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Development and Evaluation of CAHPS® Questions to Assess the Impact of Health Information Technology on Patient Experiences with Ambulatory Care

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Abstract

Background—Little is known about whether health information technology (HIT) affects patient experiences with health care.

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Objective—To develop HIT questions that assess patients care experiences not evaluated by existing ambulatory CAHPS measures.

Research Design—We reviewed published articles and conducted focus groups and cognitive testing to develop survey questions. We collected data, using mail and the internet, from patients of 69 physicians receiving care at an academic medical center and two regional integrated delivery systems in late 2009 and 2010. We evaluated questions and scales about HIT using factor analysis, item-scale correlations, and reliability (internal consistency and physician-level) estimates.

Results—We found support for three HIT composites: doctor use of computer (2 items), e-mail (2 items), and helpfulness of provider's website (4 items). Corrected item-scale correlations were 0.37 for the two doctor use of computer items and 0.71 for the two e-mail items, and ranged from 0.50 to 0.60 for the provider's website items. Cronbach's alpha was high for e-mail (0.83) and provider's website (0.75), but only 0.54 for doctor use of computer. As few as 50 responses per physician would yield reliability of 0.70 for e-mail and provider's website. Two HIT composites, doctor use of computer ($p<0.001$) and provider's website ($p=0.02$), were independent predictors of overall ratings of doctors.

Conclusions—New CAHPS HIT items were identified that measure aspects of patient experiences not assessed by the CAHPS C&G 1.0 survey.

Keywords

CAHPS®; health information technology; personal health records; patient experiences of care

INTRODUCTION

Health care organizations have been slow to adopt information technologies.[1,2] Recent studies show that only about a quarter of physicians use electronic medical records (EMRs) in ambulatory settings.[3] New models of care and federal programs are likely to increase the use of health information technology (HIT).[4,5] Physicians may use computers to record patient information, review test results, or for e-prescribing. Patients may use an electronic personal health record (PHR) for electronic messaging with providers, viewing laboratory results, and refilling prescriptions.[6]

PHRs are generally viewed positively by patients.[7–9] PHRs improve patient-physician communication,[10,11] and can foster trust in, and partnership with, doctors.[12] Viewing medical records can help prepare patients for clinical appointments[13] and increase their confidence dealing with health conditions.[12,14] HIT may have disadvantages. In one study[15] patients felt physician use of computers during the office visit depersonalized the encounter although this was not found in another study.[16]

In this study, we developed and evaluated questions that could be added to the Consumer Assessment of Health Plans and Systems (CAHPS®) survey[17–21] to assess ambulatory patient experiences with HIT. The CAHPS Clinician and Group Survey 1.0 (CAHPS C&G 1.0 survey) (see https://www.cahps.ahrq.gov/content/ncbd/CG/NCBD_CG_Intro.asp) assesses patients' experiences in ambulatory settings, but it has no HIT questions. Following CAHPS procedures,[22] we used focus groups, in-depth interviews, and field testing to draft survey questions and evaluate whether they elicit information about patient health-care experiences not captured by the CAHPS C&G 1.0 survey.

METHODS

Item Development

We followed CAHPS item development principles and procedures.[22,23] We started with a literature review.[7,10] We found no articles describing the development of survey questions about how HIT affects patients' experience of ambulatory care.[24] We conducted 3 focus groups, with a total of 21 patients, in organizations that used health information technologies, such as EMRs and PHRs. Two were conducted at a medical center in Boston, MA that has a well-developed PHR and 1 at a Secaucus, NJ health plan whose providers use personal digital assistants and an e-prescribing software. Patients said that PHRs allowed greater engagement in their health care and improved communication with their doctors. They expressed interest in expanded PHR functions, such as seeing their doctor's progress notes. One patient concern was that eye contact with doctors might decrease if doctors are distracted by information on their computer screen.

