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The Effectiveness of a Specialized Primary Care Medical Home for Patients with Serious Mental Illness

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BACKGROUND: There are unmet primary care needs among people with serious mental illness that might be improved with integrated care and medical care management. Many healthcare organizations have attempted to address this problem, but few interventions have been rigorously studied and found to be effective.

OBJECTIVE: Study the implementation and effectiveness of a novel, specialized primary care medical home designed to improve the healthcare of patients with serious mental illness.

DESIGN, SETTING, AND PARTICIPANTS.: Clustered controlled trial for a median of 401 days. One Veterans Health Administration medical center was assigned to intervention and two were assigned to usual care (control). Thirty-nine clinicians and managers were included in the study, as well as 331 patients who met eligibility criteria.

INTERVENTION.: A specialized medical home with systematic patient engagement, proactive nurse panel management, a collaborative care psychiatrist, and a primary care physician providing care that included psychiatric treatment.

MAIN MEASURES.: Quality of care, chronic illness care and care experience, symptoms, and quality of life.

KEY RESULTS.: Sixty-five intervention patients (40%) moved all psychiatric care to the primary care team. No adverse events were attributable to the intervention. Compared with control, intervention patients had greater improvement over time in appropriate screening for body mass index, lipids, and glucose (χ^2 = 6.9, 14.3, and 3.9; Ps < .05); greater improvement in all domains of chronic illness care (activation, decision support, goal-setting, counseling, coordination) and care experience (doctor-patient interaction, shared decision-making, care coordination, access; F for each 10–24, Ps < .05); and greater improvement in mental health-related quality of life (F = 3.9, P = .05) and psychotic symptoms (F = 3.9, P = .05).

CONCLUSION: A primary care medical home for serious mental illness can be feasible to implement, safe, and more effective than usual care.

TRIAL REGISTRATION.: ClinicalTrials.gov Identifier: NCT01668355.

KEYWORDS: Care coordination; Patient centered medial home; Screening; Behavioral health; Health system, hospital or practice redesign; Disparities; Veteran care.

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Prior Presentations *1. Young AS, Chang ET, Cohen AN, Chang DT, Hamilton AB, Lindamer LA, Oberman R, Whelan F: The Implementation and Effectiveness of a Specialized Primary Care PACT to Improve the Health Care of Veterans with Serious Mental Illness. Research presentation at the 2019 VA HSR&D QUERI National Conference, Washington DC, October 31, 2019.*

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INTRODUCTION

People with serious mental illness (SMI), such as schizophrenia or bipolar disorder, have much worse health outcomes than the rest of the population [1]. These individuals also have high rates of hospitalization and emergency service use, higher than patients with chronic medical conditions alone [2]. Multiple factors contribute to these disparities. The population with SMI uses primary care less often [3] and is less likely to receive high value preventative and chronic care services [4]. People with SMI often have psychiatric symptoms, cognitive deficits, impaired social skills, socioeconomic disadvantages, and high rates of addiction to substances, including tobacco. These limit their ability to self-manage their illnesses [5,6].

Primary care clinicians usually have limited training in the treatment of SMI and mental health–related stigma is prevalent [7,8]. Organizations often lack effective partnerships between primary care and specialty mental health services, with limited communication and information sharing among clinicians [9–11]. As healthcare organizations are increasingly responsible for comprehensive care of psychiatric and general medical conditions, and overall treatment cost and quality, there is heightened awareness of the need for specialized services focused on the population with SMI.

A variety of care strategies have sought to reduce utilization of high-cost services and improve outcomes of patients with SMI [12]. Examples include the co-location of mental health and primary care, case management, and integrated care. These are

appealing and have been touted as having the potential to improve care. However, when studied in research with comparison groups, most have failed to produce substantial improvement in patients' treatment or care outcomes [13,14]. A small number of strategies have shown promise [15,16]. A critical issue is coordination of medical, mental health, and addiction care in a complex population with high levels of need in each domain, and treatments that often interact. While it is in psychiatrists' scope of practice to provide routine medical screening and preventative care, very few psychiatrists are trained in primary care or provide these services [17], and organizations often do not encourage primary care by psychiatrists.

