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RESEARCH ARTICLE

Does the Primary Care Behavioral Health Model Reduce Emergency Department Visits?

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Objective. To examine the impact of integrating behavioral health services using the primary care behavioral health (PCBH) model on emergency department (ED) utilization.

Data Sources. Utilization data from three Dane County, Wisconsin hospitals and four primary care clinics from 2003 to 2011.

Study Design. We used a retrospective, quasi-experimental, controlled, pre-post study design. Starting in 2007, two clinics began integrating behavioral health into their primary care practices with a third starting in 2010. A fourth, nonimplementing, community clinic served as control. Change in emergency department and primary care utilization (number of visits) for patients diagnosed with mood and anxiety disorders was the outcomes of interest.

Data Collection. Retrospective data were obtained from electronic patient records from the three main area hospitals along with primary care data from participating clinics.

Principal Findings. Following the introduction of the PCBH model, one clinic experienced a statistically significant ($p < .01$, 95 percent CI 6.3–16.3 percent), 11.3 percent decrease in the ratio of ED visits to primary care encounters, relative to a control site, but two other intervention clinics did not.

Conclusions. The PCBH model may be associated with a reduction in ED utilization, but better-controlled studies are needed to confirm this result.

Key Words. ED visits, primary care behavioral health, utilization, integrated care

The primary care behavioral health (PCBH) model, a method of integrating behavioral health care into primary care, has been posited as a potential vehicle for engaging patients within primary care more effectively and reducing avoidable emergency department (ED) utilization (Strosahl 2002). Because patients with mental health diagnoses, high levels of psychosocial and medical need, and Medicaid insurance are among the highest ED utilizers (Doran,

Raven, and Rosenheck 2013; Morgan et al. 2013), the integration of behavioral services into primary care has great potential for reducing avoidable ED utilization. By better addressing the core needs of these vulnerable populations within primary care, ED use may be lessened (Strosahl 2002).

Several models exist for integrating behavioral health into primary care, including the collaborative care model (CC), screening, brief intervention, and referral to treatment (SBIRT), and the primary care behavioral health (PCBH) model. Each model has a different focus, and typically, different mental health professionals involved (see Serrano 2015; for further discussion on model differences). Briefly, the CC model focuses on a specific diagnosis (e.g., depression) and uses psychiatric care with enhanced follow-up (Katon et al. 2006; Woltmann and Grogan-Kaylor 2012; Celano et al. 2016). The SBIRT model focuses on universal screening for substance use disorders, brief intervention within clinic, and referral to treatment for more significant use issues (Estee et al. 2010; Paltzer et al. 2016). The PCBH model is a generalist model that focuses on providing behavioral health services within primary care to any patient who presents to clinic, thus addressing a diverse array of diagnostic issues and also providing enhanced support for psychosocial stressors and medical issues with behavioral components (Robinson and Reiter 2016).

There is mixed evidence for the efficacy of the CC and SBIRT approaches to reduce ED utilization. The CC model increased utilization of primary care and reduced visits outside of primary care in one study (Katon et al. 2006), and, among patients with acute cardiac illness and depression/anxiety, was associated with reduced ED utilization (Celano et al. 2016). However, in a meta-analysis Woltmann and Grogan-Kaylor (2012) found that CC interventions were not associated with reduced total health care costs, an indicator partly related to utilization. An SBIRT model implementation in EDs in Washington State showed a statistically significant reduction in ED visits by working-age Medicaid recipients (Estee et al. 2010). However, in another study, the SBIRT model showed no statistically significant reduction in ED utilization in a sample of over 7,000 adult Medicaid patients followed up for 24 months (Paltzer et al. 2016). No studies have documented a relationship between the implementation of the PCBH model and any kind of health

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care service utilization outside of primary care. Lanoye et al. (2017) compared patients in a safety net primary care clinic who received integrated behavioral health services (model unspecified) to those who did not receive such services. They found a significant decrease in preventable hospitalizations in the year after behavioral health intervention, compared to the year prior to intervention. In contrast, a matched control group of patients not receiving behavioral health services showed no change in preventable hospitalizations over the same time period. There were no differences between the two groups. A previous study performed in the same setting as the present study (Serrano and Monden 2011) demonstrated increased engagement (more visits) of patients in the medical home with the inclusion of the PCBH model.