We identified several HIT-related issues not assessed by the CAHPS C&G 1.0 survey, such as patient access to their electronic medical record, physician use of a computer during patient visits, e-prescribing, and patients e-mailing with their physician. We developed draft questions and then conducted two phases of cognitive interviewing, with a total of 17 patients, in Boston, Los Angeles, and Palo Alto, following previously used procedures.[23,25]

We also conducted semi-structured telephone interviews with 5 HIT leaders from organizations that had integrated PHRs and 3 health policy leaders, about HIT issues that should be covered by the new items. Towards the end of item development, we convened a technical expert panel of 20 health informatics and policy leaders from organizations representing health care delivery, informatics policy, patient advocacy, government, survey research and academia. Panelists provided advice on the survey items, pilot testing, and ways to encourage the adoption of the items after testing was completed.

The instrument included 42 items from the CAHPS C&G 1.0 survey, comprising 25 questions about experiences with care, 4 questions about eligibility and physician relationship, 1 global rating of care and 12 questions about respondent characteristics. We identified patients with chronic conditions by asking about health care visits in the past 12 months for the same condition and about taking medications for at least 3 months. The instrument also contained 35 new HIT items, including 6 open-ended items (see HIT Items, Supplemental Digital Content 1). Nineteen of those questions were factual (e.g., ever used e-mail to request prescription refills) and 10 were reports about experiences (e.g. was the physician's use of a computer helpful to you). The final survey instrument with the HIT items had a total of 77 items that asked about ambulatory care experiences in the previous 12 months. We focused our analyses on the 10 HIT items that indicate care quality and are likely to be meaningful for a health care provider and did not focus on screening questions. Question Q18, for example, asks if the patient has emailed their doctor's office in the past year. It does not assess quality of interactions but rather identifies respondents for whom a question about getting answers to e-mail applies.

We hypothesized that those 10 HIT items would form two composites – helpfulness of HIT and emailing the doctor's office – based on the focus groups that indicated that participants perceived HIT to be an efficient way to get information and to communicate with their health care providers, and that patients liked using e-mail to communicate with their providers. Based on the content of the 25 CAHPS C&G 1.0 survey items we hypothesized that they would form four composites: access to care; doctor communication; office staff; and shared decision-making.

Sites

The 3 field test sites had well-developed integrated PHRs and represented different geographic and socio-demographic characteristics (Table 1). Beth Israel Deaconess Medical Center (BIDMC) is an academic medical center in Boston with 72 ambulatory care practices. The BIDMC PHR, called PatientSite[26,27] provides patients access to problem lists, medications, allergies, visits, laboratory results, diagnostic test results, microbiology results, secure messaging, appointment making, prescription renewal, and specialist referral. Approximately 200 physicians and 40,000 patients use PatientSite every month.

Group Health Cooperative (GHC) is an integrated delivery system serving Washington State and northern Idaho that has more than 350,000 members. GHC has an integrated PHR, called MyGroupHealth, that allows patients to exchange secure electronic messages with their clinicians; access portions of their EHR, including laboratory data, problem lists, medications, allergy history, and prior immunizations; obtain after-visit summaries; search the Healthwise® health and drug-reference library; order medication refills; and schedule office appointments.[7,28] As of July 2010, 62% of the more than 350,000 adult GHC enrollees were registered to use MyGroupHealth.

Kaiser Permanente Southern California Region (KPSC) is a not-for-profit health delivery system with 3.2 million members and 13 medical centers. KPSC offers members a PHR called *My Health Manager*, which included scheduling appointments, e-mailing clinicians, reviewing past visit information, viewing lab test results, and ordering prescriptions.[29,30] As of March 2009 in Southern California approximately 30% of the 3.2 million members were registered to use *My Health Manager*.

Sample and Survey Administration

At each site we oversampled patients who were more frequent users of the PHR because they would be more likely to use the PHR features that our HIT items asked about. At BIDMC we first selected all physicians from BIDMC-owned practices who had at least 175 adult patients who had made at least 1 visit to their physician and had logged onto PatientSite at least once between February 15, 2009 and February 14, 2010. This resulted in a sample of 30 physicians. Eleven were excluded because they did not want their patients surveyed. The remaining 19 physicians included 5 specialists and 14 primary care physicians (PCPs). In the second stage we stratified each physician's patients based on the number of times the patient had logged into PatientSite. The "high use" stratum comprised patients who were at or above the median number of log-ins for that physician's panel and the "low use" stratum were patients below the median. We randomly selected 83 high-use patients and 42 low-use patients for a total of 125 patients per physician, for a sample of 2375. Of these 33 had deactivated PHR accounts, were duplicate records, or were staff members, and 13 we excluded at the request of their physician, resulting in a total of 2329 who were surveyed. BIDMC administered an internet survey in May and June, 2010. An electronic reminder was sent to non-responders after two weeks and a second reminder was sent to non-responders 2 weeks after that.

