

Patient perceptions of electronic medical records use and ratings of care quality

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Purpose: Despite considerable potential for improving health care quality, adoption of new technologies, such as electronic medical records (EMRs), requires prudence, to ensure that such tools are designed, implemented, and used meaningfully to facilitate patient-centered communication and care processes, and better health outcomes. The association between patients' perceptions of health care provider use of EMRs and health care quality ratings was assessed.

Method: Data from two iterations of the Health Information National Trends Survey, fielded in 2011 and 2012, were pooled for these analyses. The data were collected via mailed questionnaire, using a nationally representative listing of home addresses as the sampling frame (n=7,390). All data were weighted to provide representative estimates of quality of care ratings and physician use of EMR, in the adult US population. Descriptive statistics, *t*-tests, and multivariable linear regression analyses were conducted.

Results: EMR use was reported significantly more frequently by females, younger age groups, non-Hispanic whites, and those with higher education, higher incomes, health insurance, and a usual source of health care. Respondents who reported physician use of EMRs had significantly higher ratings of care quality (Beta=4.83, standard error [SE]=1.7, *P*<0.01), controlling for sociodemographic characteristics, usual source of health care, and health insurance status.

Conclusion: Nationally representative data suggest that patients' perceptions of EMR use are associated with their perceptions of the quality of the health care they receive.

Keywords: electronic medical records, health care quality, health information technology

Introduction

Electronic medical records (EMRs) have significant potential to facilitate information exchange and enable greater patient engagement. To maximize this potential, care must be exercised in the adoption and use of EMRs, to ensure that EMRs facilitate patient-centered communication and health care processes.¹⁻⁵ Prior research exploring physicians' attitudes about EMRs⁶⁻⁹ and patients' satisfaction with physicians' use of EMRs has yielded mixed results.¹⁰⁻¹² Evaluating patient perceptions of provider use of EMR and associated ratings of health care quality is a first step in understanding the impact of EMRs on the patient experience.¹³⁻¹⁵ Use of EMRs is rapidly increasing; therefore, tracking patients' perceptions of provider EMR use and assessment of their association with ratings of quality of care is important to understand patients' perspective on this evolving component of health care.¹⁶ Data from a national sample of adults in the USA were analyzed to explore whether patient-reported physician use of an EMR is associated with quality of care ratings.

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Methods

Data collection and response rates

Data from the Health Information National Trends Survey (HINTS) (HINTS 4, Cycle 1 and Cycle 2; $n=7,390$), a nationally representative survey of the US adult population that tracks attitudes, knowledge, and behavior relevant to health communication, were analyzed.¹⁷

HINTS 4 Cycle 1 and Cycle 2 data were collected in 2011 and 2012 via mailed questionnaires. The instruments used in these data collection efforts were cognitively tested and pilot tested to ensure respondents were able to understand and complete the instruments.¹⁸ Each instrument was also approved by the US Office of Management and Budget to ensure the level of burden for respondents was deemed acceptable.¹⁸ The sample design was a two-stage, stratified sample wherein addresses were selected from a United States Postal Service file of residential addresses, and individual respondents were selected from each sampled household. The final response rate for Cycle 1, was 36.7% and for Cycle 2, was 40.0%.¹⁹ Additional details about the sampling strategies and survey design for HINTS 4 are published elsewhere.^{18,20}

Measures

Ratings of health care quality

The following question captured respondents' quality of care ratings: "Overall, how would you rate the quality of health care you received in the last 12 months?" The response options were given on a five-point scale, ranging from "excellent" to "poor." To improve interpretation, the scale was treated as interval, scores were reversed, and a linear transformation was applied to create scores ranging from 0–100, wherein higher scores indicated higher ratings of quality.

Electronic medical record use

Respondents were asked the following question to assess whether they believed their health care provider maintained an EMR: "As far as you know, do any of your doctors or health care providers maintain your medical records in a computerized system?"

Health care access

Usual source of health care was assessed with the following: "Not including psychiatrists and other mental health professionals, is there a particular doctor, nurse, or other health professional that you see most often?" Health insurance status was assessed with the following: "Do you have any of the following

health insurance or health coverage plans: Insurance through a current or former employer or union; Insurance purchased directly from an insurance company; Medicare; Medicaid, Medical Assistance, or any kind of government assistance plan for those with low incomes or disability; TRICARE [health care program for Uniformed Service members] or other military health care; VA [US Department of Veterans' Affairs]; or Indian Health Service." Responses were recoded as "yes" or "no."

Sociodemographic variables

Sociodemographic variables included sex, age, education, race/ethnicity, annual household income, and employment.

