Impact of Pre-visit Contextual Data Collection on Patient-Physician Communication and Patient Activation: a Randomized Trial

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BACKGROUND: Patient contextual data (PCD) are often missing from electronic health records, limiting the opportunity to incorporate preferences and life circumstances into care. Engaging patients through tools that collect and summarize such data may improve communication and patient activation. However, differential tool adoption by race might widen health care disparities.

OBJECTIVE: Determine if a digital tool designed to collect and present PCD improves communication and patient activation; secondarily, evaluate if use impacts outcomes by race.

DESIGN, SETTING, AND PARTICIPANTS: A pragmatic, two-armed, non-blinded, randomized controlled trial conducted during 2019 in a primary care setting.

INTERVENTION: The PCD tool (PatientWisdom) invited patients to identify preferences, values, goals, and barriers to care. Patients were randomized to a standard pre-visit email or facilitated enrollment with dedicated outreach to encourage use of the tool.

MAIN OUTCOMES AND MEASURES: Outcomes of interest were post-visit patient communication and patient activation measured by the Communication Assessment Tool (CAT) and Patient Activation Measure (PAM), respectively. Outcomes were evaluated using treatment-on-the-treated (TOT) and intention-to-treat (ITT) principles.

KEY RESULTS: A total of 301 patients were enrolled. Facilitated enrollment resulted in a five-fold increase in uptake of the PCD tool. TOT analysis indicated that the PCD tool was associated with notable increases in specific CAT items rated as excellent: “treated me with respect” (+ 13 percentage points; $p = 0.04$), “showed interest in my ideas” (+ 14 percentage points; $p = 0.03$), “showed care and concern” (+ 16 percentage points; $p = 0.02$), and “spent about the right amount of time with me” (+ 11 percentage points; $p = 0.05$). There were no significant pre/post-visit differences in PAM scores between arms (− 4.41 percentage points; $p = 0.58$). ITT results were similar.

We saw no evidence of the treatment effect varying by race in ITT or TOT analyses.

CONCLUSIONS AND RELEVANCE: The inclusion of PCD enhanced essential aspects of patient-provider communication but did not affect patient activation. Outcomes did not differ by race.

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KEY WORDS: patient contextual data; health information technology; patient-provider communication; patient participation; primary health care; randomized controlled trial; health care disparities.

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Clinicians have limited time to efficiently and systematically gather data about factors in patients’ lives that affect health and care. Contextual data is highly relevant, a point reinforced by the estimate that clinical care accounts for only 20% of a patient’s health status.¹ Without this data, providers have an incomplete understanding of their patients, which may adversely affect patient-provider communication² and patient activation,³ leading to less patient-centered care and suboptimal health outcomes.^{4–8} Patient contextual data (PCD) encompasses an individual’s health values, goals, and preferences as well as personal and social determinants of health.^{9,10} While EHRs may improve aspects of patient-centered care, they were not designed to capture PCD and make it available at the point-of-care.¹¹

To improve the scalability, efficiency, and reliability of incorporating PCD into everyday practice, computers could facilitate the collection and distillation of contextual data.^{12–17} Ideally, such tools would sit atop the EHR and help humanize the electronic record by going beyond clinical data to provide

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a basis for effective health communication at the point-of-care.^{9,13,18,19} Qualitative studies with one PCD tool indicated that pre-visit collection of PCD improved patient-provider communication and promoted a shift toward shared responsibility for information gathering and co-development of the care plan.^{9,10} Patient-users reported that reflecting on their health goals spurred them to action.⁹ Providers reported that incorporating PCD into the visit supported an unparalleled level of patient activation.¹⁰ These findings supported a deeper investigation of the PCD tool as a mechanism to improve individualized care.^{13,14}

Given the focus on helping patients share information about their lives, what matters to them, and to organize their thoughts ahead of clinical encounters, we hypothesized that the PCD tool would be associated with more effective communication^{9,10} and increased patient activation.²⁰ Moreover, we expect clinician visibility into PCD to facilitate more effective communication about what matters to patients, which may be most apparent to patients in the form of relationally oriented communication tasks such as showing respect, care, concern, and interest.