At GHC we selected the 9 GHC-owned clinics in western Washington State with the most racially/ethnically diverse patients. A random sample of 20 physicians was selected. Adult patients of these physicians were eligible for the study if they had had a visit with their physician between February 1, 2009 and November 30, 2009, and had used MyGroupHealth at least twice in the past 12 months. Patients were excluded if they were currently involved in another GHC study, or if they had a diagnosis of dementia or psychosis. Similar to procedures at BIDMC, 83 high-use patients and 42 low-use patients were randomly selected from each physician for a total of 2500 who were sent surveys. GHC mailed the surveys

between January and March, 2010. Two weeks following the initial mailing, non respondents were mailed a reminder letter. Those not responding three weeks after the initial mailing were mailed a second survey.

At KPSC the study was conducted at two medical centers in San Diego and Woodland Hills, California. These two sites were selected because many (about 30%) of their members are users of *My Health Manager*. We selected the 30 primary care physicians with largest numbers of patients using *My Health Manager*. From each physician's practice we selected a random sample of 120 adult patients who used *My Health Manager*, who had made at least one office visit with their doctor between January and July, 2009, and who had sent their physician an e-mail during that period. We surveyed 3,600 members (1,800 from each medical center).

The KPSC survey was an internet survey with a mail survey follow-up. It was conducted between November 2009 and January 2010. After the initial e-mail, participants received a reminder e-mail 12 days later, and a second reminder e-mail 6 days after that. Mail surveys were sent to participants who did not respond to the two e-mails. This allowed us to test the mode most commonly used to administer the survey (mail) with a new mode for CAHPS (internet). Previous studies have found that these two modes yield comparable results.[31–34] BIDMC and GHC fielded the same questionnaire, with most items having a 4-point response scale (*never, sometimes, usually, always*). KPSC has traditionally used CAHPS surveys with a 6-point response scale (*never, almost never, sometimes, usually, almost always, always*). To make results from this survey comparable to their other surveys, KPSC used the 6-point response scale for most items, including the HIT items. The IRBs at BIDMC, GHC, KPSC, Yale, RAND, and Veterans Affairs approved this study.

Analyses

We considered surveys complete if 50% or more of applicable items were answered. We calculated response rate using American Association for Public Opinion Research (AAPOR) definition of response rate 1: the number of completed interviews divided by the total number of interviews, plus number of non-interviews (refusals and break offs, plus non contacts plus others), plus all cases of unknown eligibility.[35] We analyzed data from both completed and partially completed surveys. Item non-response was calculated based on the number of patients for whom the question was appropriate, based on responses to screener questions. Similarly, percent of "yes" responses is based solely on those who responded to the item. Items can be found online at the CAHPS website, http://www.cahps.ahrq.gov/Surveys-Guidance/Item-Sets/~/media/Files/SurveyDocuments/CG/12%20Month/Get_Surveys/1357a_Adult_Supp_Eng_11.pdf.

To assess the appropriate grouping of items we used exploratory factor analysis, first with C&G CAHPS 1.0 survey items and the HIT items combined. Oblique factor rotations (Promax) were performed. Then we conducted separate factor analyses of the C&G CAHPS 1.0 survey items and the HIT items. The item "Get appointment when using email or website" was not included in the factor analysis because it had a negative physician-level reliability estimate. We examined 3 and 4 factor solutions for both the C&G CAHPS 1.0 items and the HIT items, and, based on eigenvalues and patterns of loadings decided that the response patterns were best described by a total of 6 factors. Separate factor analyses by site yielded similar results in general. We imputed missing data in factor analyses using SAS PROC MI (SAS Version 9.2). We estimated item-scale correlations and the internal consistency reliability (Cronbach's alpha) of the multi-item composites.[36] We used the same imputed value for each missing case. Although this decreases the variance of the variables for which cases are imputed and thus can increase the correlations, it is preferable to estimating correlations using listwise or pairwise deletion. To assess the impact of missing

data we analyzed item-scale correlations with and without the use of imputed data. Results were similar, thus we report on the full-sample analyses.

