $199,999. While the majority of participating physicians reported utilizing IT to obtain information about treatment guidelines (65 percent) and for clinical data and image exchanges with hospitals and labs (66 percent), only 22 percent self-reported using e-prescribing, and less than a quarter of physicians reported employing electronic communication with patients.

Table 1
Summary Statistics of Key Variables

Key Variables	Total	Weighted	Mean	SD	Min	Max
Used IT:						
To obtain information about treatment guidelines	6,617	396,648	.65	.47	0	1
To obtain information about formularies	6,610	396,262	.45	.49	0	1
To generate preventive service reminders	6,590	394,613	.29	.45	0	1
To obtain information about patient notes/medication/problem lists	6,618	396,296	.50	.50	0	1
To write prescriptions	6,624	396,935	.22	.41	0	1
For clinical data and image exchanges with other physicians	6,611	396,251	.50	.50	0	1
For clinical data and image exchanges with hospitals and lab	6,614	396,610	.66	.47	0	1
To communicate with patients by e-mail	6,618	396,763	.24	.42	0	1
To identify drug interactions with other drugs	6,611	396,381	.59	.49	0	1
Ownership[a]	6,628	397,465	2.14	.86	1	3
Organization size	5,461	324,625	25.60	53.53	1	200
Income[b]	6,622	396,952	4.19	1.79	1	7
Gender[c]	6,628	397,465	1.25	.43	1	2
First year of medical practice[d]	6,628	397,465	4.45	1.92	1	8
Race[e]	6,535	390,510	1.78	.41	1	2

[a]Ownership (full owner = 1, part owner = 2, not an owner = 3)
[b]Income (1 = $0–$49,999; 2 = $50,000–$99,999; 3 = $100,000–$149,999; 4 = $150,000–199,999; 5 = $200,000–249,999; 6 = $250,000–299,999; and 7 = $300,000 or more)
[c]Gender (male = 1, female = 2)
[d]First year of medical practice (1 = 1970 or earlier, 2 = 1971–1975, 3 = 1976–1980, 4 = 1981–1985, 5 = 1986–1990, 6 = 1991–1995, 7 = 1996–2000, 8 = 2001 or later)
[e]Race (whites = 1, others = 0)

Table 2 portrays the differences in IT utilization by race. It was significant that minority physicians were more likely than white physicians to utilize computers or IT to obtain information about drug formularies (50.44 percent vs. 44.55 percent, $p < .001$) and to generate preventive service reminders (34.39 percent, vs. 17.75 percent, $p < .001$). On the other hand, white physicians were more likely than their counterpart minority physicians to use IT for clinical data and image exchanges with other physicians (49.87 percent vs. 45.76 percent, $p = .005$) and hospitals and laboratories (67.18 percent vs. 62.78 percent, $p = .002$), and to electronically communicate with patients about clinical issues (24.85 percent vs. 20.75 percent, $p < .001$).

Table 2
IT Utilization by Race (%)

	Total (*n* = 6,535)	**Whites (*n* = 5,048)**	**Minorities (*n* = 1,487)**	***p*-value**
Used IT to obtain information about treatment guidelines	65.78	65.31	67.36	.143
Used IT to obtain information about formularies	45.89	44.55	50.44	**<.001**
Used IT to generate preventive service reminders	29.26	17.75	34.39	**<.001**
Used IT to write prescriptions	21.93	21.08	24.75	.083
Used IT to obtain information about patient notes, medication lists, or problem lists	48.47	48.17	49.49	.368
Used IT for clinical data and image exchanges with other physicians	48.93	49.87	45.76	**.005**
Used IT for clinical data and image exchanges with hospitals and lab	66.18	67.18	62.78	**.002**
Used IT to communicate with patients by e-mail	23.92	24.85	20.75	**<.001**
Used IT to identify drug interactions with other drugs	60.22	59.60	62.33	.059

Note: Bold values indicate significance at the $p < .05$ level.

Adjusted ORs and confidence intervals (95 percent) from a multivariate logistic regression analysis for factors associated with IT utilizations are presented in Table 3. After adjusting for variables such as primary care physician status, practice ownership, and organization size, we tested whether race/ethnicity would be statistically significant in relation to IT usage. Results revealed that race/ethnicity remained significant in four different IT utilizations. Consistent with the finding in Table 2, minority physicians were more likely than their white peers to utilize computers and IT for preventive services (OR = .78, $p < .05$). White physicians were more likely than minority physicians to utilize IT for clinical data and image exchanges with other physicians (OR = 1.29, $p < .05$) and with hospitals/laboratories (OR = 1.26, $p < .05$) and for electronic communications with patients (OR = 1.38, $p < .05$).

