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Patient Engagement in ACO Practices and Patient-reported Outcomes Among Adults With Co-occurring Chronic Disease and Mental Health Conditions

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Abstract

Background: Accountable care organizations (ACOs) have increased their use of patient activation and engagement strategies, but it is unknown whether they achieve better outcomes for patients with comorbid chronic physical and mental health conditions.

Objectives: To assess the extent to which practices with patient-centered cultures, greater shared decision-making strategies, and better coordination among team members have better patient-reported outcomes (PROs) for patients with diabetes and/or cardiovascular and comorbid mental health diagnoses.

Research Design: Sixteen practices randomly selected from top and bottom quartiles of a 39-item patient activation/engagement implementation survey of primary care team members (n = 411) to assess patient-centered culture, shared decision-making, and relational coordination among team members. These data were linked to survey data on patient engagement and on emotional, physical, and social patient-reported health outcomes.

Subjects: Adult patients (n = 606) with diabetes, cardiovascular, and comorbid mental health conditions who had at least 1 visit at participating primary care practices of 2 ACOs.

Measures: Depression/anxiety, physical functioning, social functioning; patient-centered culture, patient activation/engagement implementation, relational coordination.

Results: Patients receiving care from practices with high patient-centered cultures reported better physical functioning (0.025) and borderline better emotional functioning (0.059) compared with less patient-centered practices. More activated patients reported better PROs, with higher activation levels partially mediating the relationship of patient-centered culture and better PROs.

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Conclusions: ACO patients with comorbid physical and mental health diagnoses report better physical functioning when practices have patient-centered cultures. More activated/engaged patients report better patient emotional, physical, and social health outcomes.

Keywords

accountable care organizations; patient-centered culture; patient activation; patient-reported outcomes; multiple chronic conditions

Mental health disorders, including depression, are common and associated with increased risk of onset of chronic physical conditions.¹⁻⁴ Depression commonly co-occurs with a number of chronic conditions, including cardiovascular conditions and diabetes.^{3,5} Most depression is identified and treated in primary care settings.⁶ Patients with depression, however, are less likely to be engaged in their care. Better treatment of depression and other mental health conditions may help improve outcomes for those with co-occurring chronic conditions, but challenges remain in incorporating effective care strategies into primary care settings. Given risk-based incentives to lower costs, accountable care organizations (ACOs) are motivated to engage patients in their care. Yet, little is known about such engagement and whether these efforts are associated with better patient-reported outcomes (PROs) of care among patients with mental health conditions co occurring with cardiovascular conditions or diabetes.⁷ These patients may benefit from ACO-affiliated practices' use of patient engagement strategies more than other patients because of their extensive use of the health care system.⁷

Higher levels of engagement are associated with better adherence and health outcomes,^{8,9} so an important way to improve PROs is to more effectively engage patients in their care. Models of care that incorporate important patient engagement capabilities such as patient self-management support, decision-support for providers, and team-based care have shown effectiveness in improving outcomes for depression¹⁰ and other mental health conditions.^{11,12} Team-based care is also cost-effective.¹³

In this study, we examine the extent to which practices with patient-centered cultures, greater use of shared decision making, and better relational coordination (RC) achieve better PROs. Further, we examine how patient activation, measured by the patient activation measure (PAM-13),¹⁴ mediates the relationship between practice capabilities and PROs for people with co-occurring mental health conditions. Specifically, we hypothesize that patients with diabetes and/or cardiovascular disease (CVD) with comorbid mental health conditions who receive care from more patient-centered practices, with greater use of shared decision-making, and with greater RC, will report less depression and better physical and social functioning, controlling for patient demographic characteristics and confounding variables. We also hypothesize that the relationship of greater practice capabilities and better PROs will be partially mediated by PAM-13.

METHODS

Study Design and Data Sources

The study examines differences in adoption and use of patient engagement strategies in 16 practices of 2 large ACOs— Advocate Health Care (AHC) in Chicago, Illinois, and DaVita HealthCare Partners (HCP) Medical Group headquartered in Los Angeles, California. Both are large well-established organizations, with risk-bearing contracts that create incentives to achieve better care outcomes, reduce costs, and improve patient experiences via improved involvement of patients in their care.