For each item and composite we estimated physician-level reliability, the corresponding intra-class correlation coefficient, and the number of respondents needed to achieve a reliability of 0.70.[37–40] Item-scale correlations with the total score, which corrected for item overlap, were computed. In analyses of physician-level reliability for some items only data from BIDMC and GH were included because the KPSC questionnaire used a 6-point response scale for those items. We evaluated the associations between the composite scores and overall rating of the doctor by first evaluating bivariate significance between each of the 7 composites and the rating of doctor, and then by fitting a single ordinary least squares multi-variable linear regression model in which the independent variables were the 7 composites and the dependent variable was the rating of doctor. We considered $P<0.05$ to be statistically significant.

RESULTS

There were 1164 respondents at BIDMC, 1649 at GHC, and 1930 at KPSC. Of these, 1115, 1631, and 1896, respectively, returned a completed survey. Response rates were 48% at BIDMC, 65% at GHC, and 53% at KPSC. The characteristics of respondents are shown in Table 1. Most (79%–89%) were between 35 and 74 years of age and white non-Hispanic (82% – 92%). Chronic health conditions were reported by 81% to 85% of the respondents.

Use of HIT Functions

Over 60% of participants at each site had e-mailed their doctor's office with a medical question in the last 12 months (Table 2; Q18). At each site 40% or more had received an e-mail reminder about tests or treatments needed (Q21); of those who received such an e-mail reminder, about 80% made an appointment for the test or treatment that was mentioned in the e-mail (Q21a). About half of respondents (44% to 58%) used e-mail or website to request a prescription refill (Q36).

Physician use of computers during the office visit (Q38) was common, ranging from 80% to 95%. For respondents whose physician's office put laboratory or other test results on a website, over 96% reported looking for those results on the website (Q47). When possible to see prescription medications on a website, 78% or more of respondents reported looking at the list on the website in the past 12 months (Q52). For respondents who had summary visit notes available, over 90% looked at them (Q56). Seven items that had a "don't know" response option are not shown in the Table 2 due to the large percentage that either selected that category or did not respond to the item.

Item-scale correlations (Table 3) supported the four hypothesized composites: access to care; doctor communication; office staff; and shared decision making. The item-scale correlations and factor analyses suggested three HIT composites: 1) doctor use of computer use; 2) e-mail; and 3) provider's website. The doctor use of computer composite items each had item-scale correlations of 0.37, while each of the e-mail composite items had correlations of 0.71. The provider's website item-scale correlations ranged from 0.50 to 0.60. The three items shown at the bottom of Table 3 did not have interpretable patterns of correlations with the 7 composites and thus were not included in any of the composites. The e-mail composite correlated well with access to care (0.60) and doctor communication (0.55); provider's website composite correlated most highly with access to care (0.52) and doctor communication (0.52), while doctor use of computer correlated most highly with doctor communication (0.42) (data not shown).

Reliability of Composites and Items

Coefficient alpha was 0.83 for the e-mail composite, 0.75 for provider's website, and 0.54 for doctor use of computer. Alphas for the other CAHPS composites were 0.85 for access to care, 0.92 for doctor communication, 0.85 for office staff, and 0.47 for shared decision making (data not shown).

Twelve individual items and five composites had physician-level reliability of 0.70 or greater (Table 4). The sample size needed to achieve reliability of 0.70 ranged from 289 responses for the item about prescription medication list being up-to-date on the website, to 15 responses for seeing the doctor within 15 minutes of appointment time. For composites, required sample sizes ranged from 162 for doctor use of computer to 11 for doctor communication. Two HIT composites, e-mail and provider's website, achieved reliability of 0.70 or greater. They required 30 and 47 responses, respectively, to achieve that level of reliability. We considered Q53 for the provider's website composite, but it had poor physician-level reliability (N=289 respondents to achieve an R of 0.70), and as shown in Table 3, a lower correlation (0.44) with the other items in the scale.

