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Impact of a Mental Health Based Primary Care Program on Quality of Physical Health Care

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Abstract

We examine the impact of mental health based primary care on physical health treatment among community mental health center patients in New York State using propensity score adjusted difference in difference models. Outcomes are quality indicators related to outpatient medical visits, diabetes HbA1c monitoring, and metabolic monitoring of antipsychotic treatment. Results suggest the program improved metabolic monitoring for patients on antipsychotics in one of two waves, but did not impact other quality indicators. Ceiling effects may have limited program impacts. More structured clinical programs to may be required to achieve improvements in quality of physical health care for this population.

Keywords

Serious Mental Illness; Integrated Care; Quality of Care; Primary Care

INTRODUCTION

Adults with serious mental illness (SMI) are more likely to suffer from chronic physical health conditions, such as diabetes, cardiovascular disease and hypertension, than the

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Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Study procedures were approved by the IRBs of the RAND Corporation and the New York State Office of Mental Health.

general population (Janssen, McGinty, Azrin, Juliano-Bult, & Daumit, 2015; Osborn et al., 2008). Those physical health conditions are the primary drivers of early mortality in this population; SMI is associated with about 8 years of reduced life expectancy (B. G. Druss, Zhao, Von Esenwein, Morrato, & Marcus, 2011). Medical care for physical conditions is challenging for adults with SMI due in part to historical fragmentation of the delivery system into distinct sectors for specialty behavioral health and general medical care (Mechanic & Olsson, 2016). Fragmentation complicates communication and care coordination, impacting the quality of physical health care received by adults with SMI in many settings (Mangurian, Newcomer, Modlin, & Schillinger, 2016; Nasrallah et al., 2006).

One of the leading proposed approaches to improving the physical health of adults with SMI involves providing primary care services in specialty behavioral health care settings (Alakeson, Frank, & Katz, 2010). This approach aims to provide care in the setting where adults with SMI already access the healthcare system, thereby reducing the burden on patients of obtaining care, and enabling providers to better coordinate their efforts on behalf of patients with comorbid behavioral and physical disorders. Randomized controlled trials (RCTs) of mental health based primary care, which employed structured clinical protocols and targeted services to high need patients, have shown positive effects on quality of physical health care (Benjamin G. Druss et al., 2016; B. G. Druss et al., 2010). Since 2009, integration of primary care services into community mental health centers (CMHCs) has been supported by the Substance Abuse and Mental Health Services Administration (SAMHSA) through their Primary Behavioral Health Care Integration (PBHCI) program, which has awarded grants to over 180 CMHCs across the country (Center for Mental Health Services, 2016; Scharf, 2014).

PBHCI grants are used by CMHCs to provide a range of physical health services, primarily screening and monitoring of physical health conditions and wellness services, such as smoking cessation and physical activity classes (Scharf et al., 2014). However, evidence on the impact of the PBHCI program on the quality of physical health care received by adults with SMI is limited. An evaluation of PBHCI, based on a quasi-experimental comparison of PBHCI with control clinics, found some improvement in health status, but the evaluation did not provide information about the quality of the physical healthcare that patients received (Scharf et al.). A study of two PBHCI programs in Washington State compared inpatient and outpatient utilization by patients enrolled in the program with that received by patients seen in the same clinic who did not enroll. Although the study found that PBHCI increased utilization of outpatient physical health services, data used in the study were limited to care received from providers who were affiliated with the PBHCI site (Krupski et al., 2016). More comprehensive data on utilization are needed to determine whether additional care was received from external providers or whether care previously received from external providers was simply shifted to the PBHCI clinic.

In this study, we use Medicaid claims data from New York State (NYS) to examine the impact of PBHCI on quality of physical health care. Seven (7) clinics were awarded PBHCI grants in NYS, 4 which began providing primary care services in 2011 and 3 which began providing grant services in 2013. Although claims data do not include information on health outcomes, they can help identify patterns of care that the program is designed to improve.

We use these data to compare change in the quality of care received by PBHCI patients associated with the introduction of the PBHCI program with contemporaneous change in quality of care for patients treated in control clinics that did not provide primary care services. Examining the impact that PBHCI had on quality of physical health care will be informative with respect to the potential for this model to improve the health status of adults with SMI relative to usual care in the specialty mental health sector.