We identified 39 patient activation and engagement (PAE) strategies that organizations could implement, based on previous literature, to include in a standardized baseline survey.¹⁵ Surveys were completed by a clinician or administrative leader from each of the 71 practices. Practices were scored using responses from the 39-item survey (Supplemental Digital Content, <http://links.lww.com/MLR/B581>) which assessed the extent of implementation of each PAE strategy.¹⁵ To maximize variance in PAE adoption and implementation when comparing practices, we randomly sampled 16 practices; 4 from the top quartile and 4 from the bottom quartile in each ACO.

Random samples of 273 adult patients with cardiovascular conditions and/or diabetes were sampled from each of the 16 practices, using the inclusion criteria shown in Table 1. Encounter-level data on blood pressure, hemoglobin A1c, low-density lipoprotein, comorbid conditions, sociodemographics, and insurance status were available for each patient in clinical and administrative data. Data for patients with a codiagnosis of depression [International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes: 311, 296], anxiety (300), and a number of other mental health conditions (295–299, 309) were analyzed. Substance abuse disorders were excluded from the analysis due to confidentiality concerns of the ACOs. Patient surveys assessed PROs and patient activation from a multimode patient survey administered in English and Spanish. Sampled patients were mailed surveys with a \$10 gift card incentive at first mailing. Nonrespondents received telephone followup. Respondents were mailed a second \$10 for survey completion. The survey obtained a 51% completion rate, with completion rates somewhat higher for females than males, for those 65+, and for those with both diabetes and CVD.⁷ The analytic sample includes 606 adult patients who have comorbid mental health conditions (n = 606 of 2176 respondents; 27.8%).

Practice-level data were collected from clinicians and staff of the 16 practices on the extent to which each had a patient-centered culture, used shared decision-making, and scored high RC among physicians, nurses, medical assistants, diabetes nurse educators, nutritionists, and receptionists.¹⁶ An overall 86% response rate was obtained (n = 411). The study was approved by the University of California, Berkeley, Committee for Protection of Human Subjects.

Measures

PROs—PROs included the 4-item PHQ-4 depression and anxiety scale as a measure of patient-reported emotional functioning ($\alpha = 0.85$); the 12-item physical functioning form

[Patient-Reported Outcomes Measurement Information System (PROMIS) short form 12a; $\alpha = 0.86$]; and the 8-item social functioning form (PROMIS short form 8a; $\alpha = 0.85$).^{17–20}

Practice Capabilities and Patient Engagement Strategies—The practice-reported patient engagement in decisionmaking was measured by a 7-item subscale (Cronbach α : 0.89) from the 39-item scale (Table 2 and Supplemental Digital Content, <http://links.lww.com/MLR/B581>). The response categories were “yes, fully implemented”; “yes, partially implemented,” “yes, but not regularly,” and “no.” This patient engagement composite was then scored on a scale from 0 to 7, with 1 point if fully implemented. The patient-centeredness measure, adapted from the Malcolm Baldrige National Quality Award criteria,²¹ was a 5-item scale ($\alpha = 0.92$) used previously²² (Table 2). The response categories were “disagree,” “somewhat disagree,” “neutral,” “somewhat agree,” and “agree,” 1 being “disagree” and 5 being “agree.” The patient-centeredness composite was the average of the 5 items on a 1–5 scale. The 7-item RC measure ($\alpha = 0.87$) assessed frequency, timeliness, accuracy, and problem-solving focus of communication with each other team member with whom they interacted, in addition to the degree of shared goals, shared knowledge, and mutual respect that team members had with each other^{16,23,24} (Table 2). RC has been found to be positively associated with patient outcomes in previous studies.^{16,17} All of the practice measures were aggregated to the practice level and then attributed to all patients receiving care at that site.

Patient-reported Measures—The PAM-13 was a 13-item measure developed by Hibbard et al²⁵ ($\alpha = 0.90$). Sample questions appear in Table 2. The PAM-13 has been associated with healthy behaviors, more favorable emotional health, and lower costs of care.^{8,9,26}

Control Variables—Clinical and administrative data about the presence or absence of 18 medical conditions in addition to a set of diabetes and cardiovascular diagnoses were analyzed. The total number of included comorbidities in addition to diabetes, cardiovascular, and depression for each patient was calculated. We also adjusted for patient age, sex, education, race/ethnicity, employment status, marital status, and English proficiency.

