

Patient Attitudes Toward Physician Use of Tablet Computers in the Exam Room

Scott M. Strayer, MD, MPH; Matthew W. Semler, MD;
Marit L. Kington, MS; Kawai O. Tanabe, MPH

Background and Objectives: Previous research has examined patients' attitudes toward use of exam room computers by physicians. Our objective was to determine patient attitudes toward physicians' exam room use of new tablet computers. **Methods:** A random sample of 96 patients was interviewed immediately following a visit to a physician at an outpatient family medicine clinic at a large academic medical center in central Virginia. We excluded visits to first-year residents. Patients were asked about their attitudes toward technology use in the exam room using a previously validated 16-item structured questionnaire on patient attitudes toward technology use in the exam room. **Results:** The response rate was 97%. Survey results showed mostly positive patient perceptions of the tablets regardless of age, gender, race, ethnicity, and income. There were differences in attitudes toward privacy (by race and education), use of tablets by the physician (by education and age), depersonalization of the office visit (by race), and speed of medical files overview (by age). **Conclusions:** The use of tablet computers by physicians in the examining room is perceived positively by most patients.

(Fam Med 2010;42(9):643-7.)

Health information technology (HIT) is seen as part of the solution to improving the quality, efficiency, and cost of health care—particularly in primary care. HIT can encompass such technologies as electronic health records (EHRs), computer physician order entry (CPOE), electronic prescribing, and computerized electronic alerts. The Future of Family Medicine project explicitly calls for advanced information systems (including an EHR) and also supports using clinical systems for decision support, electronic visits, and Web-based information as keys to improving the quality and efficiency of primary care.¹ Yet, it is often noted that our health care system is one of the last “industries” to adopt widespread technology systems such as those seen in banking, airlines, and grocery stores.

Despite widespread national support for HIT improvements and implementation in our health care system, little is known about the types of systems that will have the most benefit. To make matters even more

challenging, the types of devices used to run these HIT systems are rapidly changing and include Internet-based systems, desktop computers, personal digital assistants (PDAs), smartphones, and the more-recent tablet computers (including the recently announced Apple® iPad™).

The small size, mobility, easily shared screen, handwriting recognition, wireless connections, and powerful processing and recording capabilities of tablet PCs make them less intrusive than traditional desktop computers to doctor-patient interaction and potentially more useful to physicians and patients than PDAs or smartphones. However, the benefit of these new devices in the clinical setting might be limited if patients do not accept them.

Previous literature on patient attitudes toward new computer-related technology suggests that patient opinions are generally positive toward computers used by physicians, except for some reservations about privacy.²⁻¹⁰ Overall, patient satisfaction has been noted, even in studies completed with PDAs in emergency room settings¹¹ and in surveys of parents of children receiving health care.¹² Another study on PDAs in a low-income university clinic found that only 10% of patients disliked the idea of a handheld computer in

From the Department of Family Medicine (Dr Strayer and Ms Tanabe) and the School of Medicine (Dr Semler), University of Virginia; and Department of Public Health, Oregon State University (Ms Kington).

the exam room, and those who have experience with computers have enhanced positive attitudes toward handheld devices.¹³

Although a systematic review completed between 1980 and 1997 found several studies that reported on patient satisfaction with computer use by physicians,¹⁴ research into the acceptability and effectiveness of tablet PCs—which were only recently introduced into medical practice—is very limited. Only one previous study examined patient satisfaction with tablet PCs, and in that study the tablet PCs were used for a self-report questionnaire research study.¹⁵ To our knowledge, research on patient attitudes toward physician use of tablet PCs in the examination room has not yet been conducted.

The objective of our study was to determine patient attitudes toward physician use of tablet PCs in the exam room. We also sought to determine if there were differences in these attitudes based on age, gender, education, computer experience, and race or ethnicity.

Methods

We administered an exit survey to patients in the family medicine clinic at a large academic medical center in central Virginia from July to August of 2005. Physicians in the clinic had begun using tablet computers as part of a pilot program for a system-wide EHR 1 week prior to this survey, and thus the patients surveyed were exposed to physician use of the tablets at the beginning of the implementation process. Previously, physicians did not have computers in the examination rooms other than PDAs.

