

Linking Primary Care Performance to Outcomes of Care

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BACKGROUND. Substantial research links many of the defining characteristics of primary care to important outcomes; yet little is known about the relative importance of each characteristic, and several characteristics have not been examined. These analyses evaluate the relationship between seven defining elements of primary care (accessibility, continuity, comprehensiveness, integration, clinical interaction, interpersonal treatment, and trust) and three outcomes (adherence to physician's advice, patient satisfaction, and improved health status).

METHODS. Data were derived from a cross-sectional observational study of adults employed by the Commonwealth of Massachusetts (N=7204). All patients completed a validated questionnaire, the Primary Care Assessment Survey. Regression methods were used to examine the association between each primary care characteristic (11 summary scales measuring 7 elements of care) and each outcome.

RESULTS. Physicians' comprehensive ("whole person") knowledge of patients and patients' trust in their physician were the variables most strongly associated with adherence, and trust was the variable most strongly associated with patients' satisfaction with their physician. With other factors equal, adherence rates were 2.6 times higher among patients with whole-person knowledge scores in the 95th percentile compared with the 5th percentile (44.0% adherence vs 16.8% adherence, $P < .001$). The likelihood of complete satisfaction was 87.5% for those with 95th percentile trust scores compared with 0.4% for patients with 5th percentile trust scores ($P < .001$). The leading correlates of self-reported health improvements were integration of care, thoroughness of physical examinations, communication, comprehensive knowledge of patients, and trust ($P < .001$).

CONCLUSIONS. Patients' trust in their physician and physicians' knowledge of patients are leading correlates of three important outcomes of care. The results are noteworthy in the context of pervasive changes in our nation's health care system that are widely viewed as threatening to the quality of physician-patient relationships.

KEY WORDS. Primary health care; physician-patient relations; outcome assessment (health care); quality assessment, health care. (*J Fam Pract* 1998; 47:213-220)

For three decades, health policy studies in the United States have consistently called for strengthening primary care delivery as a means of controlling health care spending, improving access to care, and assuring health care quality. Substantial research links many of the defining characteristics of primary care, including accessibility, continuity, comprehensiveness, and coordination, to cost savings, improved outcomes, or both. However, because few studies have measured more than one or two primary care characteristics at a time, little is known about the relative importance of these

characteristics with respect to achieving desired outcomes. Moreover, some of the essential features of primary care have not been examined in this way, so their relationship to outcomes remains unknown. Setting priorities for quality assurance and quality improvement is difficult with these gaps in the research.

In 1994, the Institute of Medicine (IOM) Committee on the Future of Primary Care defined primary care as "the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained partnership with patients, and practicing in the context of family and the community."¹ Two characteristics named in this definition were not named in the IOM's previous definition of primary care and are noteworthy in the current health care delivery environment. The first is the assertion that primary care requires a sustained partnership with patients. The second is the specification that primary care occurs in the context of family and the community. While both of these characteristics were implicit in the IOM's previous definition,² and were featured in other definitions of primary care,^{3,5} the present definition brings renewed

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attention to them. In the current competitive health care environment, for these features to be considered essential elements of primary care rather than unaffordable luxuries there must be demonstrable benefits associated with them.

In this study, we measured the defining elements of primary care specified in the IOM's revised definition, and examined the association between each element and three outcomes of care: patients' adherence to their primary physician's advice, patient satisfaction, and improved health outcomes. Each of these outcomes is widely accepted as a desirable consequence of medical care, and is presumed to be influenced by many, if not all, of the defining features of primary care.