Table 3
Odds Ratios for IT Utilizations

Variables	IT Utilizations (95% CI)[a]								
	TRTGL	FORMLY	PSR	PNOTE	CIEXP	CIEXHL	EMAIL	DINNR	EPRSCP
Race	1.08	.80	.78*	.99	1.29*	1.26*	1.38*	.95	.89
	(.85, 1.37)	(.64, 1.0)	(.63, .99)	(.73, 1.26)	(1.01, 1.64)	(1.0, 1.57)	(1.05, 1.82)	(.75, 1.18)	(.68, 1.17)
Gender	.97	.88	.86	.62***	.78*	.82	1.03	.88	.90
	(.77, 1.22)	(.70, 1.12)	(.68, 1.10)	(.49, .79)	(.61, .98)	(.65, 1.02)	(.76, 1.30)	(.66, 1.06)	(.69, 1.18)
Specialty	.87*	84**	1.16**	.76***	.80***	.77***	1.09	.86**	1.03
	(.78, .96)	(.76, .94)	(1.04, 1.28)	(.68, .84)	(.72, .89)	(.69, .86)	(.97, 1.21)	(.78, .96)	(.90, 1.17)
First year of practice	1.12***	.98	1.04	1.16***	1.07**	1.06*	1.01	1.07**	1.16***
	(1.06, 1.17)	(.93, 1.02)	(.98, 1.09)	(1.10, 1.22)	(1.02, 1.13)	(1.02, 1.13)	(.96, 1.07)	1.01, 1.12)	(1.1, 1.23)
Income	.97	.99	1.04	1.04	1 13***	1.08*	.99	.94*	1.02

Variables	IT Utilizations (95% CI)[a]								
	TRTGL	FORMLY	PSR	PNOTE	CIEXP	CIEXHL	EMAIL	DINNR	EPRSCP
	(.91, 1.03)	(.93, 1.05)	(.97, 1.10)	(.98, 1.11)	(1.06, 1.19)	(1.02, 1.15)	(.93, 1.06)	(.89, 1.0)	(.95, 1.09)
PCP	.75	.79	2.78***	.38***	42***	.48***	1.26	.81	1.58*
	(.51,1.10)	(.54, 1.16)	(1.87, 4.12)	(.25, .56)	(.28, .62)	(.32, .72)	(.81, 1.96)	(.56, 1.19)	(1.0, 2.48)
Ownership	1.17*	1.18*	.89	1.13	1 32***	1.32***	.98	1.0	1.25**
	(1.0, 1.35)	(1.02, 1.38)	(.76, 1.04)	(.96, 1.32)	(1.31, 1.53)	(1.14, 1.54)	(.81, 1.16)	(1.02, 1.53)	(1.06, 1.48)
Practice type	1.06	1.07	1.04	1.12**	1.11*	1.09*	1.09	1.16***	1.001
	(.97, 1.16)	(.99, 1.17)	(.96, 1.13)	(1.03, 1.23)	(1.02, 1.21)	(1.0, 1.20)	(.99, 1.19)	(1.03, 1.30)	(.91, 1.09)
Organization size	1.0***	1.0***	1.0***	1.01***	1.01***	1.0***	1.0***	1.0***	1.0***
	(10, 1,0)	(1.0, 1.0)	(1.0, 1.0)	(1.01, 1.01)	(1.01, 1.01)	(1.0, 1.01)	(1.0, 1.0)	(1.0, 1.0)	(1.0, 1.0)
N	5,367	5,363	5,348	5,367	5,363	5,369	5,369	5,365	5,373

*$p < .05$
**$p < .01$
***$p < .001$
[a]TRTGL (treatment alternatives or recommended guidelines), FORMLY (formularies), PSR (preventive service reminders), PNOTE (patient notes, medication lists, or problem lists), CIEXP (clinical data/image exchanges with other physicians), CIEXHL (clinical data/image exchanges with hospitals/laboratories), EMAIL (e-mailing with patients), DINNR (drug interactions), EPRSCP (e-prescribing)

Discussions

Little is known about racial differences in the usage of IT among physicians, and this empirical analysis, using a national physician survey, was an attempt to foster an understanding of the role that physician race/ethnicity may play in the usage of IT. Our data have at least several important advantages over prior IT adoption studies in the literature. To the best of our knowledge, this research is the first attempt to understand the role of physician race/ethnicity in the use of IT at the national level. Also, the sample in the study is nationally representative and is reliable to dependent variables. Finally, while prior studies have narrowly focused on a single IT variable such as electronic communication[26] and e-prescribing,[27] our study included nine different IT variables in exploring the association of each IT utilization with race/ethnicity. Particularly, given the government efforts to develop effective clinical decision-support programs nationwide in an effort to enhance quality of care,[28] our survey data, which comprise clinical decision-support questions (e.g., using IT for drug formulary information, preventive service reminders, and clinical data exchange with other clinicians), remain timely and informative for policymakers and make our study unique and different from other studies focusing on electronic health records (EHRs) and electronic medical records (EMRs).[29-32]