Statistical Analyses—Hierarchical linear regression models (HLM) separately estimated the association of patient-centered culture, practice-reported shared decision-making activities, and RC, with each of the PROs of physical, emotional, and social functioning, controlling for the earlier noted patient characteristics and accounting for clustering of patient observations within practices using practice site random effects. The grouped structure of data, patients nested within 16 practices, supported our choice of HLM.²⁷ The mediating effect of the PAM-13 on the relationship of practice variables and each of the PROs was examined using multilevel mediation models. All analyses were conducted using Stata 14.0 (StataCorp LP, College Station, TX). Significance values for regression coefficients were considered at a level of 0.05 . Borderline values were reported for P -values in the $P = 0.05$ – 0.10 range.

RESULTS

Table 3 shows descriptive statistics for all patients in the analytic sample ($n = 606$). Table 4 shows the HLM regression results for PROs of emotional, physical, and social function. Model 1 indicates that higher education was generally positively associated with better emotional, physical, and social function in these patients with co-occurring chronic medical and mental health conditions. This was particularly true for those patients with > 4 years of college education for emotional ($\beta = 0.48, P = 0.011$), physical ($\beta = 0.51, P = 0.007$), and social ($\beta = 0.53, P = 0.020$) functioning. As expected, additional comorbidities were associated with worse PROs for emotional ($\beta = -0.06, P < 0.001$), physical ($\beta = -0.12, P < 0.001$), and social ($\beta = -0.07, P = 0.001$) functioning.

Patient-centered practice culture was positively associated with physical functioning ($\beta = 0.35, P = 0.025$), and borderline positively associated with the PHQ-4 for emotional function ($\beta = 0.29, P = 0.059$), but patient-centered practice culture was not significantly associated with social functioning ($\beta = 0.23, P = 0.222$). Model 2 of Table 4 examines the mediating effect of PAM-13. The PAM-13 score is positively associated with the PROs of emotional ($\beta = 0.33, P = 0.001$), physical ($\beta = 0.42, P = 0.001$), and social ($\beta = 0.62, P = 0.001$) functioning. PAM-13 partially mediates the association of patient-centered culture with PROs of emotional ($\beta = 0.24, P = 0.160$), physical ($\beta = -0.07, P = 0.672$), and social ($\beta = -0.14, P = 0.477$) functioning.

We conducted sensitivity analyses involving intermediate outcomes: blood pressure, hemoglobin A1c, low-density lipoprotein-C; we found no relationship to PROs. A modification of our RC composite to reflect all team members also was not associated with PROs. The regression coefficient for RC was consistent irrespective of whether the core team versus full team was included (data not shown).

DISCUSSION

Adult patients with comorbid chronic disease and mental health conditions receiving care from practices with more patient-centered cultures reported better physical functioning, and to a lesser extent emotional functioning. However, they did not report better social functioning. Given the challenges of working with diabetes and cardiovascular patients who also have a comorbid mental health condition, having an organizational culture that is responsive to these patients seems particularly important. Contrary to our hypothesis, neither shared decision-making nor RC were associated with any of the PROs. The finding regarding shared decision-making may be due to the greater difficulty involved in engaging and communicating with patients who have comorbid mental health conditions.

As hypothesized, the relationship of patient-centered culture and PROs of physical and emotional health are partially mediated or accounted for by patient activation (PAM-13). It may be that patients with co-occurring mental health conditions who are more activated ask more questions of their care team, resulting in more practice efforts to improve patient-centeredness of care, such as proactively collecting information about patients' preferences, complaints, and experiences. Longitudinal study designs are needed to establish temporal

ordering and address the possibility that complex patients stimulate patient-centeredness in practices with supportive organizational cultures. Recent studies indicate patient activation may be central to improving patient and clinical outcomes for those with comorbid conditions,²⁸ highlighting the potential of better integration of behavioral health into primary care settings.