The aim of this study was to explore the impact of the implementation of the PCBH model on ED and primary care utilization among patients with mental health diagnoses. Retrospective analysis of electronic health record data allowed us to track the ED and primary care utilization of patients of four medical homes. Three of the medical homes adopted the PCBH model during the data period; this allowed for examination of utilization pre- and postimplementation of the PCBH model. The fourth clinic maintained a more traditional, nonintegrated model of behavioral health throughout the study period and thus served as a control.

DATA

Program Description

The PCBH model has been widely adopted in government (e.g., military, tribal) clinics and in community health centers (Runyan et al. 2003; Robinson and Strosahl 2009). The PCBH model, as employed by the intervention clinics in this study, can be described as follows:

1. Behavioral health professionals function as consultants to primary care physicians (PCPs). Hence, they are referred to as behavioral health consultants (BHCs). The BHCs are viewed as integral members of the primary care treatment team.
2. The goal of consultation is to develop a treatment plan for the PCP (and the entire health care team) to execute. The focus of the plan is to help the PCP manage the psychosocial needs of his or her patient. The PCP retains control of the patient's care; the BHCs do not establish their own panel of patients.

3. Follow-up consultations with BHCs are strategically determined with the care team, and for most patients, there are 1–4 visits annually.
4. The BHCs are colocated with the primary care physicians. That is, they share office space with them and/or see patients in medical examination rooms (Robinson and Reiter 2016).

Patient and Practice Selection

Primary care data were obtained from four medical homes in Madison, Wisconsin.

Access Community Health Centers—South and East. Two clinics, Access South and Access East, were Access Community Health Centers clinics for the duration of the study. These affiliated clinics are both Federally Qualified Health Centers (FQHCs) currently staffed by family physicians, general internists, pediatricians, and mid-level practitioners. Their behavioral health consultation team consists of licenced psychologists and licenced clinical social workers. The staffing ratio was on average one BHC to three to four medical providers.

Wingra Access Family Medical Center (Wingra). Originally called Wingra Family Medical Center, Wingra Access Medical Center (Wingra) is a residency training site of the University of Wisconsin Department of Family Medicine and Community Health. Its medical staff includes family physician faculty, mid-level practitioners, and family medicine residents. In 2010, Wingra Family Medical Center affiliated with Access Community Health Centers, allowing Wingra to become an FQHC. Prior to the affiliation, Wingra had a 0.5 full-time equivalent colocated psychologist who functioned as a traditional psychotherapist for clinic patients and who did not practice the PCBH model. With the affiliation, the psychologist adopted the PCBH model employed at the other Access clinics. The Wingra behavioral health consultation team was then expanded to include other Access BHCs. After the affiliation, the staffing ratio at Wingra was, on average, one BHC for each five to six medical providers, a higher ratio than the other clinics due to the inclusion of medical residents who typically see a smaller volume of patients.

Northeast Family Medical Center (Northeast). Like Wingra, Northeast is a residency site of the University of Wisconsin Department of Family Medicine and Community Health. It has a complement similar to the Wingra Clinic of

family physician faculty and mid-level providers. Northeast also had a full-time clinical social worker over the course of the study, who is colocated but does not practice in accordance with the integrated PCBH model as described above. Northeast is the only medical home in the study that is not an FQHC and did not incorporate PCBH. Thus, it served as the control arm of the study.

