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# Patients Use the Internet to Enter the Medical Home

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**Abstract:** There is a large gap between the promise of patient-centered medical home (PCMH) and our current capacity to define and measure it. The purpose of this article is to describe the findings of “real-time” patient-reported data about constructs of the PCMH and to demonstrate how an Internet-based method can be useful for obtaining patient report about the PCMH. We find that patients’ Internet ratings seem stable and demonstrate relationships that fit constructs and models for the PCMH. We also find that current PCMH performance across this sample of 69 clinical settings is highly variable and still leaves a great deal of room for improvement.

**Key words:** *internet, medical home, patient centered, patient report, patient experience, quality measurement*

**F**UNDAMENTAL CHANGE in the doctor-patient relationship called patient-centered medical care is increasingly promoted as a model for primary care quality (Little et al., 2001; International Alliance

of Patient Organizations, 2007). Many organizations have accepted broad principles underlying “patient-centeredness” and propose that it be implemented in the form of a patient-centered medical home (PCMH) (American Academy of Family Physicians, 2007; Rosenthal, 2008).

Organizations promoting the PCMH, such as the Agency for Health Care Quality and Research, emphasize that PCMH must become “whole person oriented;” a PCMH should act to improve service deficiencies identified by patients. Thus, the Patient-Centered part of the PCMH might focus on communication about issues that matter to patients and the style of the interaction between them and the health care team (International Alliance of Patient Organizations, 2007; Little et al., 2001; Stewart, 2001). For the Medical Home part of PCMH, patients might report about actionable service delivery constructs such as continuity, access, efficiency, and coordination of care (Commonwealth Fund Health Care Quality Survey, 2006; Commonwealth Fund International Health Policy Survey, 2008).

There is a large gap between the promise of PCMH and our current capacity to define and measure it. The gap is particularly large for measurement based on patient report.

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(Berenson et al., 2008; Malouin et al., 2009). This article describes 2 bridges over that gap: “real-time” patient-reported data about constructs of the PCMH and an Internet-based method for obtaining patient report about PCMH constructs and desirable consequences.

## METHODS

### Patient-reported data

Patient-reported data is the source of the information in this report. During the past decade primary care practices and health systems wishing to know about their patients’ needs and the quality of care delivered to their patients have chosen to offer their patients an Internet-based assessment and reporting tool. Patients who complete the assessment are immediately provided printable, evidence-based health information and an action form designed to improve self-management and strengthen communication with their physicians and nurses (Ahles et al., 2006; Wasson et al., 1999). The Internet tool also immediately provides each clinical setting a summary of all data collected by the Internet assessment. Because the cumulative information from patients is completely anonymous it does not require consent.

The cross-sectional summary for patients completing the assessment during the period September 1, 2008 to December 31, 2009 is the basis for this study. Although it is recommended that clinical setting generally invite patients every 1 to 2 years to use the Internet tool as part of a comprehensive “check-up”, there is no standard protocol for gathering patient data. However, to avoid possible redundancy data from patients who report that they have completed the assessment during the previous 6 months is not included in the summary.

Clinical settings having at least 20 responses for patients aged 19 to 69 years were eligible for this study. Sixty-nine clinical settings from 35 States in the United States met these criteria. The median number of adult patients entered per clinical setting

was 64 (range 20-1917) for a total of 10 907 patients.

## CHARACTERISTICS OF THE CLINICAL SETTINGS

Practices and health systems that chose to use the Internet assessment and reporting tool may voluntarily describe the clinical setting in which they will use it. Of the 69 primary care clinical settings, 31 reported having 2 or fewer physicians, 8 were of unknown size affiliated with a large health system, 11 were of unknown size affiliated with a large employer, and the remainder provided no information.

## DATA ELEMENTS

The Internet assessment and reporting system uses branching logic to administer 35 to 80 items. Although all patients complete the 35 core items, many of which relate to PCMH, a patient who has no bothersome functional limits and no diseases experience a different level of inquiry than a patient with diabetes, hypertension, heart failure, arthritis, and significant pain. Missing core items are rare. For example, even for a sensitive topic such as the self-report alcohol use, the missing data rate is below 2%. The Internet system also offers optional measures. Data collected during the study period includes measures from the Consumer Assessment of Health Plans (Consumer Assessment of Health Plans).

