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Adoption of Patient-Reported Outcomes by Health Systems and Physician Practices in the USA

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BACKGROUND: Patient-reported outcome measures (PROs) can help clinicians adjust treatments and deliver patient-centered care, but organizational adoption of PROs remains low.

OBJECTIVE: This study examines the extent of PRO adoption among health systems and physician practices nationally and examines the organizational capabilities associated with more extensive PRO adoption.

DESIGN: Two nationally representative surveys were analyzed in parallel to assess health system and physician practice capabilities associated with adoption of PROs of disability, pain, and depression.

PARTICIPANTS: A total of 323 US health system and 2,190 physician practice respondents

METHODS: Multivariable regression models separately estimated the association of health system and physician practice capabilities associated with system-level and practice-level adoption of PROs.

MAIN MEASURES: Health system and physician practice adoption of PROs for depression, pain, and disability.

KEY RESULTS: Pain (50.6%) and depression (43.8%) PROs were more commonly adopted by all hospitals and medical groups within health systems compared to disability PROs (26.5%). In adjusted analyses, systems with more advanced health IT functions were more likely to use disability ($p<0.05$) and depression ($p<0.01$) PROs than systems with less advanced health IT. Practice-level advanced health IT was positively associated with use of depression PRO ($p<0.05$), but not disability or pain PRO use. Practices with more chronic care management processes, broader medical and social risk screening, and more processes to support patient responsiveness were more likely to adopt each of the three PROs. Compared to independent physician practices, system-owned practices and community health centers were less likely to adopt PROs.

CONCLUSIONS: Chronic care management programs, routine screening, and patient-centered care initiatives can enable PRO adoption at the practice level. Developing these practice-level capabilities may improve PRO adoption more than solely expanding health IT functions.

KEY WORDS: patient-reported outcomes; care management; health information technology; health systems.

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INTRODUCTION

Health care organizations experience hurdles when collecting and using patient-reported outcome measures (PROs), including workflow disruption, technical challenges, making data actionable, and lack of incentives.[1,2] A recent systemic review found that simply providing clinicians with feedback on their patients' PROs does not improve patient symptoms.[3] Recently published randomized trials, however, indicate that feedback combined with automated decision support can improve patient symptoms, as measured by PROs.[4,5] These findings suggest that collection and use of PROs can be facilitated by advanced health information technology (health IT) because health IT enables automated delivery and scoring of PRO assessments and remote monitoring of symptoms.[6]

Little evidence, however, currently exists about the extent of adoption of PROs by health care organizations nationally,[7] and no information exists about organizational characteristics and capabilities associated with PRO adoption. Leveraging national cross-sectional surveys of health systems and physician practices, we examine system-level and practice-level capabilities associated with organizational adoption of PROs for depression, disability, and pain, which are among the most well validated and widely used PRO domains.[8]

Medical groups, hospitals, and other health care organizations increasingly operate under the umbrella of health systems to improve their positioning as part of risk-based contracts, to better manage patient care across the continuum of care, and to control spending.[9] Health systems that own physician practices *and* hospitals may benefit from collecting PROs to better manage care across care settings. For systems, ownership and management of hospitals and medical groups can facilitate prioritization and use of PROs, alignment of stakeholder interests, and standardization of implementation across care settings.[10,11] Consequently, we hypothesize that health systems that own and manage hospitals and practices will adopt PROs more extensively compared to systems that

do not own and manage organizations across the inpatient and outpatient continuum of care (Hypothesis 1).

Disruptive innovations in health care that require extensive workflow redesign, like PROs, may be enabled by practice teamwork and culture, and discouraged by systems that constrain practice-level prioritization and experimentation. Moreover, there is limited evidence to justify routine use of PROs in clinical care[12]. We hypothesize that system-owned practices will be less likely to use PROs compared to independent physician practices because PROs are a disruptive innovation that is supported by practice teamwork and culture and because patient-centered innovation within independent practices is not constrained by a broader organization (Hypothesis 2).