Patients were selected to receive the survey at random (using a random number generator) from a register of all the patients seen in the practice each day except that, to ensure an even distribution of patients across physicians, the number of patients surveyed who were seen by any one physician was limited to 10. Visits in which the patient was seen either by a nurse practitioner or a first-year resident were excluded.

The study was conducted with patients in the Department of Family Medicine's Primary Care Center at the University of Virginia. The center is staffed by 11 faculty physicians and is the main practice site for 24 residents. Annual patient volume is approximately 25,800 and includes patients of all ages, with a diverse ethnic makeup that includes 51% minorities. Payor mix includes 20% Medicare and 19% Medicaid.

Patients randomly selected for the study were approached by a research assistant after their office visit but before they left the clinic. They were informed that their opinions would be used to help improve the care they received in the clinic but that their answers would be anonymous. Age, race, ethnicity and gender were recorded for nonrespondents. Patients who opted to participate were read the survey, and their answers were recorded.

The survey was adapted from a previously validated and published survey addressing patient attitudes toward physician use of desktop computers.⁴ The original survey was a structured questionnaire with 16 items developed from patient interviews. The survey was piloted for face validity with patients, and content validity was assessed by the previous study's authors. We determined content validity for the adapted instrument with three experts on HIT, and face validity was assessed with six patients. Based on this validation, an additional question was added to the adapted survey ("I would not mind if the doctor used the tablet computer during my next visit").

The first section of our adapted survey asked the patient's demographic and personal characteristics (sex, age, race, ethnicity, computer literacy, education, and income). Patients were then shown a tablet computer and asked if the physician had used it during the visit and, if so, what the physician had used it for (check medical records; write a prescription; look up a medical question; order a test, lab, or X ray; other). If patients indicated the physician had used the tablet computer, they were read a set of 17 statements about the tablet computers. Patients were asked to rate each statement on a 4-point Likert scale.

For every patient included in the study, a brief questionnaire was given to the physician after the visit to determine whether the physician had used the tablet computer during the visit and, if so, what it was used for (using the same options described above).

Data Analysis

Frequencies and descriptive statistics were generated for patient demographics, structured survey questions, and tablet PC use (patient and physician reported). Bivariate tests were used to compare study respondents with the general clinic population to determine differences in age, gender, and race and to determine if patient attitudes toward tablet PC use in the exam room were associated with race, ethnicity, gender, age, and income. Tests included *t* tests, chi-square tests with Yates' continuity correction, or Fisher's exact tests for cell counts less than 5. All analyses were completed using S-Plus version 6.0 (Insightful Corporation, Seattle).

Results

Of the 99 patients approached to complete the survey, 96 agreed to participate. The participants' demographics (Table 1) indicated that the study subjects had fewer members of minority groups (40% versus 69%, $P < .05$), more patients aged 50–59 (24% versus 14%, $P < .05$), and fewer patients aged 70–79 (5% versus 11%, $P < .05$) compared with all patients who visited the clinic during the study. In addition, few minorities besides African Americans were surveyed.

Table 1
Participant Demographics

<i>Participant Demographics, n=96</i>		<i>Primary Care Clinic, n=626</i>
<i>Characteristic</i>	<i># (%)</i>	<i># (%)</i>
Established patient	95 (99)	
Male	38 (40)	298 (48)
Age (years, mean \pm SD)	46.5 \pm 16.7	49.1 \pm 21.2
Age distribution		
16–19	2 (2)	39 (6)
20–29	13 (14)	102 (16)
30–39	21 (22)	100 (16)
40–49	19 (20)	94 (15)
50–59	23 (24)	85 (14)*
60–69	9 (9)	76 (12)
70–79	5 (5)	69 (11)*
80–89	3 (3)	44 (7)
90–99	1 (1)	16 (3)
100+	0 (0)	1 (0)
Currently working	43 (45)	
Computer used at work		
Yes	21 (22)	
No	20 (21)	
Computer skill/knowledge		
None	15 (16)	
Beginner	38 (40)	
Intermediate or advanced	43 (45)	
High school education or less	54 (56)	
Total annual household income		
< \$15,000	24 (25)	
\$15,000–\$50,000	48 (50)	
> \$50,000	16 (17)	
Did not answer	8 (8)	
Minority (mostly African American)	38 (40)	361 (69)*†