There is a pressing need for research on care models to improve healthcare services and outcomes for people with SMI [18]. To address this issue, the authors designed, implemented, and studied a novel specialized patient-centered medical home in the US Veterans Health Administration (VA). The VA refers to medical homes as "Patient Aligned Care Teams" (PACTs). SMI PACT is one of few projects to implement and study a primary care medical home tailored for the population with SMI [19]. This project studied the implementation and effectiveness of a primary care medical home to improve the healthcare of individuals with SMI.

METHODS

Study Participants

The VA is divided into regional networks that oversee policy. Within the Veterans Integrated Service Network covering southern California and Nevada, three medical centers were informed of the opportunity by network leadership and chose to participate in this study: VA Greater Los Angeles, VA San Diego, and VA Southern Nevada Healthcare Systems. One location that indicated interest was assigned to receive the intervention, and two matching sites were selected to provide a comparable control group at baseline and assigned to continue with usual care. Patient participants were recruited between May 2016 and February 2018, from specialty mental health clinics. Patients were eligible if they (1) had a clinician diagnosis of SMI, (2) were psychiatrically stable (low or moderate risk due to psychiatric disorders), and (3) had elevated risk for hospitalization or death due to medical conditions. SMI was defined as having schizophrenia, schizoaffective disorder, bipolar disorder, recurrent major depression with psychosis, or chronic severe post-traumatic stress disorder. Psychiatric stability was defined as having a Milestones of Recovery Scale (MORS) score of 6 or greater [20], based on assessment by the patient's psychiatrist. Elevated risk for hospitalization was defined as having a Care Assessment Need (CAN) score greater than 75th percentile [21]. Computed by VA for all patients, the CAN score estimates the risk of hospitalization or death within 90 days. Patients were excluded if they had experienced a psychiatric hospitalization within the past 6 months, were receiving palliative care, were not housed, had a legal guardian for decision-making, or were receiving primary care from a specialty PACT other than the Homeless, Post Deployment, or Women's Health PACT (e.g., care from an infectious disease PACT). Details of the study protocol have been published [19].

Study Procedures

Patients were screened based on administrative data, CAN score, and a MORS assessment. After screening, a study coordinator worked to contact eligible patients to explain the study and invite them to enroll. Although blinding to intervention status was not possible, research assessors were kept separate from intervention and service delivery. Patients were individually enrolled and, after completing a baseline survey, began receiving care under the new care model. The new care model was used starting with the first study patient who enrolled. The study was approved by the VA health services research central institutional review board and the institutional review boards of each participating medical center. All participating patients provided written informed consent.

Intervention

SMI PACT consists of a primary care medical home staffed by a specialized, integrated team of healthcare professionals that provide both primary and psychiatric care to this unique population. This model was built on and enhanced two major initiatives undertaken by the VA to improve primary care: care organization and patient-centeredness of the VA PACT care model [22], and collaborative care and mental health capacity of the VA Primary Care-Mental Health Integration (PC-MHI) care model [23]. Implementation was guided by the Consolidated Framework for Implementation Research [24], and used facilitation methods [25].

An integrated care team in primary care practice, SMI PACT clinical staff, included a primary care provider (0.25 full time equivalent [FTE]), a consulting psychiatrist (0.1 FTE), and a nurse care manager (0.5 FTE) to care for a panel of approximately 150 patients. With the exception of the psychiatrist, all SMI PACT clinical staff were co-located. The psychiatrist joined by phone, email, or instant messaging. Patients were seen by the primary care provider, nurse care manager, or other staff members. While all patients received general medical care from the SMI PACT, patients were given the choice to continue receiving mental health care from their established psychiatric provider or move all their psychiatric care to the SMI PACT. For those patients that continued to receive care from their usual psychiatrist, the SMI PACT primary care provider worked to engage and develop joint treatment plans with the psychiatrist. This was facilitated by the consulting psychiatrist. In addition to spending one full day in SMI PACT per week seeing patients, the primary care provider also communicated with patients and other clinical staff on a daily basis. The consulting psychiatrist met with the