METHODS

Data Source

Data come from a Medicaid claims data warehouse maintained by the New York State Office of Mental Health (OMH). The database includes all claims for all Medicaid enrolled individuals who received a behavioral health service in the past five years, where behavioral health service is defined broadly to include 1) visits that occurred in a behavioral health clinic setting, 2) visits in any setting with a psychiatric diagnosis, or 3) prescriptions for a psychiatric drug. For these individuals, the database includes all Medicaid claims and managed care encounter data, including client demographic, enrollment, prescription drug and service utilization, including all general medical and behavioral health inpatient, outpatient, and emergency services. New York State's Medicaid data, including managed care encounter data (New York State Department of Health, 2016), are routinely used for quality reporting and have been found to be of high quality for research purposes in methodological studies (Byrd & Dodd, 2015).

Intervention and Control Clinics

The first two waves of PBHCI grants awarded to clinics in NYS were included in this study. Four clinics received grants in 2010 and began providing services in February 2011, and another three clinics were awarded grants in 2012 and began providing services in February 2013. All PBHCI grantees are specialty mental health clinics licensed by OMH and located in New York City. The 40 community based OMH licensed clinics located in New York City which did not have a co-license or operating certificate to provide primary care services were used as controls. All study procedures were approved by the IRBs of the RAND Corporation and NYS OMH.

Study Period

Analyses were conducted separately for each of the two waves of PBHCI grants due to their different start dates. The pre-PBHCI baseline period for each wave was defined as the two years prior to initiation of PBHCI services, February 2009 through January 2011 for wave 1 and February 2011 through January 2013 for wave 2. The PBHCI intervention period included the period from the initiation of PBHCI services through the most recent date for which complete claims data are available, February, 2015.

Study Sample

The sample includes enrollees, age 18 through 64, who were continuously enrolled in Medicaid, and received treatment in a study clinic (either PBHCI or control), during both the baseline and intervention periods. Continuous enrollment was defined, following prior

studies(Horvitz-Lennon et al., 2014), as having at least nine months of enrollment during a year with no more than 2 continuous months without enrollment. Treatment at a PBHCI or control study clinic was defined as one or more visits at a study clinic at any time during the two year baseline period, and one or more visits during the four year (wave 1) or two year (wave two) follow-up period. Individuals with dual Medicaid-Medicare eligibility were excluded because we are unable to observe Medicare-only covered utilization. For the wave 1 analysis, the sample was comprised of 6,716 PBHCI patients and 13,039 control clinic patients. For the wave 2 analysis, the sample was comprised of 1,887 PBHCI patients and 11,542 control clinic patients.

Quality Measures

Three quality measures from the National Committee on Quality Assurance's Healthcare Effectiveness Data and Information Set (HEDIS)(National Committee for Quality Assurance) that assess primary care services were adapted to the NY Medicaid claims data. An additional indicator of having at least one outpatient medical visit during the year was also examined. Each measure was calculated for each year of the baseline and implementation periods. Detailed specifications of drug, diagnosis, and procedure codes used in these measures are available on the OMH website (https://www.omh.ny.gov/omhweb/psyckes_medicaid/quality_concerns/reference_guide/general_medical_health.pdf)

Outpatient Medical Visit—An outpatient medical visit is defined as either 1) a medical exam or medical screening visit (identified by procedure codes: 99201-99205, 99211-99215, 99241-99245, 99354-99355, 99341-99345, 99347-99350, 99381-99387, 99387, 99391-99397 or ICD9 V1589, V202, V70-V709, V7231, V7610-9, V762, V7644, V7647, V7649) OR 2) an office or home visit excluding behavioral health (BH) diagnosis (ICD9 290-31999), BH settings (OMH/OASAS Specific Rate Codes or BH practitioners), as identified by diagnosis or procedure codes in the claim or encounter record. The denominator included all study clients, and the numerator included those with a Medicaid funded outpatient medical visit.