Selection of Patient Records

The University of Wisconsin Internal Review Board determined that the study was not considered a human subjects research study. A data exchange agreement between Access Community Health Centers and the University of Wisconsin Department of Family Medicine and Community Health allowed the researchers to obtain information regarding patients from the four medical homes. Collection of the data was greatly facilitated by the fact that all four medical homes utilize the same electronic health record (EPIC Systems, Inc, Verona, Wisconsin). The time span of this retrospective data collection was from 2003 to 2011. Patients were included if they were at least 18 years of age at time of encounter and had at least one primary care encounter over the course of the data collection period for which any of the mental health diagnoses in (see Table S1) were entered. This resulted in a collection of records from 11,968 unique patients. Patient records were assigned to medical homes based on clinics where they had visits. Patients sometimes visited more than one primary care clinic over the course of the study period. In these cases, the patient was assigned to the medical home in which they had the most years with clinic visits. In the case of ties, a random assignment between the tying medical homes was employed. Nearly all ties were among Access Community Health Centers clinics.

Data included patient medical record numbers for matching, dates of encounters, medical care provider, and diagnoses for the visit in primary care.

Utilization Data. Data exchange agreements allowed the researchers to obtain patient ED and primary care utilization data from three local hospital and inpatient facilities (in addition to the aforementioned primary care clinics): University of Wisconsin Hospital, St. Mary's Hospital, and Meriter Hospital. With the exception of the Veteran's Administration Hospital, these three institutions represent virtually all of the ED, medical, psychiatric, and surgical hospital beds in the city.

There were 288,068 primary care encounter records for 10,150 unique patients (see Table 1). This excludes 24,231 (8.4 percent) records of 1,710 (16.8 percent) patients for whom complete insurance data were unavailable. Distribution of patients among clinics was as follows: Northeast, 36.5 percent; Access South, 18.6 percent; Access East, 18.2 percent; and Wingra, 26.7 percent. Distribution of encounter records followed a similar pattern: Northeast, 33.8 percent; Access South, 18.7 percent; Access East, 20.7 percent; and Wingra, 26.9 percent.

There were 67,025 ED encounter records from 8,304 unique patients. Note that there were 1,846 fewer patients in the ED encounters than primary care encounters because not all patients had ED encounters during the collection period. Total ED encounters ranged from 1 to 239, mean = 8.1, median = 4. A small number of records (1.4 percent) were excluded because the MRN in the ED encounter record did not match any in the primary care encounter data, probably due to underage or missing insurance exclusion as described above.

Data Analysis

Analyses compared clinics that implemented PCBH (Access South, Access East, and Wingra) to a clinic that did not (Northeast). The two Access clinics were combined because PCBH was introduced simultaneously in those clinics in 2007. Because the Wingra Clinic had a later introduction and followed a different care model (some specialty mental health before implementation of integrated care) than the Access clinics, it was compared separately to the Northeast (control) Clinic. Comparisons were made via multigroup interrupted time series analysis (ITSA) with the PCBH versus the Northeast (control) Clinic forming the groups and the year of intervention (2007 for the Access clinics, 2010 for Wingra) forming the breakpoint in the time series. In both cases, the year of PCBH introduction was excluded from the analysis. ED encounters and primary care encounters were summed within calendar quarters (January–March, April–June, etc.) within each arm (PCBH or control). Data preparation was performed in SPSS v.23. Time series analysis was performed in Stata SE v14.

ITSA uses a linear regression-based model that controls for autocorrelation between successive periods (quarters, in this case) and at the same time provides tests of a number of components in the model of interest. These components include differences in slopes or trends between the two groups, both

Table 1: Demographic and Insurance Information on Participating Medical Homes, total N = 10,150

	Arm	N	Age 2012 (SD)	Race %*					Insurance %				
				African American	American Indian	White	Hispanic	N/A	None	Commercial	Medicaid	Medicare	
Northeast Access (South) Access (East) Wingra	C	3,429	47.6 (16.0)	68.8	14.0	1.7	76.7	2.6	1.9	6.9	65.8	14.5	12.8
	I	1,894	44.3 (14.0)	65.9	27.8	8.7	42.3	10.9	9.0	32.5	31.2	28.6	7.7
	I	2,097	42.6 (13.4)	63.5	22.5	3.0	58.4	5.9	8.5	30.2	36.5	27.8	5.4
	I	2,730	45.7 (14.7)	67.4	25.2	4.0	55.2	8.1	4.5	14.0	51.1	24.5	10.4

*Asian and Native Hawaiian/Pacific Islander omitted for space; both <3% at any clinic.

prior to and after the intervention. They include a test of change in the trend for the intervention (PCBH) group alone, before and after the intervention, to examine whether the intervention caused a change. It also tests whether there was a mean change at the time of the intervention, regardless of subsequent trend.