primary care team on a weekly basis to review the caseload and discuss the clinical panel. The psychiatrist consulted on how to access mental health services, how mental health conditions may affect patients' ability to engage with treatment, and interactions and side effects of psychiatric medications. For patients who moved all their psychiatric care to the SMI PACT, the consulting psychiatrist helped the primary care provider adjust psychiatric medications and, if needed, determined if patients would benefit from a higher, more intensive level of care. The nurse care manager oversaw care management. The nurse was familiar with the patient panel and communicated with patients regarding test results, upcoming appointments with specialists, and general health education and prevention strategies. While the frequency of individual patient contacts was not tracked, all contacts were via phone or secure messaging by the nurse care manager or primary care provider. The nurse used a primary care dashboard to monitor CAN scores, receipt of services, and quality of care. This individual worked to ensure patients received appropriate care management and engaged with treatment as recommended. The nurse delivered long-acting injectable antipsychotic medications; assisted with patient concerns, including medication refills and completing forms; and linked patients with needed community resources. Following discharge from any VA or non-VA emergency room visit or hospitalization, the nurse ensured continuity of care by scheduling follow-up appointments on a patient's behalf.

Usual Care

Participants in the usual care group continued to receive care as usual. This consisted of primary care delivered within the standard VA PACT model. This model emphasizes a teamlet consisting of a provider (physician or nurse practitioner), nurse, medical assistant, and clerks. Services for SMI were provided at specialty mental health clinics that were separate from primary care.

Outcome Measures

A patient survey at baseline and 12 months measured primary (appropriate preventive screenings, perceived chronic illness care and care experience, and health-related quality of life) and secondary (psychiatric symptoms and patient activation) outcomes. VA administrative information systems provided data on lab test results, weight, height, blood pressure, diagnoses, prescriptions, services, and visits. These data were used to calculate measures of treatment appropriateness and quality, including measures of metabolic screening and monitoring, based on specifications from NCQA, HEDIS, and VA. Chronic illness care and care experiences were assessed using the Patient Assessment of Chronic Illness Care (PACIC) [26] and Ambulatory Care Experiences Survey (ACES) [27]. Patients were interviewed using the Veterans 12-Item Health Survey (VR-12) [28] for health-related quality of life and the Behavior and Symptom Identification Scale Revised (BASIS-R) [29] for mental health symptomology. The Patient Activation Measure (PAM-13) [30] was used to measure patient knowledge, skill, and confidence for self-management and care of their health conditions.

Statistical Analysis

Statistical analyses were performed on an intent-to-treat basis. To achieve 80% power with primary outcomes, a sample of 313 patients was estimated to be required. Demographics and baseline measures were compared using χ^2 or t-test. Linear mixed effects repeated measures (continuous outcomes) and logistic regression (binary outcomes) models were used to examine the effects of the intervention. Separate models were run for each outcome, with predictors of group (intervention or usual care), time (12 months before intervention or 12 months after intervention), and group × time interactions. This took into account the correlated nature of repeated measures within the same subject and allowed for missing values at either time point. Statistical significance was defined as a 2-sided P value < 0.05. Analyses of the outcome data were performed using SAS 9.4.

RESULTS

Participants

Of 1896 patients who were initially eligible, 829 were excluded after further screening, most commonly due to low mental health recovery scores or the patient no longer receiving care from VA. The remaining 1067 patients were invited to participate. Three hundred ninety were not interested and 346 were unreachable (see consort chart in Fig. 1). Three hundred thirty-one participants were enrolled into the study and assigned to the intervention ($n = 164$) or usual care ($n = 167$). Patients were enrolled for a median of 401 days. The mean age of participants was 57 years (SD = 12), 14% were female, and