HbA1c monitoring for beneficiaries with diabetes—Individuals with diabetes were defined as follows: one or more antidiabetic medications, or two or more occurrences of diagnoses of diabetes (ICD-9 CM Codes 250, 357.2, 362.0, 366.41, 648.8) in an outpatient setting, or any 1 diagnosis of diabetes in an inpatient setting, during the measurement year and the prior year. HbA1c tests were identified using procedure codes (83036-7, 3044F-3046F). The denominator for the measure includes patients with diabetes during the baseline period and the numerator includes all those receiving 1 or more HbA1c tests during the measurement year.

Glucose/HbA1c screening for beneficiaries on antipsychotic medication.—

Antipsychotic users were identified as those with 1 or more prescription fills for an antipsychotic agent according to national drug codes in pharmacy records. Glucose tests were identified using procedure codes 80047, 80048, 80050, 80053, 80069, 82947, 82950, and 82951. The denominator for the measure includes all individuals antipsychotic

prescription fills and the numerator includes all those with evidence of 1 or more HbA1c or Glucose test in each year.

LDL/Cholesterol screening for beneficiaries on antipsychotic medications.—

LDL/Cholesterol screening was defined as procedure codes 80061, 83700, 83701, 83721, 83704, 3048F-3050F/84479, 82465, and 83718. The denominator for the measure includes all individuals with antipsychotic prescription fills and the numerator includes all those with evidence of 1 or more LDL/Cholesterol test in each year.

Patient Characteristics

Information on patient demographic characteristics, diagnoses, service utilization and costs were used to adjust for differences between patients seen in PBHCI and control clinics. Demographic characteristics were age, sex, race (White, Black, Asian, Hispanic, Other/Unknown) and eligibility category (disability vs other). Mental health diagnoses were classified as severe vs other, where severe includes diagnostic codes for schizophrenia, other psychoses, or bipolar disorder. Physical diagnoses were categorized according to the Chronic Illness and Disability Payment System (CDPS), which classifies Medicaid beneficiaries by propensity to utilize care using information on prior utilization (Kronick, Gilmer, Dreyfus, & Lee, 2000). Beneficiaries were classified as CDPS High Cost Physical Diagnosis vs Other. Service utilization during the baseline period was characterized according to the following five indicators: 1) having 12 or more mental health clinic visits, 2) having an inpatient stay for a mental health diagnosis, 3) having an inpatient stay for a medical diagnosis, 4) receiving treatment for substance use, and 5) receiving treatment for a developmental disability.

Statistical Analysis

Analyses were conducted in parallel for the two PBHCI waves, which had different starting times, different periods of follow-up and slightly different grant requirements. Each wave was analyzed using a difference-in-differences (DD) approach with propensity score weighting. Propensity scores were estimated in a logistic regression model predicting treatment in a PBHCI clinic (vs comparison clinic) using information on individual characteristics during the pre-PBHCI period. The scores were used to implement a doubly robust estimate of the impact of PBHCI (Funk et al., 2011). Inverse probability of treatment weighted logistic regression models were specified with statistical controls for patient characteristics, the individual propensity score, binary indicators for the time period and treatment in a PBHCI clinic, and the statistical interaction between time period and treatment in a PBHCI clinic. A statistically significant interaction between treatment in a PBHCI clinic and time period is interpreted as an impact of the PBHCI program.

RESULTS

Characteristics of the patient populations differ between the PBHCI and control clinics for both waves (Table 1). In the wave 1 sample, there are statistically significant differences between the PBHCI and control clinic patients with respect to demographic characteristics, eligibility category, diagnosis and service use during the pre-PBHCI period. However, the

magnitude of these differences is small. The largest differences are found for service utilization, with PBHCI clinic patients less likely to have had 12 or more mental health clinic visits, more likely to have been treated for a substance use disorder and more likely to have received a diagnosis of developmental disability. There are also significant differences between the PBHCI and control clinic patients in wave 2, though the differences do not follow the same pattern as wave 1. In wave 2, the PBHCI patients are less likely to have had high costs for physical health care during the pre-PBHCI period or to have received treatment for a substance use disorder or a developmental disability compared with control patients.