Study findings must be considered within the context of limitations. Most importantly the data are cross-sectional and the temporal ordering of the relationships assessed cannot be established. Also, the findings cannot be generalized to all ACO-affiliated primary care practices. Examining a wider range of ACOs, particularly those located in areas serving a relatively high percentage of vulnerable patients with mental health conditions, will be important to assess the generalizability of our findings. Although response rates were high for the patient experience surveys, there were small differences in survey response rates between responding patients and nonresponding patients on sex, age, and having both diabetes and CVD (vs. only one or the other condition). Further, our measure for patient activation focused on chronic conditions broadly and did not contain items focused specifically on what might better engage patients with mental health conditions. For example, patients with comorbid chronic disease and mental health conditions sometimes require care from mental health professionals outside of ACO practice settings. Future studies of RC might include such an expanded group of caregivers and mental health professionals as part of clinician and staff surveys for RC assessment.

In conclusion, we found that patients receiving care from practices having more patient-centered cultures reported better physical functioning and, to a lesser extent, emotional functioning. To our knowledge, the study is the first to examine efforts ACOs make to engage patients, many of whom have comorbid chronic physical and mental health conditions, and to examine the impact on outcomes of care that matter to these complex patients. Further study of patient engagement strategies for patients with mental health conditions is needed and new care models should draw on evidence-based practices that better integrate behavioral health into primary care.^{29–31} This progress will depend importantly on new value-based payment models that encourage integration and greater use of PROs by diminishing fee-for-service payment, as implemented in the Medicare Access CHIP Reauthorization Act.³²

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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REFERENCES

1. Centers for Disease Control Prevention. QuickStats: prevalence of current depression* among persons aged 12 years, by age group and sex—United States, National Health and Nutrition Examination Survey, 2007–2010. *Morb Mortal Wkly Rep.* 2012;60:1747.
2. Hare DL, Toukhsati SR, Johansson P, et al. Depression and cardiovascular disease: a clinical review. *Eur Heart J.* 2014;35:1365–1372. [PubMed: 24282187]
3. Scott KM, Lim C, Al-Hamzawi A, et al. Association of mental disorders with subsequent chronic physical conditions: World Mental Health Surveys from 17 countries. *JAMA Psychiatry.* 2016;73:150–158. [PubMed: 26719969]
4. Correll CU, Solmi M, Veronese N, et al. Prevalence, incidence and mortality from cardiovascular disease in patients with pooled and specific severe mental illness: a large-scale meta-analysis of 3,211,768 patients and 113,383,368 controls. *World Psychiatry.* 2017;16:163–180. [PubMed: 28498599]
5. Menear M, Dore I, Cloutier AM, et al. The influence of comorbid chronic physical conditions on depression recognition in primary care: a systematic review. *J Psychosom Res.* 2015;78:304–313. [PubMed: 25676334]
6. Wang PS, Lane M, Olfson M, et al. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. *Arch Gen Psychiatry.* 2005;62:629–640. [PubMed: 15939840]
7. Shortell SM, Poon BY, Ramsay PP, et al. A multilevel analysis of patient engagement and patient-reported outcomes in primary care practices of accountable care organizations. *J Gen Intern Med.* 2017;32:640–647. [PubMed: 28160187]
8. Greene J, Hibbard JH, Sacks R, et al. When patient activation levels change, health outcomes and costs change, too. *Health Aff (Millwood).* 2015;34:431–437. [PubMed: 25732493]
9. Hibbard JH, Mahoney ER, Stock R, et al. Do increases in patient activation result in improved self-management behaviors? *Health Serv Res.* 2007;42:1443–1463. [PubMed: 17610432]
10. Johnson JA, Al Sayah F, Wozniak L, et al. Collaborative care versus screening and follow-up for patients with diabetes and depressive symptoms: results of a primary care-based comparative effectiveness trial. *Diabetes Care.* 2014;37:3220–3226. [PubMed: 25315205]
11. McEvoy P, Barnes P. Using the chronic care model to tackle depression among older adults who have long-term physical conditions. *J Psychiatr Ment Health Nurs.* 2007;14:233–238. [PubMed: 17430445]
12. Unutzer J, Katon WJ, Fan MY, et al. Long-term cost effects of collaborative care for late-life depression. *Am J Manag Care.* 2008;14: 95–100. [PubMed: 18269305]
13. Wagner EH, Austin BT, Von Korff M. Organizing care for patients with chronic illness. *Milbank Q.* 1996;74:511–544. [PubMed: 8941260]
14. Chen J, Mortensen K, Bloodworth R. Exploring contextual factors and patient activation: evidence from a nationally representative sample of patients with depression. *Health Educ Behav.* 2014;41:614–624. [PubMed: 24786791]
15. Shortell S, Sehgal N, Bibi S, et al. An early assessment of accountable care organizations' efforts to engage patients and their families. *Med Care Res Rev.* 2015;72:580–604. [PubMed: 26038349]
16. Gittel JH, Fairfield KM, Bierbaum B, et al. Impact of relational coordination on quality of care, postoperative pain and functioning, and length of stay: a nine-hospital study of surgical patients. *Med Care.* 2000; 38:807–819. [PubMed: 10929993]
17. Cella D, Riley W, Stone A, et al. The Patient-Reported Outcomes Measurement Information System (PROMIS) developed and tested its first wave of adult self-reported health outcome item banks: 2005–2008. *J Clin Epidemiol.* 2010;63:1179–1194. [PubMed: 20685078]
18. Deutsch A, Gage B, Smith L, et al. Patient-reported Outcomes in Performance Measurement. Washington, DC: National Quality Forum (NQF); 2012.