Our findings reveal that racial differences exist in IT utilization. In a simple cross-tabulation analysis, white physicians underutilized computers or IT for drug formularies in comparison with their minority counterparts. However, race did not remain significant in a multiple regression analysis after other variables (gender, age, income, primary care physician status, ownership, and organization size) were taken into account. This suggests that the association of IT with race/ethnicity may be confounded by those variables controlled in the analysis. No prior study exists in the literature, and it is unclear why white physicians underutilized IT for drug formularies. One plausible explanation is that they may not be oriented toward helping patients reduce prescription costs. This possibility may be supported by Shrank et al.,[33] who studied three-tier formulary benefit plans and found that some providers lack the necessary information to help patients save money on drug copayments.

One may assume that physicians historically have not been trained or socialized to provide cost-efficient medicine but rather to focus on the quality of their medical intervention. It would be interesting to further explore whether this orientation is promoted universally across the training of minority and majority physicians. In a cross-sectional physician survey (n = 690), Khan et al.[34] found that most of their study participants felt a responsibility to prescribe drugs that would reduce patients' copayments, but many were unaware of critical information such as preferred medications on the formulary, the patients' copayment amounts, or the price of the drugs.

The researchers were surprised to find that white physicians, compared to their minority counterparts, substantially underutilized a computerized preventive reminder system (CPRS). Although a CPRS is effective in enhancing preventive care,[35,36] CPRS usage is low among physicians in general and particularly so among majority physicians. At this point to suggest a reason for this finding would be speculative at best. Obviously additional research is needed to understand the racial gap in CPRS utilization and its impact on the delivery of drugs.

Our finding that white physicians, as compared to minority physicians, are more likely to use IT for exchanging clinical data and images with other physicians and with hospitals and laboratories suggests that minority physicians may not be comfortable sharing clinical data and images or that they may not have invested in the software necessary to interface with other healthcare providers. This discovery could be problematic as we move toward the use of universal EMRs, outsourcing medical services over the Internet.

Racial differences exist in the usage of e-mail in this study. Our finding that white physicians were more likely than minority physicians to use e-mail is in line with previous research.[37,38] In their survey of 4,302 physicians in an ambulatory care setting in Florida, Menachemi and Brooks[39] found that 18.3 percent of white physicians utilized e-mail to communicate with patients (much lower than the 24.85 percent adoption rate in our analysis), whereas minority physicians were less likely to utilize e-mail (16 percent of African American physicians, 14.6 percent of Hispanic physicians, and 7.2 percent of Asian physicians). It is unknown why white physicians are more likely to use e-mail as no related literature exists. Hence this question presents a research opportunity, and future researchers can take a further step to investigate the racial discrepancy in the use of electronic communication among medical providers. Also, it will be interesting to see if the effects of individual access or lack of access to e-mail at the patient level are linked to the use of IT among white and minority physicians.

While this study provides food for thought, there are limitations that warrant mentioning. First, we did not specifically measure different minority groups. The survey data file used for the present study did not provide information about different ethnicities (African Americans, Hispanics, Asian Americans, Native Americans, etc.) and thus caution is necessary when generalizing the study results to a specific minority group. Second, a significant number of physicians (federal employees, specialists who do not provide direct patient care, foreign medical graduates with temporary licenses, and residents) were excluded from the survey and hence our findings cannot be generalized to the overall population of physicians. Third, the 52 percent response rate of the survey may not be representative of all physicians in the United States. Those physicians who did not participate in the survey may have been substantially different from those physicians who participated. Fourth, because of the age of the data (collected in 2004–2005), our findings may not represent the current practice in relation to IT adoption among white and minority physicians. Fifth, we conducted a secondary data analysis and hence the inability to control in designing research questions and developing/collecting the data may hamper the reliability of our findings. Last, our findings might have produced a different effect if we controlled for potentially confounding factors such as geographical areas and IT-related financial incentives that are not available in the survey data.

Conclusion

In summary, despite the aforesaid study limitations, our findings make a contribution to the literature by revealing that acceptance and adoption rates of IT may vary significantly between majority and minority physicians at the national level. Ethnic/racial disparities in the use of IT at the provider level may be another barrier to increasing the number of physicians who utilize IT, and subsequently understanding racial/ethnic disparities in IT adoption among physicians remains important in helping to successfully introduce IT into the medical community. This observation could have an impact on efforts ranging from policy development to resource allocation to entrepreneurial activities such as Internet marketing as the role of IT continues to unfold in the medical community.

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