Data analyses

SUDAAN version 10.0.1 (RTI International, Research Triangle Park, NC, USA) was used to account for the complex sample procedure. All data were weighted to provide representative estimates of the adult US population. Mean ratings of quality were calculated and compared by *t*-test for those who reported their health care providers maintain an EMR and those who reported they do not. A multivariable linear regression model was conducted, regressing health care quality ratings on a set of predictors, including sociodemographic variables, health care access, and perceived provider EMR use.

Results

The vast majority of respondents (86.99%) reported that their health care provider maintained their medical records in a computerized system (Table 1). Significant differences in perceived EMR use were observed by health care access and sociodemographic variables. As summarized in the first data column of Table 1, perceived provider EMR use was more frequently reported by females, younger adults, non-Hispanic whites, those with higher education, higher incomes, health insurance, and a usual source of health care.

Mean ratings of quality of health care also differed by perceived EMR status, with significantly higher ratings among those reporting use of an EMR (mean =80.9) compared with those reporting no use (mean =73.6) ($t=4.59$, $P<0.0001$). Significantly higher ratings of quality of care were also observed among those reporting provider use of EMR compared to those reporting no EMR use for: males, females, those aged 35–64 and 65 years or older, those earning less than \$50,000 per year, Hispanics, non-Hispanic others, those with some college or less, those with health insurance, employed and unemployed persons, and those without a usual source of care (Table 2). Perceived physician use of EMR remained significantly associated with quality of care ratings in the

Table 1 Weighted population estimates for perceived electronic medical record status by sociodemographic and health care access characteristics

	Provider maintains EMR		Chi-square	P-value
	Yes (N=6,511)	No (N=879)		
Overall	86.99%	13.01%		
Health insurance			42.11	0.0000*
Yes	85.71 (84.60–86.76)	60.06 (54.11–65.73)		
No	14.29 (13.24–15.40)	39.94 (34.27–45.89)		
Regular provider			63.96	0.0000*
Yes	68.22 (66.00–70.36)	39.04 (33.49–44.90)		
No	31.78 (29.64–34.00)	60.96 (55.10–66.51)		
Employment status			0.16	0.694*
Employed	55.82 (53.86–57.77)	57.21 (50.50–63.66)		
Not employed	44.18 (42.23–46.14)	42.79 (36.34–49.50)		
Sex			15.57	0.0001*
Female	52.79 (51.97–53.61)	41.34 (36.55–46.30)		
Male	47.21 (46.39–48.03)	58.66 (53.70–63.45)		
Age			5.75	0.0003*
18–34	30.11 (29.14–31.10)	34.87 (29.06–41.18)		
35–49	26.36 (25.67–27.06)	31.42 (27.13–36.06)		
50–64	25.72 (25.20–26.25)	22.56 (19.39–26.08)		
65–74	9.73 (9.42–10.05)	5.64 (4.22–7.49)		
≥5+	8.08 (7.78–8.39)	5.51 (4.02–7.51)		
Income			8.38	0.0000*
<\$20,000	21.40 (19.56–23.36)	32.88 (26.49–39.97)		
\$20,000 to <\$35,000	15.90 (14.39–17.53)	16.51 (12.69–21.20)		
\$35,000 to <\$50,000	14.47 (13.26–15.76)	13.63 (9.54–19.11)		
\$50,000 to <\$75,000	16.55 (14.80–18.46)	19.30 (14.67–24.98)		
\$75,000 to <\$100,000	12.45 (11.29–13.71)	7.49 (5.41–10.28)		
\$100,000 or more	19.24 (17.72–20.85)	10.18 (7.86–13.09)		
Race/ethnicity			8.20	0.0000*
Hispanic	12.30 (11.52–13.12)	23.34 (18.68–28.76)		
NH White	65.30 (64.23–66.37)	48.26 (43.09–53.46)		
NH Black	9.89 (9.29–10.53)	13.87 (10.49–18.12)		
NH Other	6.41 (5.85–7.02)	9.32 (6.31–13.56)		
Missing	6.10 (5.35–6.93)	5.21 (3.96–6.82)		
Education			7.49	0.0001*
Less than high school	11.79 (10.80–12.86)	22.68 (18.01–28.14)		
High school graduate	20.98 (19.68–22.34)	24.63 (19.62–30.44)		
Some college	35.21 (33.74–36.71)	29.87 (24.48–35.87)		
College graduate	32.02 (31.07–32.99)	22.83 (19.17–26.95)		

Note: *Significant P-value.

Abbreviations: EMR, electronic medical record; NH, non-Hispanic.

multivariable model. Respondents who reported physician use of EMR had significantly higher ratings of care quality (Beta =4.83, standard error [SE] =1.70, $P<0.01$). Having a usual source of health care, increasing age, and higher income were also significantly associated with higher ratings of care quality, in the multivariable model (Table 3).