* $P < .05$

† Excludes patients who only listed ethnicity (ie, Hispanic) and no race or “Unknown” race

Patient responses on what physicians used tablet computers for in the office visit along with physician reports of their use are listed in Table 2. The general attitude of the patients toward the tablet computers was positive (Table 3). Only 4.3% of the patients stated that they disliked the idea of a doctor with a tablet computer (Table 3, question 7), though this varied by education levels ($P = .01$) with all patients who disliked the idea of a doctor with a tablet computer having higher education levels (more than high school). This attitude also varied by age, with older patients more likely to dislike a physician with a tablet computer ($P = .03$, mean age = 64 versus mean age = 45). Additionally, 2.1% stated that doctors who care about their patients would not want a tablet computer in their office (question 16). Moreover, 100% of patients stated that they would not mind if the physician used the tablet computer during their next visit (question 17).

Patient response to questions about their concerns involved in integrating technology into the clinic revealed several such concerns. These included depersonalization of the medical encounter, efficiency of the visit, likelihood of mistakes, and privacy of medical information (Table 3).

In response to the questions (questions 1, 3, 6, 11, and 15) about determining whether the patients felt the use of the tablet computer had depersonalized their encounter with the physician, most of the patients (84%) stated that interaction with their doctor had not become less personal (6), but more minority group members stated that the interaction had become less personal ($P < .01$, OR = 8.15, 95% CI = 1.89–40.25). However, 95.8% stated that they could talk as easily with their physician with the tablet computer present as they did without it (question 1). Overall, 91% of patients did not feel the physician was watching the screen more than paying attention to them.

In response to questions (numbers 2, 4, and 5) about the concern that attempting to integrate tablet computers into the practice would make things less efficient, patients indicated overall that the tablet computers had

Table 2

Responses to Tablet Computer Use

<i>Tablet Computer Use</i>	<i>Patient Response n (%)</i>	<i>Physician Response n (%)</i>
Check medical records	88 (92)	85 (89)
Write a prescription	6 (6)	1 (1)
Look up a medical question	4 (4)	3 (3)
Order a test, lab or X ray	37 (39)	39 (41)
Other	8 (8)	11 (12)

Table 3
Attitude of Patients Towards the Tablet Computers

<i>Answers to Survey Questions</i>				
<i>Question</i>	<i>Completely Disagree</i>	<i>Partially Disagree</i>	<i>Partially Agree</i>	<i>Completely Agree</i>
1. I can talk as easily with my doctor now that he/she uses a tablet computer as I did before.	0	2	8	86
2. The consultation takes longer now that my doctor uses a tablet computer.	76	7	6	7
3. Patients who want good personal contact with their doctor should choose a doctor without a tablet computer.	76	13	5	2
4. The waiting time before the consultation has become shorter since my doctor has used a tablet computer.*	16	12	24	43
5. I have noticed that since my doctor has used a tablet computer he/she gets a quicker overview of my medical files than he/she did before.	6	9	18	63
6. Since the introduction of the tablet computer in the practice, contact with my doctor has become less personal.*	75	5	11	4
7. I do not like the idea of a doctor with a tablet computer.*	84	7	1	3
8. Since the introduction of the tablet computer into the practice, other people get access to my medical files more easily than they did before.*	30	11	18	36
9. I do not think my doctor would blame the tablet computer if he/she made a mistake him/herself.	4	4	8	80
10. Since he/she has used a tablet computer, my doctor spends more time with me during the consultation than he/she did before.	39	14	16	27
11. Since my doctor has used a tablet computer, I feel more like a mere number than I did before.	80	7	4	5
12. Tablet computers make too many mistakes to trust my medical files to them.*	63	21	8	3
13. With a tablet computer my doctor treats me better than he did without a tablet computer.*	77	4	9	5
14. With my medical files in the tablet computer, my privacy is more secure than it was before.**	22	15	24	33
15. Since he/she has had a tablet computer, my doctor watches the screen rather than me.	81	6	7	2
16. Doctors who care about their patients do not want a tablet computer in their office.*	81	12	2	0
17. I would not mind if the doctor used the tablet computer during my next visit.	0	0	2	94

* One participant missing data for this item.