METHODS

STUDY DESIGN

The study population included adults employed by the Commonwealth of Massachusetts who subscribe to any of 12 health plans offered to state workers. Between January 1996 and April 1996, the Primary Care Assessment Survey (PCAS) was administered to a random sample of eligible participants, stratified by health plan. A standard three-step mail survey protocol with telephone follow-up of randomly selected nonrespondents was used.⁶ The overall response rate was 68.5 % (N=7204). Further details of the study design are documented elsewhere.^{7,8}

The Primary Care Assessment Survey. The PCAS is a validated, patient-completed questionnaire designed to measure the essential elements of primary care named in formal definitions of the term, including the recent IOM definition.⁵ The PCAS measures seven characteristics of primary care through 11 summary scales: accessibility (organizational, financial), continuity (longitudinal, visit-based), comprehensiveness (knowledge of patient, preventive counseling), integration of care, clinician interaction (clinician-patient communication, thoroughness of physical examinations), interpersonal treatment, and trust. (For a summary of the item content of each scale, visit the *Journal* Web site at www.jfp.denver.co.us.) All concepts are measured in the context of a specific clinician-patient primary care relationship, and reference the entirety of that relationship; the items are not visit-specific. Like the definitions of primary care on which it is based,^{1,5} the assessment methodology includes both distinguishing features of primary care (ie, elements that are essential and unique to primary care) and shared features (ie, elements that are essential but not unique to primary care). For purposes of measuring primary care performance, all essential characteristics (distinguishing and shared) should be assessed.^{1,2,5}

Outcome Measures. Three outcomes of care were assessed through 16 additional questions, as follows:

Adherence. Adherence to physicians' advice was assessed for seven behavioral risks that the US

Preventive Services Task Force recommends every primary physician address with every adult patient: smoking, alcohol use, seat belt use, diet, exercise, stress, and safe sex practices.⁹ For each topic, patients reported whether their primary physician had ever discussed the topic with them, and whether they had ever attempted to modify their behavior as a result of the physician's advice. Adherence was scored as the percentage of behaviors that the respondent attempted to modify on the physician's recommendation. Topics not discussed were excluded from the calculation. Current behavioral risk status was assessed using items from the Behavioral Risk Factor Survey.¹⁰⁻¹²

Satisfaction. Patients' satisfaction with their primary physician was assessed with a single item that asked: "All things considered, how satisfied are you with your regular doctor?" Seven response choices ranged from "completely satisfied, could not be better" to "completely dissatisfied, could not be worse." The item followed the battery of questions referencing this doctor. In analyses, responses were dichotomized to differentiate patients reporting complete satisfaction from all others.

Health outcomes. Changes in health status were studied using an item adapted from the Medical Outcomes Study (MOS).¹³ The item asked patients to compare their current general health status with that of 4 years ago, with 5 response choices ranging from "much better now" to "much worse now." This cross-sectional assessment methodology has been demonstrated to yield health transition estimates that are valid, though less precise than transitions estimated with longitudinal data.^{14,15}

STATISTICAL ANALYSES

The principal analytic objective was to assess the absolute and relative strength of association between each primary care variable and each outcome. The cross-sectional study design precludes our ability to determine the direction or sequencing of observed associations.

The analytic sample (n=6094) excluded all phone respondents and any mail respondents who reported having no regular personal doctor, because both groups were missing key data elements. Analytic sample sizes were: adherence, n=6014; satisfaction, n=6014; health transitions, n=6024. The subgroup of patients whose primary physician had never referred them for specialty care (n=1611) were excluded from analyses involving the integration scale, as integration is not scored under these circumstances. Sensitivity analyses revealed no significant effect of retaining this subgroup in all other analyses.

A two-stage analytic approach was used. In the first stage (adjusted bivariate regressions), each outcome variable was regressed on each primary care variable individually, controlling for the patient characteristics listed below. In the second stage (multivariable regressions), each outcome variable was regressed on all pri-

mary care scales for which a statistically significant bivariate relationship was observed ($P \leq .05$). The two-stage approach enabled us to verify that similar conclusions were reached under bivariate and multivariable analytic conditions. This is useful under circumstances such as these, where moderate to high correlations among independent variables may confound multivariable analyses. The majority of PCAS scale correlations are small, but higher correlations exist among some scales ($r = .40-.86$).⁸

The following functional forms were used for regression models: linear regression for adherence (continuous variable), logistic regression for satisfaction (binary variable) and ordered logistic regression for health outcomes (categorical variable with 5 interval responses).^{16,17} Models controlled for patients' demographic characteristics (age, sex, race, years of education, household income), type of health plan, time in current health plan, functional health status (physical and mental health summary scores derived from the 12-Item Short-Form Health Survey [SF-12]¹⁸), chronic medical conditions (from a checklist of 21 conditions with high prevalence among US adults¹⁹), and health risk behavior profile. Because of endogeneity considerations, health risk behaviors were excluded as controls from adherence analyses, and health status scales derived from the SF-12 were excluded from health outcome analyses.