Practices adopt PROs for priority patient subpopulations that are being managed as part of chronic care management programs or efforts to improve patient-centered care.[13,14] PROs are more easily integrated into routine practice when chronic care management processes, medical and social risk screening, and processes for responding to patients are already in place. Given the documented frontline challenges of using PROs for treatment adjustment,[6,15,16] we hypothesize that these organizational capabilities will be associated with practice-level use of PROs because they enable routine implementation (Hypothesis 3).

METHODS

Data Sources

Two separate cross-sectional surveys were conducted in parallel to assess the characteristics and capabilities of a nationally representative sample of health systems and physician practices. Data from the 2017–2018 health system and physician practice surveys of the National Survey of Healthcare Organizations & Systems (NSHOS), which assessed organizational characteristics and capabilities, including health IT and PROs, were analyzed. Survey responses were merged with data obtained from IQVIA OneKey database to provide additional context on health system and physician practice organizational characteristics. This study was approved by the Institutional Review Boards at University of California, Berkeley and Dartmouth College.

Survey Sampling and Administration

Sample frames for the health system and physician practice surveys were operationalized using mid-year 2015 IQVIA OneKey data. Health systems were considered organizational entities that include at least one hospital and at least one set of primary care physicians who are connected by contract or ownership. The physician practice survey included primary care or multi-specialty medical practices with three or more primary care physicians. A Monte Carlo algorithm was constructed to estimate the sampling probabilities for systems and practices. Additional sampling detail is included in the Supplemental Material, Tables 1 and 2.

Respondents were the person most knowledgeable about the survey questions; for the health system survey, respondents were commonly Presidents, CEOs, or Chief Medical Officers. For the practice survey, respondents were physician leaders or practice administrators.

Analytic Sample

Of the 732 randomly sampled health systems, 446 responded (60.9% response rate) and 323 were included in the analytic sample after excluding subsidiary organizations and incomplete responses, excluding duplicate surveys and surveys with high non-response on key study questions from the 2,333 total responses (48.6% response rate), resulting in an analytic sample of 2,190 physician practices.

Measures

Outcome Measures. The health system survey assessed the extent of system-level adoption of PROs of depression, disability, and pain for hospitals and medical practices with the system. For each of the three PROs (depression, disability, and pain), respondents indicated "how many hospitals/medical groups in the system collect patient-reported measures" as "none," "some," "most," or "all" of hospitals and/or medical practices. The Brant test was used to assess the proportional odds assumption for ordinal variables.[17] The assumption was met for the disability and pain PRO measures, but not the depression PRO measure. Consequently, each of the three PROs was specified as binary for the system-level regression analyses. Systems with PRO adoption for "all" hospitals and/or medical practices were compared to systems with adoption for "most," "some," and "none" of the system's hospitals and/or medical practices. We opted for this strict categorization of adoption given our interest in broad use rather than partial use within health systems.

At the practice level, a single binary (Yes/No) question assessed overall practice-level adoption of depression PROs. Pain and disability PRO use were assessed using four binary questions about PRO collection for four patient subgroups: (1) older adults, (2) diabetics, (3) musculoskeletal patients, and (4) heart failure patients. Count measures (range: 0–4) were separately constructed based on responses to practice-level adoption of pain and disability based on the four patient subgroups assessed.

Main Independent Variables

Ownership. Health systems were categorized into four ownership categories based on responses to a series of questions about system ownership and management of hospitals and medical groups: (1) own and manage hospitals and medical practices (n=86, 26.5%); (2) own and manage physician practices only (n=153, 47.2%); (3) own hospitals and physician practices, with limited management (n=41,

12.7%); and (4) other ownership and management arrangements (*n*=44, 13.6%).