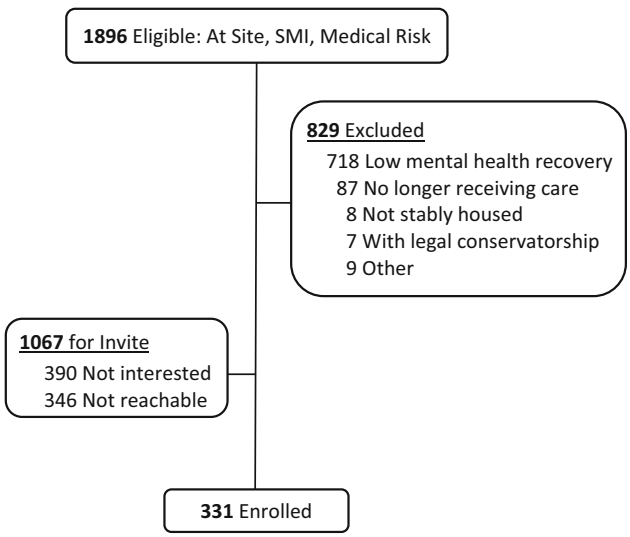

Fig. 1 CONSORT flow diagram of patient recruitment

participants most often identified as White (46%), Black (34%), or Hispanic (12%). Forty-three percent had obtained a college degree. Overall, psychiatric diagnoses among participants with SMI included bipolar disorder (36%), chronic severe PTSD (32%), schizophrenia (28%), and major depression with psychosis (4%). Due to overall demographic differences between the three medical centers participating in the study, differences were seen between intervention and control groups in sex, race, ethnicity, and diagnosis. As shown in Table 1, compared to usual care, intervention patients were significantly more likely to identify as male (91.5% vs 81.3%, $\chi^2 = 7.2$, $P = 0.007$), Black (45.1% vs 22.2%, $\chi^2 = 28.1$, $P < 0.001$), and Hispanic (13.4% vs 11.4%, $\chi^2 = 12.2$, $P = 0.002$), and have been diagnosed with schizophrenia (34.8% vs 21.0%, $\chi^2 = 13.1$, $P = 0.02$). Two hundred seventy-two participants (82%) completed a follow-up assessment, including 134 and 138 from the intervention and control groups, respectively. Patient participants were recruited between May 2016 and February 2018 from specialty mental health clinics, and follow-up assessments concluded in February 2019.

Outcomes

Sixty-five intervention participants (40%) moved all psychiatric care to the primary care SMI PACT team. With the exception of blood pressure screening ($\chi^2 = 1.5$; $P = 0.21$), at follow-up, each metabolic monitoring indicator improved significantly more at $P < 0.05$ among intervention participants compared to control (Table 2). Significantly greater improvement was seen for body mass index ($\chi^2 = 6.9$), lipids ($\chi^2 = 14.3$), and glucose or HbA1c ($\chi^2 = 3.9$).

As shown in Table 3, at 12-month follow-up, intervention participants had significantly greater improvements in care experience, as measured by the PACIC ($F = 26.6$; $P < 0.001$) and ACES ($F = 24.1$; $P < 0.001$), compared with usual care. Intervention patients had greater improvement over time in each of the chronic illness care domains, including activation ($F = 16.3$; $P < 0.001$), decision support ($F = 13.0$; $P < 0.001$), goal-setting ($F = 16.3$; $P < 0.001$), counseling ($F = 24.2$; $P < 0.001$), and coordination ($F = 13.0$; $P < 0.001$). Intervention patients also had greater improvement over time in each care experience domain, including doctor-patient interaction ($F = 15.5$; $P < 0.001$), shared decision-making ($F = 9.7$; $P = 0.003$), care coordination ($F = 20.7$; $P < 0.001$), access ($F = 16.2$; $P < 0.001$), and staff ($F = 4.4$; $P = 0.04$). No significant difference was observed in patient activation ($F = 0.00$; $P = 0.98$). While most subscales in the BASIS-R showed no significant differences, participants in the intervention group experienced a decrease in average psychosis subscale scores that was close to being significant at $P < 0.05$ ($F = 3.9$; $P = 0.05$). While there was no effect on physical health–related quality of life ($F = 0.47$; $P = 0.49$), intervention participants had greater improvement in mental health-related quality of life that approached significance at P