Discussion

Despite their considerable potential for improving health care quality, adoption of health information technologies, such as EMRs requires prudence, to ensure that such tools are designed, implemented, and used meaningfully

to facilitate patient-centered care processes and improved health outcomes.^{1,21,22} We assessed patients' perceptions of EMR use and associated ratings of quality. Our analyses revealed that the majority of the population believes that their health care providers maintain an EMR. This estimate is strikingly higher than the estimated 55% of a national sample of physicians who reported EMR use in 2011, and somewhat higher than the estimated 69% of physicians who reported EMR use in 2012.^{16,23} It is important to bear in mind that the adoption of an EMR varies significantly by type of clinical practice. For example, data from the National Ambulatory Medical Care Survey (NAMCS) Physician

Table 2 Weighted mean health care quality ratings by electronic medical record status

	Mean rating of health care quality on a 100 point scale (higher score = greater quality)					
	Provider uses EMR (N=6,511)		Provider does not use EMR (N=879)		t-test	P-value
	N	Mean (SE)	N	Mean (SE)		
Overall	6,511	80.92 (0.47)	879	73.64 (1.57)	4.59	0.0000*
Health insurance						
Yes	5,107	81.59 (0.47)	480	75.37 (1.92)	3.16	0.0021*
No	456	75.49 (1.74)	79	68.18 (4.02)	1.72	0.0893
Regular provider						
Yes	4,392	82.85 (0.49)	359	80.21 (1.68)	1.56	0.1223
No	1,159	75.17 (1.26)	194	65.81 (2.90)	3.05	0.0030*
Employment status						
Employed	2,760	80.15 (0.59)	268	74.50 (2.15)	2.57	0.0118*
Not employed	2,624	81.92 (0.80)	280	73.09 (2.09)	3.9	0.0002*
Sex						
Female	3,417	81.08 (0.60)	316	74.24 (1.65)	4.09	0.0001*
Male	2,071	80.87 (0.75)	232	73.42 (2.56)	2.83	0.0056*
Age						
18–34	768	78.98 (1.34)	87	72.23 (3.89)	1.65	0.1025*
35–49	1,243	79.36 (0.72)	132	72.66 (2.88)	2.30	0.0234*
50–64	1,899	81.84 (0.64)	190	74.36 (2.00)	3.68	0.0004*
65–74	902	85.07 (0.76)	78	80.05 (3.60)	1.35	0.1800
≥75	685	84.49 (0.89)	63	73.65 (3.94)	2.69	0.0084*
Income						
<\$20,000	1,157	76.98 (1.44)	160	70.23 (3.02)	2.03	0.0453*
\$20,000 to <\$35,000	861	79.86 (1.26)	91	68.82 (3.37)	3.32	0.0013*
\$35,000 to <\$50,000	820	82.05 (1.10)	68	74.13 (3.29)	2.27	0.0253*
\$50,000 to <\$75,000	903	82.69 (0.82)	106	76.17 (3.41)	1.88	0.0625
\$75,000 to <\$100,000	690	81.85 (0.95)	50	78.55 (3.06)	0.99	0.3244
\$100,000 or more	1,046	83.64 (0.87)	72	78.64 (4.21)	1.17	0.2433
Race/ethnicity						
Hispanic	604	78.70 (1.95)	103	68.11 (2.09)	4.27	0.0000*
NH White	3,515	81.66 (0.58)	263	78.24 (1.94)	1.77	0.0799
NH Black	767	78.19 (1.08)	109	69.89 (5.79)	1.38	0.1709
NH Other	319	83.18 (1.82)	43	64.04 (5.39)	3.35	0.0012*
Missing	391	79.10 (1.81)	46	73.57 (4.93)	1.02	0.3110
Education						
Less than high school	467	78.66 (1.47)	91	68.02 (3.35)	3.08	0.0026*
High school graduate	1,104	81.67 (0.93)	131	73.02 (3.27)	2.50	0.0139*
Some college	1,664	81.42 (0.92)	138	74.94 (3.11)	1.99	0.0496*
College graduate	2,264	80.83 (0.65)	191	78.23 (1.81)	1.37	0.1734

Note: *Significant P-value.

Abbreviations: EMR, electronic medical record; NH, non-Hispanic; SE, standard error.

Workflow mail survey showed adoption of an EMR to be as low as 29% among solo practitioners to as high as 100% in health maintenance organizations, with increasing adoption and use of EMRs with increasing practice size.¹⁶ With the movement toward group practice, fewer patients are receiving care in the types of care settings that are least likely to have adopted EMRs and increasing numbers of patients are receiving care from the types of settings that are most likely to maintain EMRs.^{16,24,25} Therefore, the estimates of EMR use obtained in our data may, in part, be a reflection of greater numbers of patients being seen in the larger group model and health maintenance organizations that are more likely

to maintain EMRs, although we are not able to discern this from our data.