It is important to note that there is a risk of health informatics interventions producing an inequality into care.²¹ In fact, ethnically and racially diverse and socioeconomically disadvantaged patients who stand to benefit most from the incorporation of PCD into care plans may be the least likely to adopt such tools. Nationally, 92% of White and 85% of Black Americans are online.²² However, there are varied profiles of Internet and technology use and non-use,^{23–25} which indicate that areas of the digital divide (e.g., sociodemographics) continue to evolve. Prior studies consistently show that Black patients are approximately 50% less likely to engage in EHR portals, even after adjustment for socioeconomic status.^{26–29}

Accordingly, the purpose of this study was to:

- evaluate the extent to which a PCD tool affects patient-provider communication and patient activation at the point-of-care; and
- assess potential differences in outcomes across populations whether differences or disparities in outcomes by race would be ameliorated or exacerbated.³⁰

METHODS

Design

This study was a pragmatic two-armed, non-blinded, randomized clinical trial. A detailed study protocol is available.³¹ Research was conducted in the two largest primary care clinics at the Froedtert & Medical College of Wisconsin Health Network, Milwaukee, WI, between May and October 2019. Patients were screened for inclusion based on demographic data (i.e., age, race/ethnicity) within the EHR. All patients with upcoming primary care appointments meeting eligibility

criteria were sent an email (if email available) or a post-card invitation (if email unavailable). Patients who verbally consented to participate were stratified by race and then randomized in a 1:1 fashion to the control arm (single pre-visit email invitation to create an account in the PCD tool sent with the electronic appointment reminder) or the facilitated enrollment arm (research coordinator proactively supported enrollment and offered assistance, if necessary, to create a PCD tool account). All participants completed a pre-visit survey before their primary care appointment (both arms) and using the PCD tool (facilitated enrollment arm only). Following the visit, all participants were asked to complete a post-visit survey within 1 month (Fig. 1). The institutional review board at the Medical College of Wisconsin approved the study.

Intervention

Patient Contextual Data Tool. The EHR-integrated and HIPAA-compliant PCD tool (PatientWisdom, PatientWisdom, Inc., Madison, CT) is a mobile-responsive digital site that patients can access through the web to securely share PCD; it incorporates single sign-on integration with the EHR (Epic Systems, Verona, WI). PatientWisdom collects PCD directly from patients and summarizes information about health values, needs, goals, barriers, supports, risks, and preferences, as well as social and personal determinants of health. Content is collected in both free-text and choice (i.e., checkbox, radio button, matrix) formats. Development of the tool followed human-centered design and health literacy principles to improve communication and surface essential PCD elements.^{9,32–34}

Outcome Variables of Interest

Patient-Provider Communication. Patients' perceptions of their primary care provider's interpersonal and communication skills were measured using the Communication Assessment Tool (CAT).³⁵ The CAT was written at the fourth-grade reading level and employs a 5-point response scale (poor to excellent). It was validated in a sample with varied sociodemographic characteristics and yielded a high internal consistency (Cronbach's alpha = 0.96). Scores are reported as percent "excellent."³⁵ Responses to items were assessed individually and collated to calculate the overall proportion of "excellent" responses.

Patient Activation. Patient activation was assessed through the 13-item Patient Activation Measure (PAM), which has been validated in diverse and nationally representative samples.^{20,36,37} Patient activation is the level of knowledge, skills, ability, and confidence an individual has to self-manage their day-to-day health.²⁰ The instrument provides two metrics for examination, a score, and a level. The activation score is based on a 0- to 100-point scale, and people can be categorized into four levels of activation (level 1 = least activated to level 4 = most activated).³⁶ We examined the change in PAM scores from baseline to follow-up and between groups.

Randomized control trial study design

Figure 1 Randomized control trial study design. R, randomization; PCD, patient contextual data.

Sample Size and Power. The calculation of the study sample size was based on detecting differences in CAT scores between arms. We calculated a sample size of 250 for 88% power for a standardized effect size of 0.4. Recruitment of 300 participants allowed for a 20% dropout rate.