Time trends in the four quality measures for PBHCI and control patients are shown in Figure 1 for both waves. In wave 1 the PBHCI quality measures were below those of the controls, with some apparent narrowing of this difference over time for the three measures of disease monitoring. In wave 2, differences between PBHCI and controls are smaller in magnitude and do not follow obvious trends over time.

Unadjusted comparisons on quality measure performance during the baseline and follow-up periods for PBHCI and control clinics are shown in Table 2. At baseline, the proportion of clients with an outpatient medical visit was approximately 90% across groups. HbA1c monitoring for those with diabetes was 72-84% across study clinic groups, and glucose monitoring for individuals on antipsychotic medications had a similar range of 73% to 82%. Performance was lowest for annual cholesterol monitoring for individuals on antipsychotic medications (56% to 69% across study groups). During the baseline period, performance was significantly lower for PBHCI than control clinics on all four measures for wave 1 and for LDL/Cholesterol screening for beneficiaries on antipsychotics in wave 2. Performance was significantly better during follow-up than the baseline period for all measures for both PBHCI and control clinics in wave 1 and for Glucose/HbA1c screening for beneficiaries on antipsychotics in the control clinic in wave 2.

On four-year follow-up the performance improved the most for the antipsychotic cholesterol monitoring measure (7%) followed the antipsychotic glucose monitoring measure (6%), and the diabetes HbA1c monitoring measure (5%) in wave 1 PBHCI clinics. No other changes of that magnitude were observed in control clinics or PBHCI wave 2 clinics on two year follow-up.

Logistic regression models, with the variables listed in Table 1 included as covariates, were used to estimate propensity scores for both waves. Weighting by propensity scores reduced the differences between PBHCI and control samples to within 0.1 standard deviation for all covariates, with none of the differences reaching statistical significance. Detailed results of propensity score weighting are available in a supplemental table.

Results from adjusted DD models for the impact of PBHCI are shown in Table 3 for both PBHCI waves. For wave 1, there is a statistically significant ($p<.0001$) increase in the odds of having received recommended monitoring of glucose and LDL cholesterol levels among antipsychotic users in the PBHCI clinics relative to the control clinics. There were no apparent impacts of PBHCI on the odds of having an outpatient medical visit or diabetes

monitoring for beneficiaries previously diagnosed with diabetes. For wave 2 there are no significant differences between the PBHCI and control groups' trends for any of the quality measures.

Heterogeneity in the impact of the program by race/ethnicity and psychiatric diagnosis was examined for those outcomes significantly associated with PHBCI. Statistical interactions with those patient characteristics did not reach statistical significance.

DISCUSSION

This study provides new evidence regarding the ability of mental health clinic based primary care services to achieve improvements in the quality of care for physical health conditions among adults with serious mental illness. Prior studies have demonstrated that under RCT conditions, the model can be successful, but information on its effectiveness in real world implementation is lacking (Benjamin G. Druss et al., 2016; B. G. Druss et al., 2010). The strengths of the study are its inclusion of seven PBHCI programs across two separate waves of the program, selection of control clinics from the same metropolitan area, estimating of intervention effects using doubly robust difference in differences models, and use of Medicaid claims data. Although PBHCI programs are grant supported, and thus partially insulated from pressures of financial sustainability, this study may be regarded as a quasi-experimental effectiveness trial because sites were challenged by multiple real world implementation barriers, including gaining access to a well trained workforce, recruitment and engagement of patients, and coordination of care with external medical providers.

Our findings suggest that PBHCI had a positive impact on quality of primary care, even if the impact was limited to wave 1 grantees, where four year follow-up data was available, and to a domain of care closest to the clinics' core mental health mission. Specifically, the wave 1 PBHCI sites improved their laboratory monitoring of metabolic side effects of psychiatric medications, as assessed by two measures. This is a substantial achievement given that most mental health clinics do not have the capacity to conduct such monitoring in-house (Benjamin G. Druss et al., 2008). PBHCI did not appear to impact measures of care that reflect the extended scope of primary care practices targeted by the program and no impacts on quality were found for wave 2 of the program on two-year follow-up. Monitoring and treatment of the metabolic side effects of psychiatric medications are important goals of PBHCI, and there is clear evidence that these services have frequently not been provided to patients for whom they are indicated (Mitchell, Delaffon, Vancampfort, Correll, & De Hert, 2012). However, these services are arguably the 'lowest hanging fruit' for primary care quality improvement in mental health. The medications are prescribed for the psychiatric conditions that are the primary focus of the clinics, and a number of efforts targeted to mental health prescribers have been mounted to improve the monitoring rates (American Diabetes Association, American Psychiatric Association, American Association of Clinical Endocrinologists, & North American Association for the Study of Obesity, 2004).