19. Kroenke K, Spitzer RL, Williams JB, et al. An ultra-brief screening scale for anxiety and depression: the PHQ-4. *Psychosomatics*. 2009;50: 613–621. [PubMed: 19996233]
20. Rose M, Bjorner JB, Gandek B, et al. The PROMIS Physical Function item bank was calibrated to a standardized metric and shown to improve measurement efficiency. *J Clin Epidemiol*. 2014;67:516–526. [PubMed: 24698295]
21. Shortell SM, Marsteller JA, Lin M, et al. The role of perceived team effectiveness in improving chronic illness care. *Med Care*. 2004;42: 1040–1048. [PubMed: 15586830]
22. Wiley JA, Rittenhouse DR, Shortell SM, et al. Managing chronic illness: physician practices increased the use of care management and medical home processes. *Health Aff (Millwood)*. 2015;34:78–86. [PubMed: 25561647]
23. Gittel JH, Beswick J, Goldmann D, et al. Teamwork methods for accountable care: relational coordination and TeamSTEPPS(R). *Health Care Manage Rev*. 2015;40:116–125. [PubMed: 24828004]
24. Gittel JH, Weinberg DB, Bennett AL, et al. Is the doctor in? A relational approach to job design and the coordination of work. *Hum Resour Manage*. 2008;47:729–755.
25. Hibbard JH, Mahoney ER, Stockard J, et al. Development and testing of a short form of the patient activation measure. *Health Serv Res*. 2005;40 (p1):1918–1930. [PubMed: 16336556]
26. Rodriguez HP, Rogers WH, Marshall RE, et al. Multidisciplinary primary care teams: effects on the quality of clinician-patient interactions and organizational features of care. *Med Care*. 2007;45:19–27. [PubMed: 17279018]
27. Nezlek JB. An introduction to multilevel modeling for social and personality psychology. *Soc Personal Psychol Compass*. 2008;2:842–860.
28. McCusker J, Lambert SD, Cole MG, et al. Activation and self-efficacy in a randomized trial of a depression self-care intervention. *Health Educ Behav*. 2016;43:716–725. [PubMed: 27179288]
29. Kroening-Roche J, Hall JD, Cameron DC, et al. Integrating behavioral health under an ACO global budget: barriers and progress in Oregon. *Am J Manag Care*. 2017;23:e303–e309. [PubMed: 29087165]
30. Fullerton CA, Henke RM, Crable L, et al. The impact of Medicare ACOs on improving integration and coordination of physical and behavioral health care. *Health Aff (Millwood)*. 2016;35:1257–1265. [PubMed: 27385242]
31. Lewis VA, Colla CH, Tierney K, et al. Few ACOs pursue innovative models that integrate care for mental illness and substance abuse with primary care. *Health Aff (Millwood)*. 2014;33:1808–1816. [PubMed: 25288427]
32. US Congress. HR 2—Medicare Access and CHIP Reauthorization Act of 2015. Pub L. 2016 (114–10). Available at: <https://www.congress.gov/bill/114th-congress/house-bill/2/text>.