Data Collection and Enrollment Protocol

Participants. Eligible participants were adults 18 years or older who self-identified as non-Hispanic White or non-Hispanic Black, spoke and understood English, and were willing and able to give informed consent. Recruitment focused on patients who had an upcoming visit 1 to 4 weeks away at one of the participating clinics with an established provider (≥ 1 previous appointment with the provider within the last 12 months).

Enrollment. Individuals who met the inclusion criteria and consented to participate were enrolled and randomized. Participants were stratified equally by race to the control or facilitated enrollment arms.

Pre-visit and Post-visit Surveys. Participants completed the pre-visit survey via REDCap³⁸ using an emailed link, over the telephone, or in-person with one of the research staff after verbal consent. The pre-visit survey measured patient activation (PAM),³⁶ technology use and acceptance (HINTS-5, Cycle-1),³⁹ patient-provider communication from previous primary care visit(s) (CG-CAHPS-3.0),⁴⁰ global health (PROMIS Global Health-v1.2),⁴¹ health literacy,⁴² and socio-demographic characteristics. After completing the pre-visit survey, participants who attended their scheduled primary care visit received an email invitation to complete the post-visit survey. The post-visit survey included the PAM³⁶ and CAT.³⁵

Analysis. We used chi-square tests for categorical variables and independent-sample *t* tests for continuous variables to examine baseline differences between study arms. For the primary outcome (CAT), we used linear regression to determine the effect of the intervention on post-visit

communication, adjusting for pre-visit CG-CAHPS scores to account for any differences between physicians. For the secondary outcome (PAM), we used a *t* test to determine the effect of the intervention on change in patient activation of race by interacting race with study arm for both outcomes.

The initial analysis used an intention-to-treat (ITT) approach, comparing patients by their study arm. Because the trial was designed to assess the impact of tool usage, rather than the impact of facilitated enrollment per se, we also completed a second treatment-on-the-treated (TOT) analysis using an instrumental variable approach.^{43,44} In the TOT analysis, participants' data are grouped whether they used PCD tool (created an account and added data) or not. The TOT allows us to estimate the effect of using the PCD tool instead of being assigned to facilitated enrollment and corrects for cross-over that may occur in the pragmatic trial. For TOT analysis, we used a two-stage least squares regression.^{45,46} The first stage of the model estimated if a person used the PCD tool in the follow-up period as a function of assigned treatment arm and their corresponding covariates. The second stage identified the causal impact of using the PCD tool using the *ivregress* command in Stata. We report TOT results in the text and show both in the tables.

We used multiple imputation using chained equations⁴⁷ (i.e., Markov chain Monte Carlo) stratified by the treatment arm to address missing data. The imputation algorithm included all baseline individual PAM³⁶ and CG-CAHPS⁴⁰ elements, patients' responses on whether the provider discussed contextual data, health literacy⁴², PROMIS⁴¹ scores, and demographics. For all results, a *p* value of ≤ 0.05 was considered statistically significant.

RESULTS

Study Participants

Figure 2 displays the CONSORT Participant Flow⁴⁸ diagram. A total of 3237 patients were invited to participate. Of those, 2735 (84%) did not respond to the invitation to enroll, and 201 (6%)

declined to participate. In total, 301 (9%) participants were enrolled and randomized, and 185 (6%) were included in the analysis.

There were no demographic differences between the arms. Sixty-four percent of the participants were female, 67% White, 48% over 65 years, and 42% retired. Twenty percent of participants reported a household income of less than \$10,000 annually, and 43% of participants reported at least some difficulty with meeting monthly bill payments (Table 1).

PCD Tool Adoption

Facilitated enrollment resulted in a five-fold increase in uptake of the PCD tool (30% vs. 6% for the control group). The most prevalent form of facilitation was telephone follow-up to remind patients about the PCD tool.

Communication

As there was cross-over between arms due to the pragmatic nature of the study, we focused on the TOT results to assess

CONSORT Flowchart of Participants

Figure 2 CONSORT flowchart of participants.