In contrast, the other measures for which no effects of PBHCI were found in either cohort, i.e. having an outpatient medical visit and HbA1c monitoring among patients with diabetes, reflect not only the clinical care provided directly by the grantee clinics, but also their

success in coordinating care with external providers, the quality of care provided by those external providers, and the additional burden on patients of obtaining care from multiple providers. Improvement in quality of care for these measures requires overcoming additional barriers to care presented by fragmentation of the health care system (Horvitz-Lennon, Kilbourne, & Pincus, 2006). The screening and wellness programming implemented through the PBHCI grants does not appear to have influenced these more complex outcomes.

These findings contribute to an emerging body of evidence regarding strategies for improving the physical health care of adults with SMI. It is instructive to compare the PBHCI program and its results with the RCTs that have shown positive effects of mental health based primary care services. The first such RCT was conducted in a large academic medical center in the VA hospital system (B. G. Druss, Rohrbach, Levinson, & Rosenheck, 2001), an integrated care system in which coordination of care across providers with different specialties is facilitated. The PBHCI programs examined here, on the other hand, were implemented in community based clinics where functional integration of specialty care with the general medical sector faces more significant institutional barriers. In addition, the VA RCT recruited clients who did not have primary care physicians, while all clinic clients were eligible for PBHCI.

Two additional RCTs that were implemented outside of integrated care systems found positive effects on quality of preventive care and management of chronic physical illness (Benjamin G. Druss et al., 2016; B. G. Druss et al., 2010), but both programs directly provided highly structured primary care services, including standardized treatment protocols for common chronic health conditions. In addition, the RCTs specifically recruited clients with identified medical needs, including hypertension, hyperglycemia, or hyperlipidemia, while the PBHCI programs were able to enroll any interested clients from their clinic caseload. Two differences between PBHCI and the RCT stand out as potential explanations for the divergence in results, the extent to which the programs directly provided or coordinated care and the extent to which the programs were targeted to individuals with specific unmet medical needs. These findings suggest that a greater level of explicitly structured care with accountability for quality (Goldman, Spaeth-Rublee, & Pincus, 2015; Kilbourne, Fullerton, Dausey, Pincus, & Hermann, 2010; Pincus, Spaeth-Rublee, & Watkins, 2011), rather than simple co-location of services (Amy M. Kilbourne et al., 2011), and a focus on high need patients may be critical to the success of mental health based physical health care services. It is worth noting that subsequent waves of PBHCI grants included more stringent requirements for direct care provision and coordination. Results from PBHCI programs funded with more stringent requirements may provide informative contrasts with the results observed here.

The impact of PBHCI may also have been limited because the clinics, both PBHCI and control, were already performing at relatively high levels of quality for this population, relative to the range of performance reported in the literature. For instance, a recent systematic review reported that the proportion of adults with SMI and diabetes who received HbA1c ranged from 43% to 89% across studies (McGinty, Baller, Azrin, Juliano-Bult, & Daumit, 2015). In this study, the prevalence of HbA1c testing in patients with diabetes was close to the upper bound of that range for both the PBHCI and control clinics for both waves

of PBHCI grants. A systematic review of studies of metabolic screening for patients on antipsychotic medications found that after implementation of clinical guidelines the proportion of patient receiving monitoring of glucose or lipids had increased to 56.1% and 28.9% respectively (Mitchell, Delaffon, Vancampfort, Correll, & De Hert, 2011). Performance for Medicaid HMOs on the HEDIS measure of diabetes screening among patients with schizophrenia or bipolar disorder on antipsychotic medications was 80.4% in 2016 (National Committee for Quality Assurance, 2016), close in magnitude to the post-PBHCI performance for both waves in this study. The proportions with annual medical outpatient visits in the two waves were approximately 90% or higher. Implementation of PBHCI in settings with lower starting points may achieve contrasting results. In addition, only two years of follow-up data were available for the wave 2 clinics, while previous have suggested that the impact of integrated programs may take additional time to occur (Krupski et al., 2016).