Physician practices were classified into five categories based on responses to ownership questions: (1) medical groups (*n*=234, 11.1%), (2) hospital or health care systems (*n*=1,018, 46.5%), (3) community health centers (*n*=314, 13.3%), (4) independent physician practices (*n*=565, 25.8%), and (5) "other" practice ownership (*n*=50, 2.3%).

Chronic care management processes (CMPs) were measured using a count measure of 23 potential processes related to practice-level use of clinical decision-support tools, patient registries, and measurement of individual clinician performance (range: 0–23).[18] Routine medical and social risk screening was measured using a count measure of routine collection of 13 patient medical and social risks (range: 0–13).[19]

Approaches to disseminate best patient care practices were assessed using six questions that assessed practice-level use of regular staff meetings, regular listserv emails/newsletters, departmental representatives/champions, an electronic database of practice or system endorsed guidelines, decision support tools embedded in the EHR, and performance improvement events (e.g., LEAN Kaizen training) (range: 0–6).

Processes to support patient responsiveness were assessed using four questions adapted from the National Malcolm Baldrige Quality Award criteria.[20] Respondents reported the extent to which they agreed that (1) the practice did a good job of assessing patient needs, (2) patients' complaints were assessed, (3) the practice promptly resolved patient complaints, and (4) the practice used data from patients to improve care. A composite of the Baldrige Criteria was calculated as the average of the 4 item responses, which used a 5-point Likert scale ranging from "strongly disagree" to "strongly agree," scored as a 0–100 scale to aid in interpretation (internal consistency reliability, α=0.79).

Five advanced health IT functions were separately assessed for health systems and practices: (1) use of advanced analytics, (2) prescription refill status function available, (3) patients' ability to communicate via email, (4) patients' access to their medical record, and (5) patients' ability to contribute to their medical record. These questions were based upon questions from the National Surveys of Physician Organizations [21–23]. A count measure (range: 0–5) of advanced health IT was separately calculated for each health system and practice. The supplemental material Table 3 includes additional detail about item content for each practice capability assessed.

Control Variables

For health systems and practices, a count measure (range: 0–4) of four external incentive payment initiatives was calculated based on responses to participation in the following: (1) capitated contracts with commercial health plans, (2) Medicare accountable care organization (ACO) risk bearing contracts (Pioneer, Next Gen, Medicare Shared Savings Program track three), (3) Medicaid ACO contracts, and (4) commercial ACO contracts.

For both health systems and practice regression analyses, we control for the number of physicians and specialist-to-primary care physician ratio. For health system analyses, we additionally control for for-profit status, ownership of health plans, and ownership of rehabilitation facilities. For practice analyses, we additionally controlled for Medicaid revenue (% of total) as a categorical variable: (1) no Medicaid (0%), (2) low Medicaid (<30%), (3) high Medicaid (>30%) to account for vulnerable patient populations served by practices. This categorization of Medicaid revenue has been used in past research comparing practice capabilities.[24]

Analyses

We examined unadjusted associations between practice ownership and covariates, using chi-square tests for categorical variables and ANOVA tests for continuous variables.

For the system-level regression models, separate multivariable logistic regression models estimated the association of system ownership and advanced health IT with system-level adoption of each of the three PROs, controlling for health system size, specialist-to-primary care physician ratio, external incentive program participation, for-profit status, and US census region (West, South, Northeast, and Midwest).

For the practice-level regression models, separate multivariable regression models estimated the association of ownership and capabilities with practice-level adoption of each of the three PROs, controlling for practice size, external incentive program participation, and Medicaid revenue. Logistic regression was used for the binary depression PRO adoption measure. For the two count measures of PRO adoption (pain and disability) at the practice-level, Poisson regression models were estimated. There was no evidence of overdispersion for the Poisson regression models for the Poisson models based on likelihood ratio tests of the overdispersion parameter, alpha, which was assessed by estimating the models using a negative binomial distribution.[25]

As a sensitivity analysis, the regression models were specified with state fixed effects to account for state policies that may influence PRO adoption. All results were weighted to account for differential sampling probabilities. Average marginal effects were used to express how the predicted probability of each binary outcome changes with a change in a predictor.[26] All statistical analyses were conducted using STATA 15.1.