TABLE 1.**Inclusion Criteria for Patients With Mental Health Conditions**

Age (18–82 y) as of December 31, 2014

Patient language preference of English, Spanish, or not known

Patient receiving care at 1 of 8 primary care practice sites selected for participation at each Accountable Care Organization (at least 1 visit to the practice in 2014)

Patient has at least one of the following ICD-9-CM diagnosis codes in the electronic health record or has filled a prescription within the past year for a medication used to treat diabetes or cardiovascular disease in year 2014

(NCQA)

Diabetes mellitus, 250

Ischemic heart disease, 410–414

Other forms of heart disease, 426–429

Cerebrovascular disease, 430–438

Patients having at least one of the following ICD-9-CM diagnosis codes in the electronic health record between January 1, 2012 and December 31, 2014 will be identified as the ones with mental health conditions (NCQA)

Depression, 311, 296.2, 296.3

Anxiety and related disorders, 300

Other mental health disorders, 295–299, 309

ICD-9-CM indicates International Classification of Diseases, Ninth Revision, Clinical Modification; NCQA, National Committee for Quality Assurance.

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TABLE 2.

Sample Questions of Patient Activation and Engagement, Patient-Centeredness, Relational Coordination, and PAM Instruments

Name of Instruments	No. Items	Cronbach α	Example Items
Patient Activation and Engagement—7-item Subscale	7	0.89	(1) “clinicians consistently encourage patients to discuss their work, home life, and social situation” (2) “staff note patient preferences for treatment in the patient’s record”; (3) “clinicians consistently involve patients in developing treatment goals”; (4) “physicians have follow-up discussions with patients regarding their treatment options and preferences”; (5) “clinicians discuss the importance of patient advanced directives”; (6) “clinicians discuss the hospice care options with patients”; and (7) “clinicians discuss the availability of hospital-based and community-based palliative care”
Patient-Centeredness	5	0.92	(1) “The practice does a good job of assessing current patient needs and expectations”; (2) “staff promptly resolve patient complaints”; (3) “patients’ complaints are studied to identify patterns and prevent the same problems from recurring”; (4) “the organization uses data from patients to improve services”; and (5) “the organization uses data on customer expectations and/or satisfaction/experiences when designing new services.”
Relational Coordination	7	0.87	Examples are asked such as: “how frequently do people in each of these groups communicate with you about patients with diabetes and/or cardiovascular disease?” In regard to shared knowledge, each team member is asked “do people in each of these groups know about the work you do with patients with diabetes and/or cardiovascular disease?”
PAM-13	13	0.90	Sample questions include: “when all is said and done, I am the person who is responsible for managing my health condition”; “I am confident that I can take actions that will help prevent or minimize some symptoms or problems associated with my health condition”; and “I am confident that I can follow through on medical treatments I need to do at home.”

PAM indicates patient activation measure.

TABLE 3.

Descriptive Statistics for Key Study Variables

Patient measures (median) (IQR, SD)	
Emotional functioning (N = 602)	3.25 (1.5–0.88)
Physical functioning (N = 606)	3.8 (1.4–0.94)
Social functioning (N = 602)	3.17 (1.5–1.04)
Total count of comorbidities (disease burden) (N=606)	6 (3–2.55)
PAM (N = 602)	3.15 (0.69–0.46)
Age (N = 606) [n (%)]	
18–44	48 (7.92)
45–64	219 (36.14)
65+	339 (55.94)
Sex (N=606) [n (%)]	
Male	209 (34.49)
Female	397 (65.51)
Education (N = 592) [n (%)]	
8th grade or less	84 (14.19)
GED or some high school	172 (29.05)
Four-year college degree or some college	273 (46.11)
> 4y college degree	63 (10.64)
English proficiency (N = 596) [n (%)]	
Good (well/very well)	470 (78.86)
Poor (not well/not at all)	126 (21.14)
Race/ethnicity (N = 599) [n (%)]	
White	259 (43.24)
Hispanic/Latino	245 (40.90)
African American	43 (7.18)
Other	52 (8.68)
Marital status (N=599) [n (%)]	
Married	302 (50.42)
Unmarried	297 (49.58)
Employment (N = 576) [n (%)]	
Unable to work	96 (16.67)
Unemployed: able to work	51 (8.85)
Employed	160 (27.78)
Retired	269 (46.70)
Practice variables (N = 606) (median) (IQR, SD)	
Relational coordination	4.1 (0.18–0.22)
Patient-centeredness	4.23 (0.41–0.28)
Practice-reported shared decision-making	3 (5–2.58)

GED indicates graduate equivalency degree; IQR, interquartile range; PAM, patient activation measure

TABLE 4.