We nest patient-reported data into 4 constructs consistent with attributes of the PCMH described previously.

*PCMH Processes.* Single item measures for:

- personal continuity—a patient has a personal doctor or nurse,
- very easy access to medical care when needed,
- efficiency—the practice appears well organized and does not waste a patient’s time,
- coordination of care if a patient has 2 or more doctors.

The *Style of PCMH Interaction* between a patient and the practice's physician and office staff. Style is based on the average of 4 measures of physician respectfulness, physician willingness to listen, staff courtesy, and staff helpfulness (Cronbach's alpha 0.88).

A *PCMH communication* composite based on the average of 3 measures for physician knowledge of the patient history, clarity of explanations, and quality of information about chronic diseases (Cronbach's alpha 0.81).

*Practice Awareness of Functional Limits.* Patient well-being has many determinants; an example is functional health (Evans & Stoddart, 1990). If truly "whole-person oriented" the medical home should be aware of more than disease and bioclinical measures. The Internet assessment includes patient function measures designed for the primary care practice setting (Nelson et al., 1990). For each of 6 functional domains (limits in daily living or social activities or social support; impediments from pain or emotional problems; reduced physical function) patients note if their doctor or nurse is aware of the limit (Magari, et al., 1998). The ratio of awareness is averaged into a score for patients having functional limits (Average correlation among measures:  $r = 0.64$ ; Cronbach's alpha = 0.93 for a combination of the 6 measures.).

We also provide a single *overarching measure* for PCMH proposed by Berwick: the percentage of patients who strongly agree "they receive exactly the care they want and need exactly when and how they want and need it" (Berwick, 2009). Patient report using this measure is associated with the independent ratings of office function by the practice staff (Wasson & Baker, 2009).

We examine the association of the overarching measure and constructs of PCMH with patient reports about PCMH desirable consequences that include:

*Patient Confidence* with self-management. Although its conceptual value has been recognized for decades, patient confidence is now clinically accepted as a critical path for improved patient outcome (Bodenheimer et al., 2002; Kaplan et al., 1989; Remmers et al.,

2009; Wasson et al., 2006) The single question used here—"how confident are you that you can manage and control your health problems or concerns?"—elicits a response to similar other measures for this concept (Wasson et al., 2008).

*Benchmarks* for prevention based on completion of mammography, bowel cancer and lipid screening in patients 50 years or older and *Benchmarks* for condition management that include control of blood pressure, cholesterol, and blood glucose when patients report a diagnoses of hypertension, cardiovascular disease, or diabetes.

Patient Internet-based reports of benchmarks for condition management have been previously validated (Wasson, 2006). Additionally, for this study, the office staff in 6 practices audited 451 (84%) of 541 eligible medical records. Accuracy of patient self-report for the presence or absence of benchmark attainment was 96% for breast cancer screening (within 2 years), 94% for blood pressure control (within 6 months), 85% for lipid control (within 6 months), 72% to 92% for diabetic control (depending on method—within 6 months), and screening for bowel cancer was 76% (within 2 years for hemoccult test and 9 years for colonoscopy). Neither patient educational attainment nor financial status had a consistent effect on accuracy.

*Wellness activities* based on self-report for healthy eating and risk avoidance, regular exercise, and not smoking; and

*Non-Use* of an emergency department or hospital in the past year.

The actual internet assessment and reporting system is accessible to the public at [www.howsyourhealth.org](http://www.howsyourhealth.org); the wording and categories for the patient responses used in the report are at [www.howsyourhealth.org/ptenterhome](http://www.howsyourhealth.org/ptenterhome).