RESULTS

Descriptive Analyses

Table 1 summarizes practice characteristics, stratified by ownership. Independent physician practices have less advanced health IT, use fewer evidence dissemination strategies and fewer chronic care management processes, and have less extensive participation in external incentive programs,

Table 1 Physician Practice Characteristics and Capabilities, Stratified by Practice Ownership

	All physician practices	Independent physician practices	Practices of medical groups	Federally qualified health center practices	Practices of hospital/health care systems	Other practices	*p*-value
***n* (% of practices)**	2,190	565 (25.8%)	243 (11.1%)	314 (13.34%)	1,018 (46.48%)	50 (2.28%)	
Practice capabilities, mean (standard deviation)							
Advanced health information technology capabilities (range: 0–5)	3.0 (0.03)	2.7 (0.06)	3.3 (0.08)	2.9 (0.08)	3.2 (0.04)	2.7 (0.19)	‡
External incentive program participation (range: 0–4)	1.5 (0.03)	1.2 (0.05)	1.8 (0.09)	1.7 (0.08)	1.6 (0.04)	1.5 (0.20)	‡
Processes for patient responsiveness (range: 0–5)	3.7 (0.02)	3.7 (0.03)	3.7 (0.05)	3.7 (0.04)	3.6 (0.02)	3.9 (0.12)	*
Medical and social risk screening (range: 0–13)	7.0 (0.07)	6.6 (0.13)	7.1 (0.21)	8.5 (0.18)	6.7 (0.10)	7.6 (0.53)	‡
Evidence dissemination strategies (range: 0–6)	3.9 (0.04)	3.0 (0.08)	4.3 (0.10)	4.4 (0.09)	4.2 (0.06)	4.1 (0.26)	‡
Chronic care management processes (0–23)	16.7 (0.21)	15.1 (0.41)	19.0 (0.61)	19.0 (0.51)	16.4 (0.30)	16.7 (1.34)	‡
Physician practice size, %							‡
3 or fewer physicians	24.6	34.2	23.1	18.2	21.6	26.0	
4–7 physicians	38.6	43.5	32.5	34.1	38.6	40.0	
8–12 physicians	15.1	12.9	9.9	19.1	16.3	16.0	
13–19 physicians	7.6	3.5	10.3	14.0	7.6	2.0	
20+ physicians	14.1	5.8	24.3	14.7	15.9	16.0	
Medicaid revenue, %							‡
No Medicaid revenue (0%)	13.2	27.3	16.1	3.8	7.6	12.0	
Low Medicaid revenue, <30%	65.0	63.9	69.6	48.7	69.5	66.0	
High Medicaid revenue, >30%	21.9	8.9	14.4	47.5	23.0	22.0	
US census region, %							‡
West	25.0	23.2	37.0	32.5	20.4	34.0	
South	28.8	20.5	21.4	23.6	37.2	20.0	
Northeast	19.8	22.1	15.6	22.3	19.1	12.0	
Midwest	26.4	34.2	25.9	21.7	23.3	34.0	

Source: National Survey of Healthcare Organizations and Systems (NSHOS). *p*-value represents statistically significant differences for the variable across ownership categories. *$p<0.05$, ‡$p<0.001$

compared to practices owned by health systems and medical groups.

Pain (50.6%) and depression (43.8%) PROs were more commonly adopted by "all hospitals and medical groups" within health systems compared to disability PROs (26.5%) (data not shown). At the practice level, PROs for depression were adopted by most practices (77.5%). Disability PROs were adopted most often for older adult patients (63.7%), followed by patients with diabetes (54.8%), heart failure (48.2%), and musculoskeletal conditions (40.3%) (Table 2). Pain PROs were adopted most for older adult (59.0%) and musculoskeletal patients (57.7%).