Probability sampling weights, calculated as the inverse of sampling probabilities, were applied to all regressions. The statistical software used (STATA 5.0) takes these weights into account when computing standard errors.²⁰ All P values were corrected for multiple comparisons using Bonferroni's method for individual t tests.

RESULTS

Table 1 summarizes unweighted sociodemographic, health, and primary care characteristics of the analytic sample. By virtue of the sampling frame, all respondents were employed adults. The mean age was 48.6 years (range: 19 to 88). Slightly more than half of respondents were female (55.8%), and the majority were white (87.9%), with higher than a high school education (69.3%). Physical and mental health summary scores were approximately the same as those of the general US adult population, and somewhat lower than those of employed adults nationally.¹⁸

BEHAVIORAL RISK DISCUSSIONS AND ADHERENCE TO ADVICE

Table 2 summarizes the prevalence of behavioral risk discussions reported by all patients, and by patients at risk in each category. Classification of at-risk status was based on published standards, where available, and on epidemiologic evidence linking the risk characteristic to disease, where unavailable (stress and safe sex). The prevalence of risk factor discussions was generally high-

TABLE 1

Characteristics of the Analytic Sample, Unweighted (N=6094)

Characteristics	Mean	(SD)
Demographics		
Age	48.6	(12.1)
Female, %	55.8	(0.50)
White, %	87.9	(0.33)
Education >12 years, %	69.3	(0.31)
Household size, no. of persons	2.7	(1.32)
Household income < 20,000, %	3.8	(0.19)
Health status		
Physical health (PCS12)*	50.7	(8.7)
Mental health (MCS12)*	49.0	(9.5)
No. of chronic medical conditions†	2.9	(2.2)
Primary care assessment‡		
Access		
Financial	64.7	(21.6)
Organizational	68.9	(16.9)
Continuity		
Longitudinal	76.8	(28.5)
Visit-based	78.0	(21.7)
Comprehensiveness		
Knowledge of patient	56.0	(16.3)
Preventive counseling	46.6	(27.7)
Integration	70.0	(21.4)
Clinical interaction		
Communication	79.1	(17.9)
Physical examinations	79.5	(19.3)
Interpersonal treatment	78.3	(19.3)
Trust	75.8	(16.0)

SD denotes standard deviation.

*Physical health (PCS12) and mental health (MCS12) summary scores are based on indices derived with the 12-Item Short-Form Health Survey.¹⁸

†From a checklist of chronic conditions with high prevalence among US adults.¹⁹

‡All scores range from 0 to 100 points, with higher scores signifying

er, though less than 100%, among patients at risk for a given behavior. The exceptions were discussions of seat belt use, which occurred rarely regardless of risk status, and exercise.

Table 3 presents results of the adjusted bivariate regressions. All PCAS scales were statistically significantly associated with adherence in these models ($t \geq 2.96$, $P \leq .05$). The relative strength of association between each primary care variable and adherence is indicated by the size of the regression coefficients (partially standardized to allow for comparison across models) and t statistics. In both bivariate and multivariable regressions, two variables (physician's knowledge of the patient, and patient's trust in the physician) were the strongest correlates of adherence. These two variables accounted for 14% of the variance in adherence scores (adjusted R^2). Other variables associat-

TABLE 2

Prevalence of Behavioral Risk Discussions for Total Sample and Patients with At-Risk Characteristics