Table 1 Baseline Patient Characteristics

	Percentages			<i>p</i> value
	Total (<i>N</i> = 185)	Control (<i>n</i> = 92)	PCD tool (<i>n</i> = 93)	
Sex				0.91
Female	64.13	63.74	64.52	
Age (in years)				0.45
50 or less	21.08	19.57	22.58	
51–65	29.73	23.91	35.48	
66–75	32.43	34.78	30.11	
75 or more	16.76	21.74	11.83	
Race				0.60
Black/African American	32.97	34.78	31.18	
White	67.03	65.22	68.82	
Education				0.88
Some high school	4.32	4.35	4.3	
High school or GED	18.38	20.65	16.13	
Some college or 2-year degree	28.11	25	31.18	
4-year college grad	18.38	18.48	18.28	
More than 4 years of college	30.81	31.52	30.11	
Marital status				0.18
Single, never married	34.05	34.78	33.33	
Married or domestic partnership	43.24	36.96	49.46	
Widowed	9.73	10.87	8.6	
Divorced	11.35	14.13	8.6	
Separated	1.62	3.26	0	
Employment status				0.53
Employed for wages	31.89	28.26	35.48	
Self employed	3.78	5.43	2.15	
Out of work and looking	1.62	1.09	2.15	
Out of work but not currently looking	2.7	3.26	2.15	
A homemaker	1.62	0	3.23	
A student	1.08	1.09	1.08	
Retired	42.16	45.65	38.71	
Unable to work	15.14	15.22	15.05	
Household income				0.71
Less than \$10,000	20.11	24.18	15.91	
\$10,000 to less than	10.61	12.09	9.09	
\$20,000 to less than	8.94	5.49	12.5	
\$30,000 to less than	4.47	4.4	4.55	
\$40,000 to less than	7.82	6.59	9.09	
\$50,000 to less than	12.29	13.19	11.36	
\$75,000 to less than	11.73	12.09	11.36	
\$100,000 to less than	11.73	9.89	13.64	
\$150,000 or more	12.29	12.09	12.5	
Insurance details*				
Directly purchased commercial	26.89	27.12	26.67	0.96
Employer-sponsored insurance	50.75	45.16	55.56	0.230
Medicaid, med assistance or any kind of governmental assistance	33.09	32.88	33.33	0.95
Any difficulty to meet monthly payments				0.67
Extremely difficult	6.01	5.43	6.59	
Very difficult	9.29	11.96	6.59	
Somewhat difficult	13.66	11.96	15.38	
Slightly difficult	13.66	11.96	15.38	
Not difficult at all	57.38	58.7	56.04	
Confident filling out forms by yourself				0.54
Extremely	65.76	67.03	64.52	
Quite a bit	23.37	21.98	24.73	
Somewhat	7.07	5.49	8.6	
A little bit	2.72	3.3	2.15	
Not at all	1.09	2.2	0	
Baseline overall CG-CAHPS**	0.689	0.759	0.687	0.88
PROMIS v1.2				
Physical health, mean (SD)	44.66 (10.18)	43.90 (9.79)	45.40 (10.56)	0.32
Mental health, mean (SD)	47.02 (9.63)	46.83 (9.90)	47.22 (9.35)	0.78
Baseline PAM score, mean (SD)	61.5 (1.2)	59.3 (1.8)	63.7 (1.5)	0.58
Baseline PAM level				0.23
Level 1 (lowest)	12.97	16.3	9.68	
Level 2	23.24	27.17	19.35	
Level 3	41.08	36.96	45.16	
Level 4 (highest)	22.7	19.57	25.81	

CG-CAHPS⁴⁰, Clinician and Group Consumer Assessment of Healthcare Providers and Systems; PROMIS⁶⁰, Patient Reported Outcomes Measure Information System; PAM³⁶, Patient Activation Measure

*Participants could choose more than one insurance category

**Overall CG-CAHPS was scored as the proportion of items with “excellent” as the response. Individual items are scored as “excellent” = 1 and all other responses = 0

Table 2 Impact of Patient Contextual Data Tool on Patient-Provider Communication and Patient Activation