Association between Composites and Global Rating of Doctor

The doctor communication composite was the strongest predictor of rating of doctor (β=0.56, $p<0.001$) (Table 5). Two of the HIT composites, doctor use of computer (β=0.08, $p<0.001$) and provider's website (β=0.05, $p=0.02$), were also statistically significant independent predictors of the overall rating of the doctor.

DISCUSSION

The CAHPS C&G 1.0 survey is used to measure patient experiences with ambulatory care, but it does not include HIT questions. In this study we developed HIT items and assessed their psychometric properties. The resulting items, and the three composites they formed, assess patient experience when their doctor (or the doctor's office) uses HIT and patients' direct interactions with HIT. Our findings are timely given the growing interest in using PHRs to achieve improved health outcomes.[28–30,41]. Recent randomized trials have shown that interventions that include patient-clinician secure messaging, included in most PHRs, are associated with improved chronic disease care in diabetes,[42] hypertension[43] and depression.[44] The doctor use of computer composite did not have good physician-level reliability. This may be because the phrase, "doctor use of computer", used in the questions, may be too broad. Patients observing their physician entering data into the computer (e.g., history of problem) may find it tedious and unhelpful, while patients whose doctors show them x-rays or other images on the computer may perceive use as beneficial. Additional efforts to refine these items are needed.

Seven items had a "don't know" response option. These items can provide information about a feature that may not be well publicized or understood, or that is rarely used. The "ability to make appointments via e-mail or a website" was one such item. At one site, 45% responded "don't know," possibly indicating patients had never tried to make an appointment online. Some items may be hard for patients to answer because physicians may complete tasks on the computer without telling the patient, e.g. when doctors look up test results on the computer during the patient encounter. To keep surveys brief, it may be appropriate to drop items in which many patients are unlikely to know whether a feature is available or would have a hard time judging if it is being used.

This study has several potential limitations. The study sites had relatively advanced HIT systems. Our findings may not apply to organizations with less advanced systems. Respondents were included because they used a PHR; additionally they were well educated

and predominately white. Our findings may not be generalizable to patients with different characteristics. Our response rates were comparable to other patient surveys but non-respondents may have less experience using PHRs and less interest in HIT; such patients may rate their experiences differently than patients with more HIT experience. Our analyses are based on pooled internet and paper questionnaire responses. This may have introduced biases, though studies have shown that there are no statistical differences between internet and mail surveys in scores or scales.[31,32,45,46]

The response rates at the three sites ranged from 48% to 65%. We considered a survey complete if 50% or more of the items were answered, so response rates for many questions were lower. Thus, the data presented may not generalize to all patients, although these response rates are comparable to other administrations of CAHPS surveys.[38] Furthermore, any bias due to non-response is more likely to affect the distribution of responses more than measures of association, a major focus of these analyses.

Provider organizations can use these items, (see guidance at: http://www.cahps.ahrq.gov/Surveys-Guidance/Item-Sets/~/media/Files/SurveyDocuments/CG/12%20Month/Get_Surveys/1357a_Adult_Supp_Eng_11.pdf), to evaluate their PHR. Similarly, they can assess whether their clinicians and staff are using email in ways patients perceive as valuable. The survey can also be used to identify areas for quality improvement. Interest in patient experiences with HIT is likely to grow as more providers employ EMRs and PHRs. Additionally, interest in patient-centered medical homes (PCMHs) is also likely to increase EMR and PHR adoption, because HIT is a core element of PCMHs.[5] The new items developed in this study may help organizations evaluate whether their adoption of HIT improves the patient experience.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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TABLE 1