The higher ratings of quality of care observed among those who reported physician use of EMR, even after controlling for important sociodemographic and health care access variables, underline the potential importance of perceived EMR use on the patient–clinician encounter. Furthermore, among persons without a usual source of care, ratings of quality of care were significantly higher for those who reported that their health care provider maintained an EMR compared with those who reported that they did not, while no differences were observed among persons with a usual

Table 3 Independent associations of electronic medical record use and quality of care ratings

n=5,576	Quality of care ratings			
	Beta coefficient	SE beta	Adj Wald F	P-value
Provider uses EMR			8.05	0.0055*
Yes	4.83	1.70		
No	0.00	0.00		
Health insurance			0.95	0.3319
Yes	1.84	1.88		
No	0.00	0.00		
Regular provider			24.61	0.0000*
Yes	6.63	1.34		
No	0.00	0.00		
Employment status			2.61	0.1092
Employed	0.00	0.00		
Not employed	1.76	1.09		
Sex			0.16	0.6885
Female	0.37	0.91		
Male	0.00	0.00		
Age			3.07	0.0200*
18–34	–3.09	1.78		
35–49	–4.80	1.69		
50–64	–2.71	1.44		
65–74	–0.38	1.19		
≥75	0.00	0.00		
Income			3.57	0.0053*
<\$20,000	0.00	0.00		
\$20,000 to <\$35,000	2.40	1.96		
\$35,000 to <\$50,000	5.17	1.95		
\$50,000 to <\$75,000	6.01	1.92		
\$75,000 to <\$100,000	5.34	1.87		
\$100,000 or more	7.17	1.87		
Race/ethnicity			0.58	0.6767
NH White	0.00	0.00		
Hispanic	–1.36	2.12		
NH Black	–1.48	1.58		
NH other	1.83	2.08		
Missing	–0.50	1.98		
Education			2.40	0.0726
Less than high school	0.00	0.00		
High school graduate	2.57	1.84		
Some college	1.78	1.99		
College graduate	0.01	1.88		

Note: *Significant P-value.

Abbreviations: EMR, electronic medical record; NH, non-Hispanic; SE, standard error.

source of care. Prior research indicates that persons without a usual source of care are less likely to use preventive services, more likely to rate their care unfavorably, more likely to use emergency services, and more likely to experience poor health outcomes.^{26–31} Although not directly discernible from the HINTS data, this finding may suggest that EMRs play a role in continuity of care for those who lack a regular provider. Further research is needed to explore the ways in which EMR capabilities and health information exchange

efforts can better support continuity of care, particularly for patients without a usual source of care.

HINTS data are derived from cross-sectional surveys, therefore inferences about causality in observed relationships are not appropriate. The response rate for this survey, although an improvement over declining response rates from telephone surveys, is low.^{32,33} Low response rates can lead to biases in the data. However, significant efforts were made in this data collection to reduce the potential for bias, through modality coverage and sampling.³⁴ Additionally, recent methodological research suggests that the potential for bias resulting from declining response rates may be less significant than previously assumed.^{33,35,36}

National survey tools are often constrained by survey length and respondent burden to measuring constructs of interest with only one or two items. In particular, the one-item measure of provider EMR use is relatively blunt, may not elicit accurate reports from respondents, and may fail to capture the functionality and nature of EMRs that may contribute to various aspects of care quality. Although the EMR question followed a series of questions on patient health care experiences that encouraged respondents to consider the health care providers that they had seen in the prior year, it was a broadly stated question and not specific to any one health care provider. A final limitation to note is that the association of perceived provider EMR use and ratings of quality may be confounded by the potential for practices with greater resources to have functioning EMR systems. That is, it may be the case that the greater resources of practices with EMR systems may be the driving factor in patient ratings of quality rather than the EMR itself. This, however, was not assessed and therefore could not be controlled in the analyses.

Conclusion

Our analyses revealed higher ratings of general care quality among patients who believed their health care providers maintained an EMR, providing early evidence, from the patient perspective, of a positive evaluation of “meaningful use” of information technology in the health care setting. While EMRs have the potential to facilitate information exchange, enable greater patient engagement, and improve continuity of care, caution must be exercised in adoption and use of EMRs to ensure these tools facilitate, rather than impede, patient-centered communication and care processes.⁵ Understanding the patient perspective on use of EMR and associated ratings of health care quality is a first step in evaluating the impact of EMRs on the patient experience.^{13–15} Continued research is needed to track the impact of EMRs on the patient experience, patient-reported outcomes, care

processes, and health outcomes and to evaluate specific use of EMR functionality to improve patient care.

Disclosure

The authors report no conflicts of interest in this work.

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Patient Related Outcome Measures

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