	Intention-to-treat					Treatment-on-the-treated				
	UC	95% CI	PCD tool	95% CI	Difference	95% CI	<i>p</i> value	Difference	95% CI	<i>p</i> value
<i>N</i>	92.00		93.00							
Change in PAM score	5.65	(1.31, 9.98)	1.86	(− 1.16, 4.89)	− 1.23	(− 5.78, 3.33)	0.60	− 4.41	(− 19.90, 11.08)	0.58
Overall CAT	0.69	(0.60, 0.77)	0.77	(0.70, 0.84)	0.09	(− 0.01, 0.20)	0.08	0.40	(− 0.07, 0.86)	0.09
Individual items										
Greeted me in a way that made me feel comfortable	0.70	(0.61, 0.80)	0.81	(0.73, 0.89)	0.11	(− 0.02, 0.23)	0.09	0.42	(− 0.11, 0.95)	0.12
Treated me with respect	0.73	(0.64, 0.82)	0.86	(0.79, 0.93)	0.14	(0.02, 0.25)	0.02	0.53	(0.01, 1.04)	0.04
Showed interest in my ideas	0.63	(0.53, 0.73)	0.77	(0.69, 0.86)	0.15	(0.03, 0.28)	0.02	0.59	(0.06, 1.13)	0.03
Understood my main health concerns	0.69	(0.59, 0.78)	0.74	(0.65, 0.83)	0.07	(− 0.06, 0.19)	0.31	0.31	(− 0.21, 0.83)	0.24
Paid attention to me	0.73	(0.64, 0.82)	0.84	(0.76, 0.92)	0.12	(0.00, 0.23)	0.05	0.46	(− 0.06, 0.98)	0.08
Let me talk without interruptions	0.73	(0.67, 0.82)	0.77	(0.69, 0.86)	0.06	(− 0.07, 0.18)	0.37	0.32	(− 0.19, 0.84)	0.22
Gave me as much information as I wanted	0.63	(0.53, 0.73)	0.72	(0.63, 0.81)	0.10	(− 0.03, 0.23)	0.13	0.38	(− 0.14, 0.90)	0.15
Talked in terms that I could understand	0.76	(0.67, 0.85)	0.81	(0.73, 0.89)	0.05	(− 0.07, 0.17)	0.39	0.25	(− 0.28, 0.76)	0.36
Checked to be sure I understood everything	0.67	(0.58, 0.77)	0.71	(0.62, 0.80)	0.04	(− 0.09, 0.18)	0.52	0.23	(− 0.30, 0.76)	0.40
Encouraged me to ask questions	0.64	(0.54, 0.74)	0.70	(0.60, 0.79)	0.07	(− 0.07, 0.20)	0.32	0.30	(− 0.22, 0.83)	0.25
Involved me in decisions as much as I wanted	0.64	(0.54, 0.74)	0.72	(0.63, 0.81)	0.09	(− 0.05, 0.22)	0.19	0.41	(− 0.12, 0.93)	0.13
Discussed next steps, including any follow-up plans	0.71	(0.61, 0.80)	0.73	(0.64, 0.82)	0.03	(− 0.09, 0.16)	0.60	0.21	(− 0.31, 0.73)	0.43
Showed care and concern	0.66	(0.57, 0.76)	0.82	(0.74, 0.90)	0.16	(0.04, 0.29)	0.01	0.63	(0.10, 1.16)	0.02
Spent the right amount of time with me	0.70	(0.60, 0.79)	0.81	(0.73, 0.89)	0.12	(− 0.00, 0.24)	0.05	0.53	(0.00, 1.05)	0.05

Intention-to-treat and treatment-on-the-treated CAT²⁸-related results are estimated using a linear regression model adjusting for baseline top-coded CG-CAHPS³⁴. Overall CAT was scored as the proportion of items with “excellent” as the response. Individual CAT items are scored as “excellent” = 1 and all other responses = 0.