## ANALYSIS

Each of 69 primary care clinical settings that sponsored the Internet system is ranked using its average patients' responses

**Table 1.** Characteristics of Respondents (10 907 Patient Responses in 69 Clinical Settings)

	Median % for 69 Settings	% Cutoffs for Higher and Lower Tertiles Across 69 Clinical Settings
Female	73	77 and 62
Age 18-49	59	71 and 47
Some college education	84	90 and 78
White race	94	96 and 92
No basic financial needs	84	90 and 81
At least one chronic disease <sup>a</sup>	44	52 and 32
At least one functional limit <sup>b</sup>	29	37 and 24
At least one disease or functional limit	59	68 and 54

<sup>a</sup>Hypertension, Cardiovascular Disease, Diabetes, Respiratory Disease or Arthritis

<sup>b</sup>Limits in Daily Living or Social Activities or Social Support; Impediments from Pain or Emotional Problems; Reduced Physical Function.

for the PCMH constructs and desirable consequences. For some analyses ranked clinical settings are also placed in higher, middle, and lower tertiles.

We examine the associations among PCMH constructs and desirable consequences using the Spearman correlation ( $r$ ).

Statistical tests of significance are derived using linear regression with adjustment for each clinical settings number of patients, mix of patient demographics (age group, sex, educational level, financial need) and the average burden of illness of patients served (the sum of functional limits and chronic diseases). Adjusted beta coefficients indicate the strength of association after adjustment.

## Findings

Table 1 shows the demographics and illness burden of respondents. The typical (median) patients using the Internet system among those aged 19 to 69 years in these clinical settings are generally young, white, women, and more than high-school educated. The distribution by age and sex is comparable to the National Ambulatory Survey for primary care practices; however, the educational level of respondents and white racial predominance of respondents in these clinical settings is higher than the United States population (Educational Attainment in the United States,

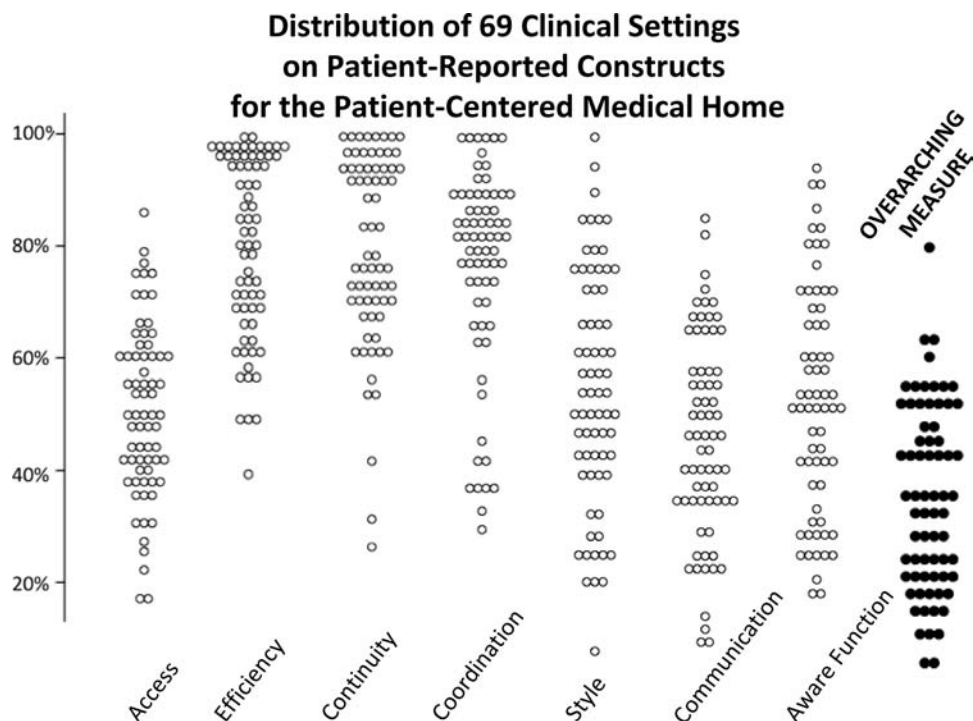
2007; National Ambulatory Medical Care Survey, 2007).

On the basis of the difference between higher and lower cutoffs for the higher and lower third (tertile) of the 69 clinical settings the greatest variation is observed in the age mix of patients; the least in racial mix. The majority of respondents have at least one functional limit or a chronic diagnosis.