Characteristics of Study Respondents

		BIDMC (N=1164)		GHC (N=1649)		KPSC (N=1930)	
Variable		**N**	**Percent**	**N**	**Percent**	**N**	**Percent**
Age	18–34 yrs	100	9	123	8	128	7
	35–44 yrs	165	14	153	9	174	9
	45–54 yrs	279	24	263	16	332	18
	55–64 yrs	351	30	508	31	536	29
	65–74 yrs	198	17	380	23	428	23
	75 or older	71	6	222	14	256	14
Gender	Female	665	57	1013	62	1061	57
Education	Less than HS	5	1	27	2	24	1
	HS graduates	48	4	152	9	195	11
	Some College	175	16	425	26	678	37
	4-yr college graduate	292	27	364	22	400	22
	More than 4-yr college	576	53	673	41	556	30
Race/ethnicity	Hispanic	12	1	37	2	144	8
	White (not Hispanic)	997	92	1381	85	1506	82
	Black (not Hispanic)	26	2	42	3	50	3
	Asian (not Hispanic)	42	4	121	7	109	6
	Other[†] (not Hispanic)	6	1	47	3	23	1
Health	Poor	20	2	29	2	38	2
	Fair	99	9	153	9	234	13
	Good	338	31	591	36	633	34
	Very Good	440	40	623	38	667	36
	Excellent	205	19	246	15	286	15
Chronic Condition	Yes	948	81	1403	85	1560	84

Notes. BIDMC=Beth Israel Deaconess Medical Center; GHC=Group Health Cooperative; KPSC=Kaiser Permanente Southern California; HS=high school; yr=year; yrs=years.

[†]Other refers to American Indian, Alaska Native, Native Hawaiian, or Other Pacific Islander.

N's vary because of item non-response

TABLE 2

Item Non-response and Endorsement Rates for Screening and Factual Questions[†]

		BIDMC (N=1164)			GHC (N=1649)			KPSC (N=1930)		
Item Number	**Item**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**
q5	Need care right away	1164	2	44	1649	2	54	1930	2	57
q7	Make appt for routine care	1164	2	91	1649	7	79	1930	2	81
q13	Complete med. history form on web (*HIT*)	1164	2	3	1649	11	25	1930	2	3
q14	Phone Dr office during regular hours	1164	3	44	1649	7	42	1930	3	45
q16	Phone Dr office after regular hours	1164	3	11	1649	7	8	1930	2	8
q18	E-mail Dr office medical question (*HIT*)	1164	3	61	1649	8	74	1930	2	64
q21	Dr office e-mail treatment reminder (*HIT*)	1164	3	56	1649	8	48	1930	3	41
q21a	Made appt after e-mail reminder (*HIT*)	666	6	81	864	17	81	828	8	80
q60	Talk Dr regarding health concerns	1164	5	94	1649	3	96	1930	4	96
q30	Dr said >1 choice for treatment	1164	7	73	1649	4	67	1930	4	65
q33	Dr order a tests for you	1164	6	93	1649	3	90	1930	3	95
q36	Use e-mail/web to ask Dr refill Rx (*HIT*)	1164	5	49	1649	3	58	1930	2	44
q37	Use e-mail/web to ask Dr new Rx (*HIT*)	1164	6	15	1649	3	21	1930	2	17
q38	Dr use computer during visit (*HIT*)	1164	7	80	1649	11	95	1930	3	95
q40	Dr use computer to show info (*HIT*)	945	9	46	1572	13	71	1836	4	59
q47	Look for test results on web (*HIT*)	834	7	96	1566	11	97	1895	9	97
q52	Look for list of Rx meds on web (*HIT*)	515	12	81	1192	15	90	450	1	78

		BIDMC (N=1164)			GHC (N=1649)			KPSC (N=1930)		
Item Number	**Item**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**	**Patients question applies to[#]**	**% non-response among applicable patients**	**% Yes among responding patients**
q56	Look at visit notes from Dr office (*HIT*)	163	38	93	1334	2	94	1590	23	96

Notes. BIDMC=Beth Israel Deaconess Medical Center; GHC=Group Health Cooperative; KPSC=Kaiser Permanente Southern California; Appt=appointment; med=medical; Dr=doctor; Rx=prescription; info=information. HIT indicates new health information technology item.

[†] Seven items that had "don't know" response option are not included in the table due to the large percentage that either selected that category or did not respond to the item. In addition, one factual question, about how physicians made visit notes available to patients, had four options with "mark one or more" instructions and could not be displayed in this table format. The 6 open-ended questions are also not included in the table.