UC, usual care (control arm); PCD, patient contextual data; CAT, Communication Assessment Tool; CG-CAHPS, Clinician and Group Consumer Assessment of Healthcare Providers and Systems; PAM³⁰, Patient Activation Measure

the impact of the PCD tool. In the post hoc TOT analysis, the higher overall CAT score (i.e., summary score across all items) trended with PCD tool use but did not reach a statistical significance ($p = 0.09$). In post hoc item-level TOT analyses, there were marked increases in scores for specific CAT items: Use of the PCD tool was associated with gains in “treated me with respect” (86% vs. 73%, $p = 0.04$), “showed interest in my ideas” (77% vs. 63%, $p = 0.03$), “showed care and concern” (82% vs. 66%, $p = 0.02$), and “spent about the right amount of time with me” (81% vs. 70%, $p = 0.05$). Differences on all other items were in the same direction, but not statistically significant.

Results from multiple imputation (Appendix Table 4) using chained equations⁴⁷ and ITT results are in Table 2 and parallel the TOT results. Results were also reweighted to statistically ensure equal representation of White and Black participants in the analysis (Appendix Table 5); these are aligned with the results presented in Table 2.

Patient Activation

The pre-visit survey overall mean PAM score was 61.5 (SD = 1.2), which aligns with a level 3 of activation, indicating that a person is taking action to maintain or improve their health

(Table 1). The overall mean compares well with a national sample in which the mean PAM score was 61.9.³⁶ The control arm baseline PAM score was 59.3 (SD = 1.8), and the facilitated enrollment arm was 63.7 (SD = 1.5), a difference that approaches a statistical significance ($p = 0.06$). No differences were observed in PAM scores through the TOT analysis (Table 2).

Assessment of Differences by Race

When testing for an interaction between race and study arm, neither of the interaction terms was statistically significant (CAT $p = 0.80$; PAM $p = 0.31$). These findings are presented in Table 3. When comparing Black ($M = 55.3$, SD = 1.7) versus White ($M = 64.6$, SD = 1.5) participants’ baseline mean activation scores, Black participants had a significantly lower baseline score (− 9.32; 95% CI = − 14.08, − 4.57; $p < 0.001$). Black participants experienced an average 5.6-point (SD = − 3.5-point) increase in the PAM score in both arms, which was higher than White participants’ average change in the PAM score in both arms ($M = 3$ -point; SD = 2.15-point). The findings are suggestive but did not rise to the level of statistical significance and may be due to chance.

Table 3 Interaction Between Race and Treatment Effect in the Intention-to-Treat Analysis

	<i>p</i> value
<i>N</i>	185
Change in PAM score	0.31
Overall CAT	0.80
Individual items	
Greeted me in a way that made me feel comfortable	0.11
Treated me with respect	0.73
Showed interested in my ideas	0.64
Understood my main health concerns	0.23
Paid attention to me	0.26
Let me talk without interruptions	0.90
Gave me as much information as I wanted	0.06
Talked in terms that I could understand	0.23
Checked to be sure I understood everything	0.53
Encouraged me to ask questions	0.28
Involved me in decisions as much as I wanted	0.64
Discussed next steps, including follow-up plans	0.41
Showed care and concern	0.06
Spent the right amount of time with me	0.51

*Intention-to-treat PAM³⁰-related results are estimated using a linear regression model adjusting for race, treatment, an interaction between race and treatment, and baseline PAM score. We report the *p* value on the interaction term. Intention-to-treat CAT²⁸-related results are estimated using a linear regression model adjusting for race, treatment, an interaction between race and treatment, and baseline top-coded CG-CAHPS³⁴. We report the *p* value on the interaction term. Overall CAT was scored as the proportion of items with “excellent” as the response. Individual items are scored as “excellent” = 1 and all other responses = 0*

PAM, Patient Activation Measure; CAT, Communication Assessment Tool; CG-CAHPS, Clinician and Group Consumer Assessment of Healthcare Providers and Systems

DISCUSSION

This randomized trial assessed the extent to which a consumer informatics tool—designed to securely capture PCD and share a summary within the EHR—impacts patient-provider communication and patient activation. We found that people who used the PCD tool reported improvements in essential elements of patient-provider communication, but there was no impact on patient activation.