Table 1 Characteristics of Patients in Intervention and Control Cohorts

Characteristics	Intervention	Usual care	Total	*P* value
No. of participants	164	167	331	
Age, mean (SD), years	58.7 (10.4)	54.5 (13.9)	56.6 (12.4)	.003
Female, no. (%)	14 (8.5)	31 (18.7)	45 (13.6)	.007
Race, no. (%)				
White	59 (36.0)	94 (56.3)	153 (46.2)	< .001
Black	74 (45.1)	37 (22.2)	111 (33.5)	
Asian	3 (1.8)	7 (4.2)	10 (3.0)	
Pacific Islander	1 (0.3)	1 (0.3)	2 (0.6)	
American Indian	0 (0.0)	3 (1.8)	3 (0.9)	
Other	18 (11.0)	11 (6.6)	29 (8.8)	
Multiple race	8 (4.9)	11 (6.6)	19 (5.7)	
No response	1 (0.6)	3 (1.8)	4 (1.2)	
Ethnicity, no. (%)				
Hispanic	22 (13.4)	19 (11.4)	41 (12.4)	.002
Education level, no. (%)				
Less than high school diploma	7 (4.3)	6 (3.6)	13 (3.9)	.80
High school diploma or equivalent	26 (15.9)	29 (17.4)	55 (16.6)	
Some college	62 (37.8)	58 (34.7)	120 (36.3)	
Degree, 2-year college	37 (22.6)	37 (22.2)	74 (22.4)	
Degree, 4-year college	16 (9.8)	22 (13.2)	38 (11.5)	
Some graduate school	8 (4.9)	4 (2.4)	12 (3.6)	
Master's or doctoral degree	8 (4.9)	11 (6.6)	19 (5.7)	
Married, no. (%)	41 (25.0)	64 (38.3)	105 (31.7)	.009
Paid employment, no. (%)	26 (15.9)	37 (22.2)	63 (19.03)	.15
Diagnosis, no. (%)				
Schizophrenia	57 (34.8)	37 (22.2)	94 (28.4)	.02
Bipolar disorder	57 (34.8)	62 (37.1)	119 (36.0)	
Major depression with psychosis	4 (2.4)	8 (4.8)	12 (3.6)	
Chronic disabling PTSD	46 (28.1)	60 (35.9)	106 (32.0)	
MORS Score, mean (SD)	6.4 (0.6)	6.5 (0.7)	6.5 (0.6)	.05
CAN Score, mean (SD)	85.8 (7.6)	84.3 (9.4)	85.1 (8.5)	.11

PTSD post-traumatic stress disorder, MORS Milestones of Recovery Scale, CAN Care Assessment Need

Table 2 Treatment Quality Outcomes

Outcomes at follow-up	No. (%)		Logistic model statistics				
	12 months before	12 months after	β (group × time)	*SE* β	Wald's χ^2	*df*	*P* value
Screened for body mass index every 6 months							
Intervention	133 (81.1)	144 (87.8)					
Usual Care	131 (78.9)	117 (70.5)	1.13	.43	6.85	1	.009
Screened for blood pressure every 6 months							
Intervention	144 (87.8)	146 (89.0)					
Usual Care	141 (84.9)	131 (78.9)	0.60	.48	1.55	1	.21
Screened for lipids every 6 months							
Intervention	52 (31.7)	88 (53.7)					
Usual Care	46 (27.7)	41 (24.7)	1.37	.36	14.30		< .001
Screened for glucose or HgA1c every 6 months							
Intervention	100 (61.0)	119 (72.6)					
Usual Care	93 (56.0)	85 (51.2)	0.68	.34	3.90		.05

< 0.05 (F = 3.9; P = 0.05). No significant adverse events occurred as a result of the intervention.

DISCUSSION

In this trial of 331 patients with SMI, a specialized primary care medical home resulted in improvements in treatment appropriateness, chronic illness care and care experience, psychotic symptoms, and mental health–related quality of life at 12 months compared to usual care. To our knowledge, this study is the first controlled trial in primary care of collaborative care for patients with SMI.

Improvements seen in appropriate receipt of preventive services (screenings) were comparable with prior trials that targeted screening of patients with SMI. For example, similar differences in BMI measurement between participant groups at 1 year were observed in a prior trial. That prior trial studied receipt of preventive care as part of primary care delivered at a mental health clinic [31]. At 1 year, nearly 90% of the SMI PACT intervention group had received two of the four preventive screening measures (BMI and blood pressure), which surpasses a similar previous trial [31]. With regard to chronic illness care and care experience, two other trials measured patients' experiences [31,32]. One assessed experiences comparable to the current trial and found improvements in care experiences similar to those found here.