Adjusted Analyses

In multivariable regression analyses, systems with more advanced health IT functions were more likely to use disability ($p<0.05$) and depression ($p<0.01$) across "all" hospitals and medical groups compared to systems with less advanced health IT (Table 3 and Supplemental Material, Figure). Compared to systems that owned both hospitals and medical groups, systems that owned only medical groups adopted disability PROs less extensively ($p<0.01$), but depression PROs more extensively ($p<0.01$). Systems that owned hospitals and medical groups, but had limited management (compared to sole management) adopted depression PROs more extensively ($p<0.01$). Higher specialist-to-primary care physician ratios and system ownership of health insurance plans, rehabilitation centers or skilled nursing facilities were not associated with system-level PRO use.

In multivariable regression analyses (Table 4), practices were more likely to adopt disability, pain, and depression PROs when they had more chronic care management processes ($p<0.001$), broader medical and social risk screening ($p<0.001$), and more processes to support patient responsiveness ($p<0.05$) compared to practices with more limited capabilities. Practices using more evidence dissemination strategies were more likely to adopt disability ($p<0.001$) and depression ($p<0.01$) PROs, but not pain PROs. Practices with more advanced health IT did not have more extensive adoption of disability or pain PROs, but were more likely to use depression PROs ($p<0.05$). External incentive program participation and evidence dissemination strategies were not associated with PRO use at the practice level.

Compared to independent physician practices, system-owned practices were less likely to use disability ($p<0.001$) and depression ($p<0.001$) PROs, but not pain PROs. Community health centers were less likely to use disability ($p<0.001$) and pain ($p<0.001$) PROs, but not depression PROs than independent practices. Physician group-owned practices were less likely to use depression PROs ($p<0.001$) compared to independent practices, but not disability and pain PROs.

Table 2 Practice-Level Adoption of Patient-Reported Outcomes of Disability, Pain, and Depression, by Practice Ownership

Patient-reported outcome (PRO) measure and population adopted (%)	All physician practices	Independent physician practices	Practices of medical groups	Federally qualified health center practices	Practices of hospital/health care systems	Other practices	*p*-value
	2,190	565	243	314	1,018	50	
Disability PROs							
Older patients	63.7	71.7	73.3	58.3	58.3	72.0	‡
Diabetic patients	54.8	62.7	62.1	57.6	47.3	66.0	‡
Musculoskeletal patients	40.3	47.3	49.4	41.1	33.2	56.0	‡
Heart failure patients	48.2	53.1	58.0	46.5	43.0	60.0	‡
Pain PROs							
Older patients	59.0	57.9	63.8	62.4	56.7	74.0	*
Diabetic patients	53.0	54.2	55.1	58.9	49.5	64.0	*
Musculoskeletal patients	57.7	55.6	60.9	62.4	56.2	66.0	N/S
Heart failure patients	46.1	45.0	48.6	51.0	44.3	54.0	N/S
Depression PROs	77.5	79.6	77.4	83.4	74.2	86.0	†

*Source: National Survey of Healthcare Organizations and Systems (NSHOS). Standard errors are in parenthesis. *p<0.05, †p<0.01, ‡p<0.001; N/S, not significant*

Results of sensitivity analyses that included state fixed effects were consistent with our main results (see Supplemental Material, Tables 4 and 5), although the ownership effects attenuated in the system-level regression model.

DISCUSSION

We conducted the first national assessment of US health system and practice capabilities associated with adoption of PROs of disability, pain, and depression. We found partial support for Hypothesis 1; systems that owned and managed hospitals and medical groups were more likely to adopt disability PROs for "all" hospitals and medical groups compared to systems that only owned and managed medical groups. However, they were less likely to adopt depression PROs compared to systems that own medical groups only and systems with limited management responsibility for hospitals and/or medical groups. The results underscore that simply because health systems own and manage hospitals and medical groups and have greater control of the continuum of care does not necessarily motivate their broad use of PROs.