Results of this study should also be interpreted in light of the limitations of quality measures based on Medicaid claims data. The data themselves are subject to errors due to complex requirements of billing processes. However, there is no reason to suspect that such errors differ between PBHCI and control clinics. Beneficiaries covered by both Medicaid and Medicare, the dual eligibles, were excluded from the analysis because of the lack of information on claims covered by Medicare; 16% of wave 1 and 19% of wave 2 beneficiaries were excluded on this basis. Though it is likely that dual eligible beneficiaries have more serious illnesses, since they must qualify as disabled to received Medicare coverage prior to age 65, it is unlikely that this exclusion would produce differential effects across clinic types. The Medicaid data abstract used in this study has undergone extensive review and is regularly used for monitoring patient-level quality of care. The quality measures calculated from the claims are designed to reflect clinical guidelines and there is some evidence of association between quality measure performance and health status (Harman et al., 2010), but the measures do not directly reflect positive health outcomes. Most importantly, it is not possible to capture the full scope of targeted clinical processes in claims. For instance, screening for high blood pressure or obesity or counseling regarding management of chronic illness may have occurred without generating billing claims.

PBHCI is an important model to study, not only because the program is continuing, but also because it affords an opportunity to examine the potential of this model of integration to improve care for physical health conditions for adults with SMI. Though the impact of the program appears modest at best in this analysis, the findings have two important implications for the design and implementation of future programs. First, the clearest contrast with the randomized controlled trials is in the use of clinical protocols for management of medical conditions. Later iterations of the PBHCI program have in fact required more structured clinical programs. Second, PBHCI type programs might be best targeted specifically to patient groups or clinics that have previously been identified as having poor access to primary care or as receiving poor quality of physical health care. Clinics in which the quality of physical health care is relatively high may have more difficulty producing additional improvements and may be likely to shift care from one setting to another, rather than provide that otherwise would not have occurred. Studies of PBHCI should be considered among the multiple integrated care models, including health

homes, Accountable Care Organizations, and Certified Community Behavioral Health Centers, that aim to improve the quality of care for patients with comorbid physical and mental health conditions (Bao, Casalino, & Pincus, 2013). Continued improvement in the delivery system will depend on integrating information from assessments of these diverse strategies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1. Trends in quality measures for PBHCI and control clinics.
Lines represent trends in outcome measures by year for PBHCI and control clinics.

Table 1.

Characteristics of the PBHCI and Control Group Patients for Wave 1 and Wave 2

Variable	Wave 1			Wave 2		
	PBHCI Group (N=6712)	No IC Group (N=13012)	p-value ¹	PBHCI Group (N=1881)	No IC Group (N=11514)	p-value ¹
<u>Demographic</u>						
Age (SD)	43.41	43.28	11.09	45.93	44.81	11.14
Male	2385	4120	31.66%	707	3847	33.41%
Race/Ethnicity						
White	1965	4241	32.59%	484	3637	31.59%
Black	2272	4214	32.69%	664	3888	33.77%
Asian	61	278	2.14%	26	250	2.17%
Hispanic	1733	2725	20.94%	410	2357	20.47%
Other/Unknown	681	1554	11.94%	297	1382	12.00%
Disability Aid Category ²	4902	8903	68.42%	1540	8614	74.81%
<u>Diagnosis</u>						
Severe Mental Illness	2197	3794	29.16%	895	3691	32.06%
High Cost Physical Diagnosis	729	1525	11.72%	146	1436	12.47%
<u>Service Use</u>						
12 or More MH Clinic Visits	4053	10200	78.39%	1436	9402	81.66%
MH Inpatient Stay	1066	1895	14.56%	335	1767	15.35%
Medical Inpatient Stay	2106	3586	27.56%	564	3189	27.70%
Substance Use Treatment	1355	1848	14.20%	184	1748	15.18%
Developmental Disability Treatment	481	521	4.00%	18	421	3.66%

PBHCI=Primary Behavioral Health Care Integration; No IC=No Integrated Care; SD=Standard Deviation; MH=Mental Health

¹ p-values are for tests of differences between PBHCI and No IC clinic samples.