No effects were found on patient activation, most psychiatric symptoms, or physical health–related quality of life. However, intervention participants experienced modestly greater improvements in psychosis symptoms and mental health–related quality of life. Similar to Kilbourne et al., [33] who utilized the SF-12, as well as Bauer et al., [32] Druss et al., [31] and Druss et al., [34] who utilized the SF-36, we found greater improvements in mental health–related quality of life on the VR-12, which is based on the SF-12, and designed to be more accurate among patients with chronic illness. While findings from Kilbourne et al. [33] and Druss et al. [31] were not statistically significant, ours were close to being statistically significant. This is a small effect, and a more definitive study of effects on quality of life would require a larger study. We found no significant improvement in physical health–related quality of life. This finding is consistent with some previous trials, [32,34] but in contrast with other studies that did demonstrate improvement in this domain. [31,33] It is encouraging that we saw no signs of worsening of mental health status under SMI PACT. We were not expecting improvements in psychiatric symptom domains. Observed improvements in these symptoms could have been influenced by SMI PACT nurses' delivery of long-acting injectable medication, which can help with medication adherence and symptom control, or by our attention to comorbid addiction.

This study was conducted within the VA and therefore may or may not generalize to other settings. Compared with the general population, the VA population has more men, and averages older age, higher income, and better access to primary care. We were able to build on the PACT medical home model that has been disseminated across VA. Non-VA sites may not yet have existing medical homes, so implementing the model could be more challenging.

This study reorganized care within clinics. The need to make organizational change and potential for contamination of intervention and control effects made it impossible to randomize at the patient or provider level. In addition, our study excluded patients who were hospitalized in the last 6 months, not housed, or treated by other PACTs. While there is a high prevalence of SMI among homeless and hospitalized patients, these are patients for whom other established care models are believed to be appropriate. With regard to randomization, the purpose of randomization in controlled trials is to balance important unmeasured factors between groups. When there are multiple potential factors, a very large number of intervention and control sites are required for randomization to offer value. This large a trial was not justifiable at this stage of care model development. Some consider the prospective matched-cohort design used here to be less valid than a randomized controlled clinical trial. However, there is prior research