Behavior	Total Sample		Patients at Risk*	
	n	(%)†	n	(%)†
Smoking	3182	(53.3)	964	(91.8)
Alcohol	2324	(39.0)	232	(62.5)
Seat belts	969	(16.3)	232	(14.4)
Exercise	4422	(74.0)	2082	(73.0)
Diet	4224	(70.7)	1650	(84.9)
Stress	3630	(60.8)	1585	(70.3)
Safe sex	1099	(18.5)	537	(39.0)

*At-risk classification was based on self-reported characteristics. For the seven topics, respectively, at risk was defined as: any smoking, >13 alcoholic drinks/week, seat belt use "some of the time, a little of the time, or none of the time," exercise <3 times/week, obesity (BMI), life "extremely" or "quite" stressful, unmarried <50 years old.

†Because of missing data, the denominator for computing prevalence of risk-factor discussions (total sample) varies as follows: smoking, n=5970; alcohol, n=5961; seat belts, n=5945; exercise, n=5973; diet, n=5977; stress, n=5969; safe sex, n=5958.

ed with adherence in regressions were: female, white, more education, higher self-reported physical and mental health, and fewer chronic conditions (negative coefficients, $P < .01$).

Regression results were applied to assess changes in adherence as two PCAS scales (knowledge of patient, trust) were systematically varied and all other variables held constant at their mean. With all other factors held constant, adherence rates were 2.6 times higher (44.0% adherence vs 16.8%, $P < .001$) with "knowledge of patient" scores in the 95th percentile (80 points) than in the 5th percentile (28 points). The relationship between trust and adherence was nearly identical: 43.1% adherence compared with 17.5% ($P < .001$) with trust scores in the 95th and 5th percentiles, respectively.

PATIENT SATISFACTION

Patient satisfaction data were strongly positively skewed, with approximately three fourths of respondents either completely satisfied (33%) or very satisfied (44%) with their physician. All PCAS scales were significantly related to satisfaction ($P \leq .05$) in adjusted bivariate regressions (Table 3). In both bivariate and multivariable regressions, trust was the dominant correlate of

TABLE 3

Primary Care Scales as Predictors of Each Outcome, Adjusted Bivariate Regression Results

Primary Care Scale	Adherence		Satisfaction		4-Year General Health Transitions	
	β	t statistic	β	z score	β	z score
Access						
Financial	2.87	8.9	0.60	18.0	0.07	2.6
Organizational	4.79	15.6	1.25	30.0	0.10	3.5
Continuity						
Longitudinal	2.02	6.3	0.38	11.3	0.06	2.3
Visit-based	4.46	13.9	1.27	26.4	0.07	2.5
Comprehensiveness						
Knowledge of the patient	8.54	29.0	1.55	33.8	0.20	7.5
Preventive counseling	n/a	n/a	0.47	15.2	0.12	4.4
Integration	6.78	19.8	1.59	29.4	0.19	6.3
Clinical Interaction						
Physical examinations	6.09	20.1	1.65	31.8	0.21	7.6
Communication	7.01	23.3	2.30	34.8	0.21	7.9
Interpersonal treatment	6.41	21.5	2.19	33.8	0.16	5.9
Trust	7.70	26.0	2.26	36.5	0.23	8.4

Note: All regression coefficients are statistically significant (t statistic ≥ 2.96 , $P \leq .05$). For each outcome variable, the relative strength of association between the primary care variables and the outcome is indicated by the size of the coefficients and of the t statistics (z scores). Regression coefficients are partially standardized to allow for this meaningful comparison across independent variables. However, regression coefficients (β) cannot be meaningfully compared across outcomes because the 3 outcome measures have different functional forms. All models adjust for patients' age, sex, race, educational attainment, annual household income, comorbid conditions, type of health plan, and time in health plan. Models of satisfaction and health transitions adjust for patients' current health-risk behaviors. Models of adherence and satisfaction adjust for patients' self-reported current physical and mental health status.

satisfaction. Trust accounted for 35% of variance in satisfaction in the adjusted bivariate regression model (adjusted R^2). Patients' education and self-reported mental health were also statistically significantly related to satisfaction in regressions (negative and positive coefficients, respectively, $P < .01$).