** Two participants missing data for this item.

not hindered the clinic's efficiency. Most of the patients stated that neither their wait time nor their consultation was longer after the introduction of the tablet computers to the practice (questions 2, 4). For question 5, most of the patients (84.5%) stated that the physician got a quicker overview of their medical files using the tablet, with older patients disagreeing more often ($P=.03$, mean age=55 versus mean age=45 for those agreeing).

Questions 9 and 12 addressed the concern that patients might perceive tablet computers as increasing the likelihood of mistakes. Nearly all of the respondents expressed confidence that the tablet PCs were not prone to mistakes (88.4%), but patients with higher education (more than high school) disagreed with this statement more often ($P<.01$, OR=18.8, 95% CI=2.32, 152.7). Patients were uniformly confident that if their doctors made a mistake, they would not blame it on the tablet computer (91.7%).

Questions 8 and 14 sought to determine whether patients perceive the tablet computers as decreasing the privacy of the medical information. Fifty-seven percent

of respondents reported that other people get access to patient medical files more easily than before. Sixty-one percent of respondents reported that their data was more secure on the tablet PCs compared with before. Respondents with a high school or less education were 4.2 times as likely to agree that their data were more secure ($P<.01$, 95% CI=1.8, 10.0).

Discussion

In the 2 decades since personal computers were first introduced into the medical setting the potential for computer technology to improve patient care has increased. However, many of the same basic concerns about patient perceptions of doctors using computers in the exam room have remained. By conducting this survey during the first weeks in which physicians in the clinic had used the tablet computers, we were able to assess patient attitudes when concerns about decreased efficiency, decreased privacy, increased chance of mistakes, and depersonalization of the doctor-patient relationship might be highest. Nevertheless, patient atti-

tudes toward the tablets were mostly positive. Nearly all of the patients surveyed had no problems with physician use of the tablet computer, and no patients had concerns if the physician used the tablet during their next visit. Most of the patients expressed confidence that the tablet computers did not affect their relationship with the physician, lengthen their office visit, or increase mistakes made in their care. Concerns about privacy were apparent, as reported in previous studies.

This study is one of the first attempts to determine if these attitudes are influenced by race, ethnicity, gender, age, and income. In addition, the study was designed to include patients regardless of literacy skills, since the questions were read out loud to patients by a trained research assistant. The responses were generally consistent across each segment of the demographic distribution with some notable differences based on race (depersonalization, privacy), education (dislike of physician with tablet, mistakes, privacy), and age (quicker overview of medical files, dislike of physician with tablet). This is an important finding, since health disparities might be exacerbated if technology is not perceived positively by all patients, and some of these variations deserve further attention.

Limitations

There are limitations to this study that are worth noting. The study has a small number of participants. However, the low number of nonrespondents among potential subjects who were randomly selected limits the possibility of response bias. Additionally, the diverse patient population that was surveyed increases the chances that the results of this study might be generalizable to a wider range of practices considering adopting tablet computers compared with previous studies. The study was conducted in an academic family medicine center, which may limit its generalizability to private practices. This setting did enable overrepresentation of low income and minority patients, thus enhancing the generalizability to a broader patient population. Reproducing these results in a community-based practice would be a logical next step.

In addition, we found differences in our study population compared with all patient visits to the clinic. Because this occurred by chance, it is mostly noted to underscore the frequencies found in the study population for comparison to other settings. We also found no evidence of systematic response bias, since most patients agreed to participate in the study.