Table 3 Chronic Illness Care, Care Experience, Symptom, and Functional Outcomes

	Unadjusted estimates, mean (SD)		Intervention difference	
	Baseline	12 months	Model estimates of within group difference (95% CI)	*P* value (overall model)
Primary outcomes				
PACIC				
Activation				
Intervention	2.89 (1.21)	3.71 (1.16)	0.81 (0.5 to 1.1)	
Usual care	3.20 (1.26)	3.24 (1.39)	0.02 (− 0.3 to 0.30)	< .001
Decision				
Intervention	2.94 (1.16)	3.70 (1.03)	0.74 (0.5 to 1.0)	
Usual care	3.11 (1.12)	3.29 (1.26)	0.13 (− 0.1 to 0.4)	< .001
Goals				
Intervention	2.55 (1.08)	3.31 (1.13)	0.75 (0.5 to 1.0)	
Usual care	2.82 (1.15)	3.00 (1.29)	0.13 (− 0.1 to 0.4)	< .001
Counseling				
Intervention	2.73 (1.24)	3.64 (1.13)	0.92 (0.7 to 1.2)	
Usual care	3.04 (1.34)	3.17 (1.34)	0.04 (− 0.2 to 0.3)	< .001
Coordination				
Intervention	2.19 (1.04)	3.00 (1.12)	0.81 (0.6 to 1.0)	
Usual care	2.21 (1.04)	2.50 (1.19)	0.24 (0.0 to 0.5)	< .001
Total scale score				
Intervention	2.66 (.99)	3.47 (.97)	0.81 (0.6 to 1.0)	
Usual care	2.85 (1.02)	3.04 (1.13)	0.10 (− 0.1 to 0.3)	< .001
ACES				
Doctor-patient interaction				
Intervention	74.02 (25.33)	86.36 (16.94)	11.62 (7.7 to 15.6)	
Usual care	73.83 (27.0)	75.32 (25.41)	0.08 (− 4.1 to 4.3)	< .001
Shared decision-making				
Intervention	68.58 (30.98)	86.04 (21.21)	17.59 (9.6 to 25.6)	
Usual care	80.95 (27.33)	80.80 (28.49)	− 0.47 (− 8.7 to 7.8)	.003
Coordination				
Intervention	63.04 (31.48)	83.43 (21.28)	21.15 (16.1 to 26.2)	
Usual care	60.0 (33.98)	65.60 (32.58)	4.16 (− 1.2 to 9.5)	< .001
Access				
Intervention	64.49 (28.71)	80.31 (21.18)	16.06 (11.3 to 20.9)	
Usual care	58.80 (30.02)	61.30 (28.44)	1.67 (− 3.4 to 6.8)	< .001
Staff				
Intervention	71.31 (30.24)	83.14 (23.78)	11.85 (6.1 to 17.6)	
Usual care	70.90 (29.56)	73.98 (28.27)	2.92 (− 3.1 to 9.0)	.04
Total scale score				
Intervention	67.97 (24.16)	83.33 (16.78)	15.48 (11.8 to 19.2)	
Usual care	66.69 (25.09)	69.87 (23.72)	1.94 (− 2.0 to 5.9)	< .001
PAM-13				
Intervention	2.10 (0.44)	2.17 (.47)	0.06 (− 0.0 to 0.1)	
Usual care	2.13 (0.44)	2.19 (.44)	0.06 (− 0.0 to 0.1)	.97
BASIS-R				
Depression/functioning				
Intervention	1.63 (.68)	1.49 (.73)	− 0.12 (− 0.2 to 0.0)	
Usual care	1.71 (.72)	1.61 (.69)	− 0.10 (− 0.2 to 0.0)	.75
Interpersonal relationships				
Intervention	2.42 (.89)	2.46 (0.99)	0.0 (− 0.1 to 0.1)	
Usual care	2.39 (.89)	2.46 (0.84)	0.07 (− 0.1 to 0.2)	.52
Self-harm				
Intervention	1.56 (1.09)	1.51 (1.16)	− 0.05 (− 0.2 to 0.1)	
Usual care	1.77 (1.07)	1.61 (1.13)	− 0.12 (− 0.3 to 0.1)	.60
Emotional lability				
Intervention	0.35 (.68)	0.31 (.69)	− 0.02 (− 0.1 to 0.1)	
Usual care	0.18 (.45)	0.16 (0.41)	− 0.01 (− 0.1 to 0.1)	.88
Psychosis				
Intervention	0.88 (.79)	0.72 (.76)	− 0.16 (− 0.3 to − 0.1)	
Usual care	0.65 (.65)	0.64 (0.73)	0.01 (− 0.1 to 0.1)	.05
VR-12				
MCS				
Intervention	39.14 (11.02)	42.39 (12.75)	3.22 (1.2 to 5.2)	
Usual care	37.10 (12.73)	37.17 (12.20)	0.31 (− 1.7 to 2.4)	.05
PCS				
Intervention	37.81(11.02)	38.80 (10.99)	0.29 (− 1.2 to 1.8)	
Usual care	38.02 (10.62)	37.19 (11.61)	− 0.47 (− 2.0 to 1.1)	.49

ACES Ambulatory Care Experiences Survey, PACIC Patient Assessment of Chronic Illness Care, PAM-13 13-item Patient Activation Measure, BASIS-R Behavior and Symptom Identification Scale Revised, VR-12 Veterans 12-Item Health Survey, MCS mental component score, PCS physical component score

indicating that results using this design are often similar to randomized controlled trials across various clinical topics, treatments, and interventions [35]. In this study, patients enrolled at the intervention sites had characteristics that are associated with more severe psychiatric illness. This would be expected to make improving medical care more challenging, so the results here may be conservative estimates. Finally, while budget impact analysis and multi-site dissemination research would provide important information, these are beyond the scope of this manuscript.

CONCLUSION

In this trial of 331 adult patients with SMI, a specialized primary care medical home improved use of preventive services, including metabolic screenings, as well as chronic illness care and care experience, psychotic symptoms, and mental health–related quality of life. This care model can be effective, and should be considered for improving medical care among populations with SMI. The feasibility, effectiveness, and economic impact of disseminating this care model should be studied.

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Author Contribution *Authors Young, Cohen, and Oberman had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.*
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Acquisition of data: Young, Cohen, E. Chang, D Chang, Lindamer, Oberman.
Analysis and interpretation of data: Young, Cohen, E. Chang, D. Chang, Hamilton, Lindamer, Oberman, Sanford, Whelan.
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Critical revision of the manuscript for important intellectual content: Young, Cohen, Sanford, E. Chang, D. Chang, Hamilton, Lindamer, Oberman, Whelan.
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Declarations:

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