Regression results were applied to examine differences in the likelihood of complete satisfaction as trust scores were systematically varied, and other variables were held constant at their mean. Patients with 95th percentile trust scores (trust=100) were about 5 times more likely than those with median levels of trust (trust=75) to express complete satisfaction with their physician (87.5% vs 18.4%, $P < .001$). Below trust scores of 60, the likelihood of complete satisfaction was negligible.

4-YEAR HEALTH TRANSITIONS

Sixty-four percent of respondents reported that their general health was unchanged from that of 4 years ago. Approximately 18% indicated that their health had improved, and the remaining 18% indicated that their health had declined.

All PCAS scales were significantly related to health outcomes in the adjusted bivariate models. Five dominant correlates of health outcomes emerged: trust, communication, thoroughness of physical examinations, physician's knowledge of the patient, and integration of care (Table 3). In the multivariable model, only the thoroughness of physical examinations remained statistically significantly related to health outcomes ($P < .01$). Patients' race (white), number of chronic conditions, and health-risk behavior profile were significantly related to improved health (negative coefficient, $P < .01$). The overall explanatory power of the multivariable model was small (adjusted $R^2 = .04$). The results were unchanged when the sample was limited to patients who had been under the present physician's care for the entire 4 years referenced in the dependent variable ($n=2986$).

DISCUSSION

The definition of primary care recently proposed by the IOM brings renewed attention to sustained physician-patient relationships as a necessary and defining element of primary care. Our study applies the IOM definition,¹ and examines the relative strength of association between each primary care element and three important outcomes of care. In this context, the observed strength of association between two primary care characteristics (patients' trust in their physician and physicians' knowledge of patients) and each outcome is important.

ADHERENCE

Nonadherence has been characterized as one of the most significant problems facing medical practice.²¹ Studies suggest that approximately half of all prescribed

treatments are not followed by patients,²²⁻²⁶ and nonadherence rates are even higher when behavioral or lifestyle changes are required.^{22,25,26}

Our study suggests that behavioral risk discussions, particularly those pertaining to alcohol use, seat belt use, and safe sex, are often an omitted feature of primary care relationships. The findings are consistent with previous evidence concerning physicians' health-risk behavior counseling practices,^{27,29} and indicate that US Preventive Services Task Force recommendations⁹ are not followed completely.

Our results suggest that when discussions occur, adherence to recommended behavior changes is strongly associated with the strength of the physician-patient relationship. Previous studies find adherence to be positively associated with effective physician-patient communication,^{26,30,31} continuity,^{32,33} and humane interpersonal treatment.^{21,34} Their relative importance in achieving adherence was not examined. Our study reaffirms the strong association of each, but suggests that patients' trust in their physician and the physician's knowledge of the patient supersede all other factors. With all other factors held constant, adherence rates were nearly 3 times higher in primary care relationships characterized by very high levels of trust and whole-person knowledge than in those with very low levels.

Some important factors must be considered in interpreting these results. First, actual adherence rates are likely underestimated by the scoring algorithm used in this study, which classifies as nonadherent those patients whose physicians discussed a topic for which no behavior change was warranted (eg, a nonsmoker whose physician-assessed smoking status would score 0 on smoking-related adherence). Sensitivity analyses suggest that this measurement characteristic attenuates the observable association between adherence and the primary care variables, making our results more conservative. Another consideration is the use of self-reported adherence information. Although the tendency for socially desirable response bias is known to be mitigated by the use of mailed surveys (as opposed to telephone or in-person interviews),^{35,36} the observed associations between primary care performance and adherence may be inflated because of the cross-sectional study design. Further study using a longitudinal research design is necessary to clarify the sequencing of effects.