[#] Because of skip patterns not all items are answered by every respondent.

TABLE 3

Item-Scale Correlations for Reporting Items, using Pooled Sampled. Imputed data (n = 4743).

		Composites						
Item Number	**Item**	**Access**	**Communication**	**Staff**	**SDM**	**Computer**	**E-mail**	**Website**
q6	Get care right away	**0.66** *	0.43	0.29	0.22	0.19	0.40	0.35
q8	Get appt. for routine care	**0.73** *	0.43	0.38	0.20	0.21	0.41	0.39
q9	Make appt. for routine care	**0.70** *	0.45	0.40	0.23	0.23	0.44	0.42
q12	Get appt. when use e-mail/website (*HIT*)	**0.69** *	0.35	0.29	0.24	0.18	0.48	0.37
q15	Get info during regular hours	**0.57** *	0.42	0.37	0.24	0.21	0.52	0.37
q17	Get info after regular hours	**0.53** *	0.43	0.29	0.18	0.17	0.51	0.45
q22	See Dr within 15 minutes	**0.43** *	0.32	0.32	0.16	0.16	0.32	0.30
q58	Dr explain	0.49	**0.81** *	0.32	0.40	0.36	0.48	0.46
q59	Dr listen	0.46	**0.85** *	0.32	0.43	0.38	0.48	0.44
q61	Dr give easy instructions	0.52	**0.80** *	0.34	0.42	0.36	0.51	0.47
q62	Dr know med history	0.44	**0.71** *	0.31	0.38	0.38	0.45	0.44
q63	Dr respect	0.45	**0.81** *	0.33	0.42	0.34	0.46	0.41
q64	Dr spend enough time	0.48	**0.73** *	0.36	0.36	0.33	0.42	0.44
q65	Office staff helpful	0.45	0.36	**0.74** *	0.13	0.22	0.30	0.42
q66	Office staff courteous	0.40	0.37	**0.74** *	0.15	0.20	0.29	0.39
q31	Dr talk pros/cons of trmt. choices	0.22	0.42	0.16	**0.35** *	0.21	0.23	0.22
q32	Dr ask your treatment preference	0.25	0.37	0.11	**0.35** *	0.22	0.21	0.22
q42	Dr computer use helpful to you (*HIT*)	0.27	0.42	0.23	0.23	**0.37** *	0.27	0.32
q43	Dr computer use easier to talk (*HIT*)	0.17	0.28	0.14	0.20	**0.37** *	0.18	0.21
q19	Get info when e-mailed Dr office (*HIT*)	0.58	0.48	0.31	0.23	0.23	**0.71** *	0.40
q20	Quex answered when e-mail Dr office (*HIT*)	0.54	0.53	0.28	0.26	0.27	**0.71** *	0.42
q48	Web test results easy to find (*HIT*)	0.32	0.32	0.29	0.16	0.21	0.32	**0.55** *
q49	Results on web as soon as needed (*HIT*)	0.40	0.36	0.34	0.19	0.23	0.34	**0.60** *

		Composites						
Item Number	**Item**	**Access**	**Communication**	**Staff**	**SDM**	**Computer**	**E-mail**	**Website**
q50	Results on web easy understand (*HIT*)	0.39	0.38	0.32	0.21	0.26	0.30	**0.56** *
q57	Visit notes easy to understand (*HIT*)	0.47	0.53	0.38	0.23	0.27	0.41	**0.50** *
q13a	Dr up-to-date re med hist.	0.43	0.60	0.32	0.33	0.35	0.46	0.42
q34	Office follows up test results	0.38	0.36	0.26	0.22	0.22	0.31	0.29
q53	List Rx meds on web up-to-date (*HIT*)	0.33	0.37	0.28	0.13	0.26	0.30	0.44

Notes.