Stability of patient characteristics was examined for 21 clinical settings having at least 30 patient responses in both the earlier and later halves of the study period. Ranking by demographics and burden of illness demonstrated high stability ( $r \geq 0.75$ ;  $P < .01$  for sex, education, financial status, and burden of illness. For age distribution of respondents the early to late correlation across clinical settings was somewhat lower but still strong:  $r = 0.54$ ;  $P = .01$ ).

## Constructs of the Patient-Centered Medical Home

The Figure 1 illustrates the distribution of the clinical settings on each of the constructs of PCMH and an overarching measure. Although several of the PCMH constructs show high attainment by many clinical settings (such as efficiency, continuity, and coordination) the variation across these clinical settings is striking.



**Figure 1.** Distribution of 69 clinical settings on patient-reported constructs for the patient-centered medical home.

Across clinical settings, the overarching PCMH measure is very highly correlated ( $r = 0.84-0.87$ ) with the PCMH process average (access, efficiency, continuity, and coordination) and the style of interaction and the quality of communication. Variation in this overall measure of the PCMH ranged 72% in absolute terms for 31 small primary care practices and 45% in absolute terms for 19 clinical settings organized by an employer and a health system. Again we observed that the correlation on the overarching measures was very strong ( $r = 0.78$ ;  $P < .01$ ) for the 21 clinical settings having at least 30 patient responses in both the earlier and later halves of the study period.

#### **Relationships among variables after multivariate adjustment**

After adjustment for the number of respondents in each clinical setting, their demographics, and their burden of illness the constructs of access and communication are most

consistently associated ( $P < .01$ ) with patient-reported confidence with self-management (adjusted beta 0.57 and 0.46, respectively) and awareness of patient function (adjusted beta 0.30 and 0.35).

No constructs of the PCMH alone are significantly associated with practice benchmarks, wellness activities or utilization. However, Table 2 illustrates that the ranking of a clinical setting on patient-reported self-management confidence is strongly associated (adjusted  $P < .01$ ) with its ranking on several patient-reported wellness activities (healthy eating/risk avoidance (adjusted beta 0.54) and exercise (adjusted beta 0.43) and the benchmark for diabetic blood sugar control (adjusted beta 0.87). As an example, for clinical settings in the lower tertile of confidence 38% of their patients exercise regularly, 73% engage in healthy eating and risk avoidance, and 64% report control of their blood sugar if they are diabetic. For clinical settings in the higher tertile of confidence

**Table 2.** The Association Between Patient Confidence with Self-Management and Attainment of Desirable Consequences of the Patient-Centered Medical Home

Categories of Desirable Consequences (100 is Maximum Attainment)	Average Attainment Based On Patient-Reported Confidence with Self-Management		
	Higher Tertile	Middle Tertile	Lower Tertile
Benchmark—Mammogram (Age 50+) <sup>a</sup>	91	86	79
Benchmark—Lipid screen (Age 50+)	88	80	82
Benchmark—Bowel screen (Age 50+)	76	72	64
Benchmark—Systolic blood pressure <140	84	83	79
Benchmark—Cholesterol <200 (age 50+) <sup>a</sup>	80	72	66
Benchmark—Diabetics' control of blood glucose <sup>b</sup>	78	73	64
Wellness—Healthy eating and risk avoidance <sup>b</sup>	89	80	73
Wellness—Not smoking	93	88	86
Wellness—Exercising regularly <sup>b</sup>	75	55	38
Nonuse of emergency department or hospital	91	89	84

Significance of association between tertile ranking of clinical settings and desirable consequences after adjustment of age, sex, educational attainment, financial status, burden of illness and number in the reporting panel of patients:

<sup>a</sup> $P \leq .05$ ,

<sup>b</sup> $P < .01$ .

the respective averages are 75%, 89% and 78%. Table 2 also demonstrates trends for a positive impact of patient confidence on completion of mammography and attainment of blood cholesterol control.

## DISCUSSION

The twin purposes of this article were to describe the findings of “real-time” patient-reported data about constructs of the PCMH and to demonstrate how an Internet-based method can be useful for obtaining patient report.

Overall, we observed a great deal of variation in patient-reported PCMH performance across clinical settings. There is a great deal of room for reduction of variation and improvement of care.