We examined ITSA models for raw number of ED visits, totaled within 3-month periods beginning in April 2003 and ending June 2012, a total of 37 quarters (minus the 4 quarters deleted during the year of PCBH introduction, as described earlier). In order to control for overall patient population within clinics, we also examined ITSA models for the ratio of ED visits to primary care visits (i.e., ED visits/primary care visits) across the same time periods. The use of this ratio is also conceptually important given that the underlying theory is that better engagement in the medical home, in part captured by medical home visits, is part of what drives reduced unnecessary utilization outside of the medical home.

RESULTS

Table 2 shows coefficients for the time series components for the comparison of the Access clinics to the Northeast control including results for raw ED encounter totals and the ED encounters to primary care encounters ratios. Table 3 shows comparable results for the Wingra Clinic compared to the Northeast control. Figure 1a,b shows corresponding plots of results for the Access versus Northeast comparisons; Figure 2a,b shows plots of the Wingra versus Northeast comparisons.

In the Access versus Northeast comparison, ED rates were similar in 2003 (Figure 1a). The difference in trend over time before implementation is significant ($p = .003$), with the Access clinics increasing on average 11.6 (95 percent CI 4.0–19.2) ED encounters more each quarter (Table 2). Following the introduction of PCBH, there was no significant difference between trends for Access and Northeast. For Access alone, there was a significant change in trend after PCBH implementation with the ED encounter rate leveling off (-6.4 , 95 percent CI -11.1 to -1.7 , $p < .01$).

The ratio of ED encounters to primary care encounters provides a different perspective on the ED utilization (Figure 1b). The ratio of ED encounters in the Access clinics was much higher (difference in ratios = 0.40 , 95 percent CI 0.29 – 0.51 , $p < .001$) and decreased at a significant rate compared to

Table 2: Selected Coefficients for Raw ED Totals (left) and ED Totals Divided by Primary Care Totals (right) for Access Clinics Compared to Northeast Clinic (Control)

	<i>Access Clinics Versus Northeast Clinic (Control)</i>							
	<i>Total ED Encounters Per Quarter</i>				<i>ED/Primary Care Encounters</i>			
	<i>Coefficient</i>	<i>95% CI</i>		<i>p</i>	<i>Coefficient</i>	<i>95% CI</i>		<i>p</i>
Initial difference	43.83	−26.05	113.72	.21	0.397	0.286	0.507	<.01
Difference	11.59	4.01	19.17	<.01	−0.016	−0.027	−0.004	<.01
preintervention slopes								
Relative change	56.91	−38.76	152.58	.24	0.006	−0.101	0.112	.92
postintervention								
Relative change in	−5.66	−14.89	3.57	.22	0.008	−0.003	0.019	.16
slopes								
postintervention								

Table 3: Selected Coefficients for Raw ED Totals (left) and ED Totals Divided by Primary Care Totals (right) for Wingra Clinic Compared to Northeast Clinic (Control)

	Wingra Clinic Versus Northeast Clinic (control)							
	Total ED Encounters Per Quarter				ED/Primary Care Encounters			
	Coefficient	95% CI		p	Coefficient	95% CI		p
Initial difference	41.87	−19.71	103.46	.18	0.057	0.029	0.085	<.01
Difference	1.62	−2.18	5.41	.40	0.004	0.002	0.006	<.01
preintervention slopes								
Relative change	−44.69	−119.77	30.39	.24	−0.113	−0.163	−0.063	<.01
postintervention								
Relative change in	−3.32	−25.11	18.48	.76	−0.006	−0.017	0.004	.21
slopes								
postintervention								

Northeast, which showed a slow increase (-0.006 vs. +0.002, difference = -0.008, 95 percent CI -0.011 to -0.005, $p = .005$).