Hierarchical Linear Models for Patient-Reported Outcomes for Emotional, Physical, and Social Function

	Emotional Function [Coefficient (P)]		Physical Function [Coefficient (P)]		Social Function [Coefficient (P)]	
	Model 1 (n = 584)	Model 2 (n = 551)	Model 1 (n = 587)	Model 2 (n = 554)	Model 1 (n = 583)	Model 2 (n = 554)
Constant	2.58 (0.002)	1.32 (0.115)	3.76 (<0.001)	3.04 (<0.001)	3.20 (0.001)	1.86 (0.050)
Age (vs. 18–44) (y)						
45–64	0.07 (0.620)	–0.02 (0.867)	–0.18 (0.214)	–0.18 (0.159)	–0.18 (0.283)	–0.19 (0.229)
65+	0.27 (0.055)	0.08 (0.598)	–0.31 (0.025)	–0.43 (0.002)	–0.11 (0.519)	–0.27 (0.114)
Female (vs. male)	–0.11 (0.150)	–0.07 (0.362)	–0.13 (0.078)	–0.12 (0.078)	–0.01 (0.895)	0.00 (0.980)
Education (vs. 8th grade or less)						
GED or some high school	0.25 (0.085)	0.18 (0.201)	0.17 (0.264)	0.08 (0.567)	0.24 (0.180)	0.13 (0.426)
Four-year college degree or some college	0.37 (0.023)	0.21 (0.183)	0.19 (0.240)	0.06 (0.670)	0.34 (0.076)	0.20 (0.275)
> 4-year college degree	0.48 (0.011)	0.30 (0.107)	0.51 (0.007)	0.33 (0.051)	0.53 (0.020)	0.33 (0.110)
Poor English proficiency (vs. good)	0.11 (0.399)	0.20 (0.136)	0.01 (0.945)	0.10 (0.441)	0.36 (0.024)	0.42 (0.006)
Total count of comorbidities (disease burden)	–0.06 (<0.001)	–0.03 (0.094)	–0.12 (<0.001)	–0.08 (<0.001)	–0.07 (0.001)	–0.02 (0.271)
Patient-centeredness of practice	0.29 (0.059)	0.24 (0.160)	0.35 (0.025)	–0.07 (0.672)	0.23 (0.222)	–0.14 (0.477)
Practice-reported shared decision-making	–0.01 (0.661)	–0.01 (0.578)	–0.02 (0.282)	0.02 (0.257)	0.01 (0.546)	0.04 (0.060)
Relational coordination of practice	–0.15 (0.441)	–0.11 (0.529)	–0.10 (0.592)	–0.09 (0.606)	–0.17 (0.463)	–0.18 (0.374)
Race/ethnicity (vs. white)						
Hispanic/Latino	—	–0.25 (0.016)	—	0.02 (0.830)	—	0.01 (0.914)
African American	—	–0.14 (0.361)	—	–0.13 (0.347)	—	0.08 (0.624)
Other	—	–0.11 (0.405)	—	0.02 (0.865)	—	–0.05 (0.723)
Married (vs. unmarried)	—	–0.05 (0.522)	—	–0.07 (0.296)	—	–0.08 (0.321)
Employment (vs. unable to work)						
Retired	—	0.54 (<0.001)	—	0.94 (<0.001)	—	0.92 (<0.001)
Unemployed: able to work	—	0.28 (0.056)	—	1.01 (<0.001)	—	0.77 (<0.001)
Employed	—	0.58 (<0.001)	—	1.10 (<0.001)	—	0.99 (<0.001)
Patient activation measure	—	0.33 (<0.001)	—	0.42 (<0.001)	—	0.62 (<0.001)
Akaike Information Criterion	1488.2	1347.9	1517.2	1281.2	1694.7	1502.6
Bayesian Information Criterion	1549.4	1442.7	1578.5	1376.2	1755.9	1597.6