SATISFACTION

Empirical studies have shown that patients' expressions of dissatisfaction are potent predictors of disenrollment from a physician or health plan.³⁷⁻⁴¹ Past studies of satisfaction with physicians have documented the importance of access,⁴² communication,^{30,41,43-47} technical quality,^{48,49} and interpersonal quality of care,^{41,43,44,48} but provided little insight regarding their relative importance. One recent study found communication to be most highly correlated with visit-specific satisfaction, from among 5

primary care characteristics (communication, coordination, knowledge of patient, longitudinal continuity, and visit-based continuity).⁴⁶ The present study finds that each of these is strongly positively associated with satisfaction, but that patients' trust in their physician far exceeds all other variables in its association with satisfaction. With all other factors held constant, a fivefold difference in the likelihood of complete satisfaction (88% vs 18%) occurred among patients with high levels of trust compared with median levels of trust. Further research is needed to discern whether patient satisfaction can be improved by improving patient trust (ie, whether the observed relationship is causal). However, these results suggest that, among the many features that make up a primary care relationship, trust is the one most closely related to the broad construct of patient satisfaction.

HEALTH IMPROVEMENTS

Findings concerning health outcomes differed from those of other outcomes in at least two ways. First, the thoroughness of physical examinations and integration of care were among the leading correlates of health outcomes, whereas they were less important in the other models. Also, while all primary care variables were significantly related to health outcomes (Table 3), they explained less of the variance in this outcome (adjusted R^2) than they did in the other outcomes.

The latter issue (low R^2) is common in health outcomes research, particularly in studies involving a general adult population.^{50,51} In a general population, changes in health over a brief time period are generally small, making it difficult to identify decisive predictors of change. The ability to robustly predict outcomes is substantially better in studies involving severely acutely ill patients,^{52,53} where medical care can quite literally mean the difference between life and death. Note, however, that if the observed relationships are extrapolated over a lifetime, the cumulative effects of primary care variables on functional health outcomes may be quite substantial. A longitudinal study design is needed to more precisely determine the strength of the relationship between primary care performance and functional health outcomes, and to discern the sequencing of effects.

LIMITATIONS

Several limitations of our study must be taken into account. First, as noted above, the cross-sectional research design limits our ability to draw causal inferences from these findings. Longitudinal or interventional research studies are important next steps.

Second, given known limitations of patient-based assessments of technical aspects of care,⁵⁴⁻⁵⁷ the PCAS includes only one item (thoroughness of physical examinations) pertaining to this domain. A stronger association between technical quality and outcomes might have been observed if more complete indicators of this

domain were available.

Finally, the managed care market in Massachusetts is both more mature and more pervasive than in most other parts of the US. Thus, the mean primary care scores observed in this population may not generalize to other areas. However, the observed relationships between the primary care variables and outcomes should generalize more broadly, as there is no reason to hypothesize that the factors associated with adherence, satisfaction, or health transitions would be unique among adults in Massachusetts.

CONCLUSIONS

In this study, sustained physician-patient partnerships with bonds of trust, and knowledge of patients were leading correlates of three outcomes of care: adherence, satisfaction, and improved health status. The results are noteworthy in the context of changes in health care delivery that many patients, clinicians, medical educators, and policy makers speculate may threaten the therapeutic alliance between doctor and patient.⁵⁸⁻⁶³ In the current competitive environment, the annual churn of patients from one health plan to another often severs primary care relationships. Health care organizations press for ever-higher levels of clinician productivity and adopt urgent-care coverage systems that assure access but often disregard continuity. Opportunities for sustained partnerships and whole-person knowledge of patients are often compromised.

The recent IOM report, along with previous definitions of primary care, asserts that these attributes are essential to primary care, and are a part of what distinguishes it from the rest of medical practice.^{1,3,5} The methodology introduced here permits these attributes to be measured, and the findings provide empirical evidence concerning their substantive relationship to important outcomes. Future research must identify specific features of organizations and delivery systems that foster or impede primary care performance, and establish whether the observed relationships between primary care performance and outcomes are causal. A clear understanding of the linkages between specific features of the primary care relationship and outcomes, and a knowledge of the organizational arrangements best adapted to provide these features, are essential as we continue to redesign the ways that we organize and provide health care.

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