Although causation may not be inferred from the cross-sectional results we also observed:

- clinical settings providing very easy access and high-quality communication are more likely to be aware of their patients' functional limits; their patients will also

be more confident with self-management; and

- patient confidence with self-management appears to be a link to several desirable consequences of the PCMH.

Regarding the use of the Internet, we reconfirmed several of its virtues and challenges. (Bates & Gawande, 2009) During the past decade the Internet-based assessment and reporting system that generated data for this report has been in use for practice improvement, large community evaluations, monitoring the safety of care, and evaluating the impacts of health care service intensity across the United States. (Ho, 2007; Luce et al., 2004; Wasson et al., 2008; Wasson et al., 2007; Yassitis et al., 2009) Additional virtues of an Internet approach illustrated in this study include:

- The Internet supports multiple functions. Although it requires patients do most of the “work” in return they immediately receive the benefit of information tailored to their needs and the practice receives a summary for each patient and all patients.

- Depending on the purpose of an assessment—from “just good enough” to “research worthy”—the number of items requested of patients can change (Dawson et al., 2010; Wasson & Baker, 2009). Office practices and patients will appreciate assessment brevity linked to reports for action; researchers may favor length for precision though the results will probably be quite similar. For example, we observed for these clinical settings that the 4 item measure of office access from Consumer Assessment of Health Plans was highly correlated ( $r = 0.80$ ) with the single access measure we chose to use here. The branching logic possible with the Internet allowed us to efficiently support both types of measures.
- The effort for a practice to use internet systems for patient assessment is minuscule compared to the time and money customarily required for implementing mail or phone surveys, collating information from electronic medical record systems, or performing chart audits.

Despite its virtues Internet use in this study probably induced a positive bias on constructs and desirable consequences of the PCMH.

- The participating clinical settings are early adopters of an Internet system to improve patient care. Because they are early adopters they may have different, presumably better, performance on measures of PCMH than practices that have not adopted such an Internet system.
- An analysis based on patient report depends on patients capable and willing to use the Internet. Since there was no standard protocol for whom the practice invited to use the Internet assessment respondents may not be representative of all patients in the practice panel. Furthermore, there are documented biases against Internet use for less educated and

less healthy patients. (van Uden-Kraan et al., 2009)

In this study, the respondents were more highly educated and less mixed ethnically than would be expected for a similar age and sex sample of the United States population. However, it is incorrect to automatically assume that these differences are the result of sampling biases by the clinical settings. It may also be the result of the demography of patient panels served by these settings. In support of this alternative explanation is the fact that when the same assessment system was offered by an unemployment office for the State of New Jersey (from Sept 1 2008-December 31, 2009) it produced 204 respondents 67% of whom were low income, 37% nonwhite, and 34% high-school educated or less.

On the basis of the observations from this study, we believe that patients' rating of clinical performance are stable in the short run, they demonstrate the expected relationships to PCMH constructs (1-7) and care models (18-21) and that the Internet can, with little effort supply enough information about demographic and illness burden of respondents so that the comparative practice analyses can be adjusted and be made fair. Additional studies of patient report for the PCMH using the Internet are needed to reconfirm that these methods are valid and useful for many types of primary care practices.

In summary, variation in patient-reported measures of the PCMH makes clear that some clinical settings are performing well and others ought to consider a quality improvement strategy. Since practice-reported process measures are often poorly correlated with patient-rated outcomes (Jaén et al., 2010) this analysis supports further testing of “real-time” patient-reported measures to guide the improvement of patient-centered care and to comprehensively capture performance of the medical home. Despite bias in use by some patients the Internet seems to be a very useful method for gathering these measures.