In our study, patients who completed the PCD tool were significantly more likely to report that their provider treated them with respect, valued their ideas, and showed care and concern. Moreover, despite the well-known time constraints imposed on primary care clinicians,⁴⁹ patients who used the PCD tool rated physicians spending the right amount of time with them significantly higher than did non-PCD tool users. These results, in conjunction with previously published results from interviews with primary care clinicians who used the PCD tool for pre-visit planning and within-visit discussions¹⁰ as well as focus groups with PCD tool users,⁹ suggest that the PCD tool adds efficiency to the clinic visit without compromising the patient-provider relationship. In fact, the relationship is enhanced. Notably, we saw higher scores among users in the TOT analysis in certain CAT items, even in the context of high baseline communication scores. Our findings demonstrate the benefit of this PCD tool in facilitating effective communication skills and relationship dynamics, the core components of patient-centered care.^{50–52}

While the PCD tool was associated with higher scores for every CAT item, the fact that some differences were large and statistically significant while others were relatively minor serves as a validity check in the context of everyday clinical practice. More specifically, one would expect patients using the PCD tool to feel that their clinician treated them with respect, showed care and concern, and showed interest in their ideas because the PCD tool focuses on what matters to them. Similarly, patients using the PCD tool might be more likely to report that their clinician spent the right amount of time with them because their needs are being met as a function of sharing priorities. In contrast, one would not expect much of a difference in patient perception of tasks that are distal to contents of the PCD tool; indeed, the smallest differences were observed for discussing next steps, checking to be sure the patient understood everything, talking in understandable terms, and letting the patient talk without interruptions.

In this study, we sought to understand if PCD tool usage would narrow differences in communication and patient activation by race or worsen them because the technology might not be accessible to some. We saw no evidence of the treatment effect, either in ITT or in TOT analyses, varying by race. Similar increases in the change in PAM scores for both races bolster the observation that including this PCD tool as part of the primary care visit did not introduce a disparity or barrier. Enriching the encounter with PCD collected directly from patients may be one potent way to improve health equity by addressing implicit bias and structural racism.⁵³

These findings support the importance of carefully designed PCD tools and other interventions aimed at increasing the patient's ability to communicate effectively with their provider. In the COVID-era surge in telehealth care,⁵⁴ PCD tools that collect pre-visit data are even more critical. PCD tools can substitute for the work completed by medical assistants (e.g., agenda, chief complaint), to assist providers with where a patient wants to focus the visit.⁵⁵ In pre-COVID studies, a patient-prioritization discussion⁵⁶ aid enhanced decision-quality outcomes and patient-provider communication across diverse populations.⁴⁶

Limitations and Strengths

The study has limitations. First, we cannot comment on how effective the intervention would be in other settings or populations. Milwaukee, WI, is a geographical area noted for its segregation and disparities among populations.⁵⁷ The results require replication in other samples. Second, the PCD tool had been implemented previously, and therefore, patients could not be randomized to receiving an invitation or not. While we used several techniques to account for likelihood to self-select into using the tool, selection bias may persist. Third, we did not reach parity in retaining equal numbers of Black (33%) and White (67%) participants, which may have influenced the results. Additional strategies for recruiting and retaining Black participants such as community information sessions and

network sampling⁵⁸ may have improved the number of retained Black participants. Fourth, we obtained limited screening data about eligible patients. Therefore, we can only present a comparison of age of the population and sample ($M = 68$ vs. 60 years). Last, our results are based on the use of a particular PCD tool and may not generalize to other tools. Despite these limitations, the study has meaningful implications for the redesign of health information technology to meet the needs of both patients and clinicians.

CONCLUSION

Use of the consumer informatics tool to collect and summarize PCD was associated with improvements in essential aspects of patient-physician communication, but not in patient activation. We did not see outcome differences by race. Future research should investigate the influence of socioeconomic position,⁵⁹ education, and health literacy, on baseline racial differences of patient activation. A follow-up study will assess organizational characteristics that affected patient and clinician use of the PCD tool.

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Compliance with Ethical Standards:

Conflict of Interest: Bradley Crotty reports being an advisor for Buoy Health. Gregory Makoul reports employment with PatientWisdom, Inc. He did not participate in the analysis of trial data.

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