In the comparison of Wingra Clinic with Northeast Clinic, for both raw ED encounter rates (Table 3 and Figure 2a) and the ratio of ED to primary

Figure 1: (a and b) Comparison of Combined Access Clinics (PCBH) and Northeast (control) Clinic from April 2003 through December 2011

Note. Top is total number of ED visits. Bottom is ratio of ED visits to primary care visits. Intervention instituted in 2007.

care encounters (Table 3 and Figure 2b), both clinics showed a gradual increase between 2003 and 2010, followed by a sharp decline after the intervention point. In raw ED encounters, none of these differences in mean numbers or trends were significantly different. However, the Wingra Clinic ratios

Figure 2: (a and b) Comparison of Wingra Clinic (PCBH) and Northeast (control) Clinic from April 2003 through December 2011

Note. Top is total number of ED visits. Bottom is ratio of ED visits to primary care visits. Intervention instituted in 2010.

of ED visits to primary care encounters (Table 3 and Figure 2b) started higher than Northeast (0.001, 95 percent CI 0.0004–0.0020, $p = 0.002$) and increased at a higher rate (0.004, 95 percent CI 0.002–0.006, $p < .001$) prior to the intervention point. Following the introduction of PCBH, Wingra Clinic

experienced a large and significant (-0.11 , 95 percent CI -0.16 to -0.06 , $p < .001$) decrease, which was not experienced by the Northeast Clinic, although the downward trend in rates continued at similar rates for both clinics ($p = .212$).

DISCUSSION

We found a statistically significant decline in the ratio of ED visits to primary care encounters for Wingra Clinic as compared to the Northeast Clinic after implementation of the PCBH model. No such decline was observed in the Access clinics, although raw ED utilization showed a trend toward leveling and the ratio of ED to primary care visits continued a preexisting downward trend. Given that we were unable to control for all factors that may have changed as a result of Wingra becoming part of an FQHC and implementing PCBH simultaneously and given the lack of similar declines at the other Access clinics, we cannot reject the null hypothesis. The analyses here do not rule out that there may have been some other as-yet-unidentified factor related to becoming an FQHC that may have caused the changes in utilization, rather than PCBH implementation. Future studies would do well to consider the complexities listed here, and to explore their populations in more detail to reveal further defining features of potential subpopulations that may affect utilization.

In total, all the intervention clinics showed improvement (leveling or downward trend) in ED utilization postintervention. However, key differences in the populations of the clinics likely accounted for the fact that the intervention clinics in general had higher ED utilization. Herein lies the difficulty of finding adequate controls for studies of this type. In this study, the intervention clinics were FQHCs, which serve a high-needs population with no other comparable clinics in the community. This is a significant factor in interpreting the comparisons made in this study.

We hope this study provides impetus for further analysis of the impact-specific models of integrated care and the effect they may have on emergency department utilization relative to primary care utilization. If it can be confirmed that a model of care is associated with increased engagement in the medical home and reduced utilization of costly emergency care, then the promise of integrated care can be realized.

However, as with the state of the current literature, the findings are tempered by elements related to the study design and by the reality that patient

health care utilization is a complex affair. One model is not likely to be able to account for all factors impacting ED utilization, and retrospective, quasi-experimental studies such as this one will suffer from poor controls. It is also important to note that the utility of the PCBH model cannot be solely measured in terms of its ability to reduce ED visits; however, studies like this and future studies can begin to tell a more detailed story of how patients with mental health concerns treated in primary care may benefit from increased access to behavioral health care within primary care and also improve the functioning of the health system at large.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the supporting information tab for this article:

Appendix SA1: Author Matrix.

Table S1. ICD-9 Codes Used to Identify Index Patients.