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Constructs for the Medical Home		Wording
<b>Medical Home Processes</b>		
Continuity		Do you have one person you think of as your personal doctor or nurse? Yes; No.*
Access		How easy is it to get medical care when you need it? Very easy; Easy; Somewhat difficult; Very difficult; I have not needed medical care.
Efficiency		When you visit your doctor's office how often is it well organized and time efficient? Most of the time; Some of the time; It is almost never efficient, visits often waste my time; Does not apply to me, I seldom visit a doctor's office.
Coordination		If you are seeing a specialist and your primary physician, do you have one doctor who you feel is in charge of your medical care? Yes; No; I am not sure. (Only asked of those having both).
<b>Style of Interaction</b>		
Physician		<i>Listens and respects. 6 responses; 2 items.</i>
Staff		<i>Always helpful, courteous and respectful. 6 responses; 2 items.</i>
<b>Communication</b>		
Physician Aware		<i>Always knows history and explains clearly. 6 responses; 2 items.</i>
Chronic Disease		In general, how would you rate the information your doctor or nurse gave you about these problems? Excellent; Very Good; Good; Fair; Poor; None Received. (Asked only of those who indicated any one of five chronic diseases)
Desirable Consequences		Wording
<b>Person Oriented</b>		
Aware of Functional Limits		Is your doctor aware of the problem? Yes; No. (Asked when a patient has a score of 4 or 5 on the 1-5 scale of Dartmouth Coop Charts: Limits in Daily Living or Social Activities or Social Support; Impediments from Pain or Emotional Problems; Reduced Physical Function).**
<b>Confidence with Self-Management</b>		
Self-Care		How confident are you that you can manage most of your health problems or concerns? Very confident; Somewhat Confident; Not very confident; I do not have any health problems.
<b>Practice Benchmarks</b>		
Mammogram		In the last two years have you had a mammogram for breast cancer? Yes; No. (Asked of women, aged 50+)
Lipid checked		In the last two years have you had a test for fat (cholesterol) in the blood? Yes; No. (Asked of those aged 50+)
Bowel Cancer		In the last two years have you had a test for cancer of the bowel? Yes; No; No, but I had a colonoscopy in the last 9 years. (Asked of those aged 50+)

Blood Pressure	What was your last blood pressure? High number (systolic)? (Asked of those with hypertension, diabetes, or cardiovascular disease)
Cholesterol	What was your last total cholesterol level? (Asked of those with hypertension, diabetes, or cardiovascular disease)
Blood glucose (for Diabetics)	<ul style="list-style-type: none"> <li>How often do you keep your blood sugar (glucose) in the normal range (between 80-150)? I do not test my blood sugar; All of the time; Often; Sometimes; Rarely; Never</li> <li>If your blood sugar level before eating was checked in the past four weeks, what was it?</li> </ul>
<b>Wellness Activities</b>	
Health Habits	How often do you practice good health habits in two or more of the following areas: using a seat belt, getting exercise, eating right, getting enough sleep or wearing safety helmets? All of the time; Most of the time; some of the time; A little of the time; None of the Time.
Smoking Status	Are you a smoker? No; Yes and I might quit; Yes but I'm not ready to quit.
Exercise	Do you exercise for about 20 minutes 3 or more days a week? Yes, most of the time; Yes; some of the time; No, I usually do not exercise this much.
<b>No Hospital or ED Use</b>	
Utilization	<ul style="list-style-type: none"> <li>In the past year did you stay in a hospital overnight or longer? Yes; No.</li> <li>In the past year have you been in the hospital or visited an emergency department for any of these problems? Yes; No. (Asked only of those who indicated any one of five chronic diseases)</li> </ul>

Patient age is categorized into 19-49,50-64,65-69. Financial needs are determined by response to this question: do you have enough money to buy the essential (such as food, clothing, or housing)? Yes, always; Sometimes; No.

*Italics refer to items from: Consumer Assessment of Health Plans (CAHPs):*  
[www.ahrq.gov/qual/cahpsix.htm](http://www.ahrq.gov/qual/cahpsix.htm)

\* Patient report of continuity is highly related to several methods of actual measuring continuity. (Wasson JH, Sauvigne AE, Mogielnicki RP, et al. Continuity of outpatient medical care in elderly men: A randomized trial. *JAMA* 1984;252(17):2413-2417.)

\*\* Nelson EC, Landgraf JM, Hays RD, Wasson JH, Kirk JW. (1990). The functional status of patients: How can it be measured in physicians' offices? *Med Care*. 28(12):1111-1126.