Practices owned by health systems and community health centers adopted disability and depression PROs less

Table 3 Association of Health System Characteristics and System-Level Adoption of Patient-Reported Outcome Measures of Disability, Pain, and Depression

	Coefficient		
	Disability PROs	**Pain PROs**	**Depression PROs**
System capabilities			
Advanced health information technology capabilities	0.17 (0.097)	0.13 (0.112)	0.23 (0.116)*
External incentive program participation	0.02 (0.132)	−0.12 (0.171)	0.12 (0.192)
Health care system size (number of physicians)	−0.00 (0.000)	0.00 (0.000)	0.00 (0.000)
Own and manage hospital and physician practices (reference)	-	-	-
Own and manage physician practices only	−0.93 (0.459)*	−0.59 (0.519)	1.01 (0.534)
Own hospital and physician practices, but limited management	0.30 (0.457)	1.5 (1.029)	1.28 (0.630)*
Other ownership and management	−1.04 (0.438) *	−0.44 (0.478)	0.09 (0.496)
Own rehabilitation center or skilled nursing facility	−0.33 (0.353)	0.22 (0.424)	−0.30 (0.422)
Own health insurance plan	−0.06 (0.343)	0.57 (0.476)	−0.00 (0.413)
Specialist-to-PCP ratio	−0.18 (0.114)	−0.06 (0.109)	−0.07 (0.096)
For-profit status	0.49 (0.416)	0.18 (0.437)	0.09 (0.514)
South (reference)	-	-	-
Midwest	−0.69 (0.426)	−1.01 (0.491)*	0.06 (0.472)
Northeast	−0.90 (0.4110)*	−0.55 (0.525)	−0.52 (0.491)
West	−0.65 (0.441)	−0.20 (0.527)	−0.01 (0.550)
Multi-region	−0.17 (0.541)	−1.10 (0.655)	−0.06 (0.627)
Intercept	1.70 (0.564)†	1.75 (0.593)†	0.86 (0.605)
Observations	325		

*Source: National Survey of Healthcare Organizations and Systems (NSHOS) and IQVIA One Key Data. Logistic regression was used to estimate each binary outcome. Standard errors are in parenthesis. *p<0.05, †p<0.01, ‡p<0.001. PROs, patient-reported outcomes*

Table 4 Association of Physician Practice Characteristics on Practice-Level Adoption of Patient-Reported Outcome Measures of Depression, Pain, and Physical Function

	Coefficient		
	Disability PROs	**Pain PROs**	**Depression PROs**
Practice capabilities			
Advanced health information technology capabilities	0.01 (0.014)	0.01 (0.015)	0.09 (0.05)*
External incentive program participation	0.00 (0.013)	0.02 (0.014)	0.04 (0.041)
Processes to improve patient responsiveness	0.12 (0.028) ‡	0.05 (0.03)*	0.16 (0.085)*
Medical and social risk screening activity	0.07 (0.005) ‡	0.07 (0.006) ‡	0.1 (0.022) ‡
Evidence dissemination strategies	0.012 (0.014)	0.00 (0.015)	0.04 (0.041)
Chronic care management processes	0.02 (0.003) ‡	0.01 (0.003) ‡	0.03 (0.009) ‡
Physician practice size			
0–3 physicians	−0.01 (0.057)	−0.06 (0.061)	−0.23 (0.216)
4–7 physicians	−0.08 (0.053)	−0.11 (0.056) †	−0.30 (0.198)
8–12 physicians	−0.10 (0.063)*	−0.08 (0.066)	−0.45 (0.228) †
13–19 physicians	−0.07 (0.077)	−0.01 (0.079)	−0.22 (0.304)
20 + physicians (reference)	-	-	-
Practice ownership			
Independent (reference)	-	-	-
Physician group	−0.05 (0.051)	0.02 (0.060)	−0.67 (0.221) ‡
Community health center	−0.29 (0.059) ‡	−0.12 (0.062) ‡	−0.10 (0.240)
Hospital/healthcare system	−0.26 (0.044) ‡	−0.04 (0.049)	−0.56 (0.161) ‡
Other	−0.02 (0.116)	0.12 (0.131)	0.12 (0.503)
Medicaid revenue			
Low Medicaid revenue, <30%	−0.13 (0.048) ‡	−0.10 (0.055)*	0.07 (0.18)
High Medicaid revenue, >30%	−0.18 (0.06) ‡	0.02 (0.064)	0.16 (0.226)
No Medicaid revenue (reference)	-	-	-
Intercept	−0.51 (0.121) ‡	−0.18 (0.133)	−0.51 (0.384)
Observations	2,190		