Finally, follow-up data after the implementation is fully complete would be helpful in assessing if these results merely represented a “first impression” of the technology by patients that isn’t really found to be true after time. Unfortunately, we were not able to collect these data since our clinic underwent a subsequent technology change to desktop computers.

Conclusions

The success of redesigning primary care and correctly implementing HIT over the next several years will rely on rigorous evaluation of new systems, software, and devices. Also, cost-effectiveness data and implementation strategies should be studied as these new systems are designed and deployed. Particular attention should be paid to minorities, disadvantaged patients (including low education), and older patients to ensure that the benefits of HIT do not create additional health disparities in our health care system.

Acknowledgments: Funding was received from the Department of Health and Human Services, Health Resources and Services Administration, Academic Units in Primary Care award to the Department of Family Medicine at the University of Virginia (D12HP00148 Galazka, PI).

This paper was presented at the 2006 North American Primary Care Research Group Annual Meeting, Tucson, AZ.

Corresponding Author: Address correspondence to Dr Strayer, University of Virginia, Department of Family Medicine, PO Box 800729, Charlottesville, VA 22908. 434-982-3294. Fax: 434-243-4800. sstrayer@virginia.edu.

REFERENCES

1. Martin JC, Avant RF, Bowman MA, et al. The future of family medicine: a collaborative project of the family medicine community. *Ann Fam Med* 2004;2 Suppl 1:S3-S32.
2. Sullivan F, Mitchell E. Has general practitioner computing made a difference to patient care? A systematic review of published reports. *BMJ* 1995;311(7009):848-52.
3. Solomon GL, Dechter M. Are patients pleased with computer use in the examination room? *J Fam Pract* 1995;41(3):241-4.
4. Ridsdale L, Hudd S. Computers in the consultation: the patient’s view. *Br J Gen Pract* 1994;44(385):367-9.
5. Legler JD, Oates R. Patients’ reactions to physician use of a computerized medical record system during clinical encounters. *J Fam Pract* 1993;37(3):241-4.
6. Rethans JJ, Hoppener P, Wolfs G, Diederiks J. Do personal computers make doctors less personal? *Br Med J (Clin Res Ed)* 1988;296(6634):1446-8.
7. Brownbridge G, Herzmark GA, Wall TD. Patient reactions to doctors’ computer use in general practice consultations. *Soc Sci Med* 1985;20(1):47-52.
8. Hsu J, Huang J, Fung V, Robertson N, Jimison H, Frankel R. Health information technology and physician-patient interactions: impact of computers on communication during outpatient primary care visits. *J Am Med Inform Assoc* 2005;12(4):474-80.
9. Lelievre S, Schultz K. Does computer use in patient-physician encounters influence patient satisfaction? *Can Fam Physician* 2010;56(1):e6-e12.
10. Garrison GM, Bernard ME, Rasmussen NH. 21st-century health care: the effect of computer use by physicians on patient satisfaction at a family medicine clinic. *Fam Med* 2002;34(5):362-8.
11. Rudkin SE, Langdorf MI, Macias D, Oman JA, Kazzi AA. Personal digital assistants change management more often than paper texts and foster patient confidence. *Eur J Emerg Med* 2006;13(2):92-6.
12. Johnson KB, Serwint JR, Fagan LM, Thompson RE, Wilson MH. Computer-based documentation: effect on parent and physician satisfaction during a pediatric health maintenance encounter. *Arch Pediatr Adolesc Med* 2005;159(3):250-4.
13. Houston TK, Ray MN, Crawford MA, Giddens T, Berner ES. Patient perceptions of physician use of handheld computers. *AMIA Annu Symp Proc* 2003;299-303.
14. Mitchell E, Sullivan F. A descriptive feast but an evaluative famine: systematic review of published articles on primary care computing during 1980–1997. *BMJ* 2001;322(7281):279-82.
15. Main DS, Quintela J, Araya-Guerra R, Holcomb S, Pace WD. Exploring patient reactions to pen-tablet computers: a report from CaReNet. *Ann Fam Med* 2004;2(5):421-4.