* Item-scale correlation, corrected for item overlap with the scale total score. HIT indicates new health information technology items. Composites: Access=Access to Care; Communication=Doctor Communication; Staff=Office Staff; Computer=Doctor Use of Computer; SDM=Shared Decision Making; E-mail=Questions Answered by e-mail; Website=Provider's Website. Dr=doctor; appt=appointment; info=information; trmt=treatment; quex=questions; Rx=prescription

TABLE 4

Physician Level Reliability (n=69 physicians)

Items and Composites		Average n per doctor	Reliability	ICC	N needed for R=0.7
Access to Care					
q6*	Get care right away	37	0.55	0.03	69
q8*	Get appt for routine care	58	0.63	0.04	80
q9*	Make appt for routine care	57	0.67	0.05	64
q12*	Get appt when use e-mail/website (*HIT*)	23	†	†	†
q15*	Get info during regular hours	29	0.80	0.09	17
q22*	See Dr within 15 minutes	70	0.91	0.22	15
Doctor Communication					
q58	Dr explain	66	0.79	0.05	42
q59	Dr listen	66	0.78	0.05	44
q61	Dr give easy instructions	63	0.75	0.04	49
q62	Dr knows medical history	66	0.80	0.05	38
q63	Dr respect	66	0.78	0.05	43
q64	Dr spend enough time	66	0.78	0.05	43
Office Staff					
q65	Office staff helpful	64	0.78	0.05	43
q66	Office staff courteous	64	0.77	0.05	45
Shared Decision Making					
q31	Dr talk pros/cons of trmt. choices	44	0.32	0.01	218
q32	Dr ask which trmt. you thought best	43	0.36	0.01	177
Doctor Use of Computer					
q42	Dr use of computer helpful to you (*HIT*)	58	0.41	0.01	194
q43	Dr use of computer easier for you to talk (*HIT*)	58	0.43	0.01	181
E-mail					
q19*	Get info when e-mail Dr office (*HIT*)	46	0.82	0.11	23
q20*	Quex answered when e-mail Dr office (*HIT*)	46	0.67	0.05	54
Provider's Website					

Items and Composites		Average n per doctor	Reliability	ICC	N needed for R=0.7
q48*	Web test results easy to find (*HIT*)	53	0.60	0.04	83
q49*	Results on web as soon as needed (*HIT*)	53	0.55	0.03	103
q50*	Results on web easy to understand (*HIT*)	53	0.63	0.04	73
q57*	Visit notes easy to understand (*HIT*)	34	0.38	0.02	131
COMPOSITES					
Access to Care*		71	0.85	0.13	30
Doctor Communication		67	0.93	0.17	11
Office Staff		64	0.80	0.06	37
Shared Decision Making		44	0.40	0.01	153
Doctor Use of Computer (*HIT-C*)		58	0.46	0.01	162
E-mail* (*HIT-C*)		46	0.78	0.08	30
Provider's Website* (*HIT-C*)		59	0.75	0.07	47
Items not included in composites					
q13a*	Dr up-to-date about medical history	13	0.33	0.01	59
q34*	Dr office followed up with test results	62	0.82	0.11	31
q53*	List of Rx meds on website up-to-date (*HIT*)	33	0.21	0.01	289

Notes.

*Only responses from BIDMC and GHC were included (number of doctors=39) due to KPSC using different response options for these items and composites;

†**Reliability estimate was negative.**

q17 was excluded because of low number of respondents.

ICC=intra class correlation; R=reliability; appt.=appointment; trmt.=treatment; Rx=prescription; meds=medications.

HIT indicates new health information technology item. HIT-C indicates new health information technology composite.

TABLE 5

Overall Rating of Doctor Regressed on Composites; Bivariate and Multivariable Results Using Standardized Regression Coefficients.

	Bivariate Results		Multivariable Results	
Composite	**Estimate**	**P value**	**Estimate**	**P value**
Access to care	0.328	<0.001	0.045	0.054
Doctor Communication	0.641	<0.001	0.557	<.0001
Office Staff	0.226	<0.001	0.032	0.129
Shared Decision Making	0.299	<0.001	0.016	0.442
Doctor Use of Computer (*HIT-C*)	0.244	<0.001	0.081	<.0001
E-mail (*HIT-C*)	0.352	<0.001	0.034	0.134
Provider's Website (*HIT-C*)	0.288	<0.001	0.047	0.023
			$R^2 = 0.43$	

HIT-C indicates new health information technology composite.