Source: National Survey of Healthcare Organizations and Systems (NSHOS) and IQVIA One Key Data
*Standard errors are in parenthesis. * $p<0.05$, † $p<0.01$, ‡ $p<0.001$*
The disability and pain models use Poisson regression for count measures and the depression model uses logistic regression for binary outcomes.
PROs, patient-reported outcomes

extensively than independent practices, partially supporting Hypothesis 2. Lower adoption may be due to payer requirements, which do not directly incentivize routine PRO data collection or reporting. Independent physician practices tend to have longer-term relationships with their patients which may facilitate PRO data collection. Normative considerations,[27] such as shared professional values related to improving patient engagement, might contribute to the relatively higher adoption of PROs among independent practices. Future qualitative research should clarify how to support independent practices to translate their collection of PROs to routine use as part of remote monitoring of symptoms, treatment adjustment, and the delivery of patient-centered care.

Health systems and payers will need to assist practices in establishing chronic care management processes, medical and social risk screening, and processes to be responsive to patients' needs and preferences, as these capabilities were more strongly associated with practice-level PRO adoption than advanced health IT, in support of Hypothesis 3. Research on PRO implementation highlights the challenges associated with providing the right PRO measure for the right patient at the right time.[16] Care management and screening programs both focus on priority populations for which PROs can be integrated to manage positive screens and refer patients to treatment services can make PROs more directly actionable.[28]

Importantly, we found that external incentive participation was not associated with system-level or practice-level PRO use. Practice participation in external incentives programs have been previously associated with broader adoption of chronic care management processes and health IT functions.[7] Although PROs can be useful for care management,[29] unlike health IT, payers have not directly incentivized PRO use. Clinicians under risk-based arrangements are often unaware of them because they are shielded from external requirements by health system and practice leaders, potentially limiting the influence of these incentives on practice-level PRO adoption.[30] To support PRO adoption across hospitals and practices may need to more directly incentivize "meaningful use" of PROs as part of future value-based incentive contracts.[31]

Our study results should be considered in light of important limitations. First, the NSHOS surveys assessed whether systems and practices "collected" PROs, but did not assess the extent to which PROs were routinely used. Past research finds that PROs are not routinely used to inform treatment; our results focused on organizational adoption are consistent with these observations.[32] Second, the surveys are cross-sectional and cannot establish causal relationships. Third, NSHOS system survey only included questions that could be reliably assessed by system leaders, which precluded the assessment of the full range of capabilities assessed in the practice survey. Finally, although we considered specialist-to-primary care physician ratios and Medicaid revenue, omitted variable bias is possible. For example, we did not have patient-level PRO assessment data or information about patient case mix that

could potentially explain differences in organizational adoption. Future research should examine how patients' clinical needs shape organizational adoption and use of PROs.

CONCLUSION

Support for practices with limited chronic care management processes, medical and social risk screening, and processes to support patient responsiveness may be needed to enable routine collection and use of PROs at the practice level. Developing these capabilities could advance the use of PROs more than solely expanding health IT functions or participating in external incentive programs.

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s11606-022-07631-0.

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Declarations:

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