² Reference is Other Aid Category.

Table 2.

Unadjusted pre-post differences in performance of PBHCl and control clinics on quality measures for waves 1 and 2

Quality of Care Measures	PBHCl Clinics					Control Clinics					Difference in Differences (PBHCl-Control) ^f	
	Clients	Person Years	%	Follow-Up Person Years	Difference PBHCl (Post-Pre)	Clients	Person Years	%	Follow-Up Person Years	Difference Control (Post-Pre)		
Outpatient Medical Visit												
Wave 1 *	6,712	10,745	91.1	20,378	89.03	13,012	20,805	90.0	39,022	87.7	-2.23 [‡]	0.11
Wave 2	1,881	2,507	89.7	2,464	87.95	11,514	17,524	91.0	17,246	89.7	-1.36 [‡]	-0.4
HbA1c monitoring for beneficiaries with diabetes												
Wave 1 *	975	1,752	71.6	3,469	77.0	1,791	3,199	79.7	6,281	82.0	2.3 [‡]	3.0
Wave 2	336	625	81.6	625	81.1	1,843	3,389	84.0	3,447	85.5	1.6	-2.0
Glucose/HbA1c screening for beneficiaries on antipsychotic												
Wave 1 *	2,994	5,254	73.5	9,116	79.9	4,692	8,239	80.2	14,399	82.5	2.3 [‡]	4.1
Wave 2	793	1,436	80.5	1,432	82.2	3,921	7,094	81.6	7,086	82.9	1.3 [‡]	0.4
LDL/Cholesterol screening for beneficiaries on antipsychotic												
Wave 1 *	2,994	5,254	56.4	9,116	63.6	4,692	8,239	66.8	14,399	69.0	2.2 [‡]	5.1
Wave 2 *	793	1,436	63.7	1,432	65.3	3,921	7,094	69.0	7,086	68.8	-0.2	1.8

PBHCl=Primary Behavioral Health Care Integration; HbA1c=Hemoglobin A1c; LDL=Low-Density Lipoprotein.

^f Positive difference in differences result indicates gains over time in quality measure performance in PBHCl clinics relative to Control clinics.

* Difference between PBHCl and control clinics during pre-PBHCl period is statistically significant at p=05.

[‡] Difference between pre and post samples is statistically significant at p=05.

Table 3.

Adjusted difference in differences estimates of PBHCI impacts on quality measures

Quality of Care Measure	Wave 1					Wave 2				
	Estimate ¹	Standard Error	95% Confidence Interval	Z-Score	P-value	Estimate ¹	Standard Error	95% Confidence Interval	Z-Score	P-value
Outpatient Medical Visit	-0.075	0.052	(-0.18, 0.03)	-1.44	0.15	0.05	0.103	(-0.15, 0.25)	0.48	0.63
HbA1c monitoring for beneficiaries with diabetes	0.14	0.092	(-0.04, 0.32)	1.56	0.1179	-0.10	0.177	(-0.44, 0.25)	-0.55	0.5852
Glucose/HbA1c screening for beneficiaries on antipsychotic	0.22	0.054	(0.12, 0.33)	4.12	<.0001	-0.02	0.108	(-0.23, 0.20)	-0.15	0.8799
LDL/Cholesterol screening for beneficiaries on antipsychotic	0.21	0.045	(0.12, 0.30)	4.55	<.0001	0.07	0.089	(-0.11, 0.24)	0.75	0.4527

PBHCI=Primary Behavioral Health Care Integration; HbA1c=Hemoglobin A1c; LDL=Low-Density Lipoprotein.

¹Positive difference in differences estimates indicate gains over time in quality measure performance in PBHCI clinics relative to Control clinics.