


# Integration of Diabetes and Depression Care Is Associated with Glucose Control in Midwestern Federally Qualified Health Centers



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**BACKGROUND:** The 2016 American Diabetes Association position statement emphasized that psychosocial and medical care should be integrated and provided to all people with diabetes.

**OBJECTIVE:** To determine whether better integration of diabetes and depression care is associated with better glycemic control.

**DESIGN:** Cross-sectional surveys of Midwestern federally qualified health center (FQHC) leaders and primary care providers (PCPs) in 2016. Responses were linked to FQHC-level data on the percentage of patients with uncontrolled diabetes (glycated hemoglobin  $\geq$  9%; 75 mmol/mol).

**PARTICIPANTS:** Midwest Clinicians' Network-affiliated FQHC leaders, and PCPs at the FQHCs.

**MAIN MEASURES:** Multilevel models were used to determine associations between the percentage of patients with uncontrolled diabetes and FQHC and PCP characteristics; presence of diabetes and behavioral health care services; and PCPs' perception of the stage of integration between diabetes and depression care services based on the transtheoretical model (i.e., pre-contemplation, contemplation, preparation, action, or maintenance).

**KEY RESULTS:** Response rates were 60% for the FQHC survey ( $N = 77$ ) and 55% for the PCP survey ( $N = 538$ ). In adjusted models, FQHCs in which PCPs perceived a higher stage of integration between diabetes and depression care had 3% fewer patients with uncontrolled diabetes per 1-level increase in integration stage ( $p = 0.01$ ); on-site diabetes self-management education was associated with 7% fewer patients with uncontrolled diabetes ( $p < 0.01$ ).

**CONCLUSIONS:** At Midwestern FQHCs, a higher stage of perceived integration of diabetes and depression care was associated with better FQHC-level glycemic control. Future studies are needed to elucidate what defines integration of diabetes and depression care services.

**KEY WORDS:** diabetes; depression; integrated care; glucose control.

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## INTRODUCTION

In 2016, the American Diabetes Association (ADA) published a position statement emphasizing that psychosocial care should be integrated with medical care and provided to all people with diabetes.<sup>1</sup> Among the various psychosocial factors identified in the position statement was the high prevalence of depression among people with diabetes.<sup>2–6</sup> People with comorbid diabetes and depression have worse self-management, worse disease control, worse quality of life, greater functional disability, worse quality of care, greater health care utilization, 50–75% greater total medical costs, and increased mortality.<sup>7–12</sup> Thus, it is critical to address physical and mental health problems in tandem for patients with diabetes.

Several models exist for the integration of physical and mental health care for patients with diabetes.<sup>13</sup> These models were developed in primary care settings, where most patients with diabetes receive their diabetes care, and emphasized systematic, patient-centered care. In order to integrate care, system-level changes are necessary including integration of clinical workflows and culture, cross-training of providers and clinic staff, sharing of clinical information and scheduling, and oftentimes physical collocation of providers.<sup>14</sup> Evidence does exist from randomized trials that one particular model of integrated care, the collaborative care model, leads to improved depression symptoms and glycemic control compared to usual care.<sup>15</sup>

While arguments to integrate diabetes and depression care are strong, little is known about how integrated care affects glycemic control. A major challenge to understanding the real-world impact of integrated care is the shortage of integrated care in primary care and endocrinology clinics.<sup>16</sup> In contrast, nearly 65% of federally qualified health centers (FQHCs) have integrated behavioral health and primary care, in which colocated mental health clinicians, most often social workers, collaborate with medical providers on patient care and offer

short-term behavioral and psychological interventions.<sup>17</sup> Moreover, patients receiving care in FQHCs have a higher prevalence of diabetes than patients receiving care elsewhere (12.7% vs. 8.9%).<sup>18</sup> In addition, about 40% of patients with diabetes receiving care at FQHCs have comorbid depression,<sup>19</sup> which is much higher than the 11% prevalence of comorbid diabetes and depression estimated for the USA.<sup>20</sup>

Given the prevalence of diabetes and depression among FQHC patients, and the preponderance of FQHCs with integrated behavioral health services, we sought to assess whether the degree of perceived integration of diabetes and depression care was associated with better diabetes control.

## METHODS

### Participants

The Midwest Clinicians' Network (MWCN) is a nonprofit corporation that provides education, research, and networking opportunities for health care providers, FQHCs, and primary care associations in 10 states: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Ohio, and Wisconsin. In Summer 2016, all 132 MWCN-affiliated FQHCs were sent the "Health Center Survey," in order to gain information about the FQHC's behavioral health services (Supplemental Appendix 1). The survey was sent to the behavioral health director or another FQHC leader. In Fall 2016, a follow-up survey was sent to primary care providers (PCPs) who worked at the eligible FQHCs that had completed the Health Center Survey. This follow-up survey, the "Provider Survey," was sent to 1115 PCPs (i.e., attending physicians, advanced practice nurses, physician assistants) (Supplemental Appendix 2). Both questionnaires were mailed up to 3 times approximately 1 month apart.

### Measures

**Conceptual Model.** A conceptual model motivated the inclusion of survey items (Supplemental Figure 1). We hypothesized that integration of behavioral health into primary care would affect PCP attitudes and behaviors regarding behavioral health, as well as patient attitudes, health behaviors, mental health, self-efficacy, treatment adherence, and engagement in their health care. Because of these changes in PCP and patient attitudes and behaviors, FQHC-level diabetes control would improve.

**Surveys.** We focused survey items on the defining features of primary care-behavioral health integration described in the literature and existing surveys.<sup>21–27</sup> These features included colocation; communication and collaboration; shared problem lists, treatment plans, medication lists, and lab results; and joint decision-making.<sup>28</sup> In addition, we asked PCPs about their perceptions of and satisfaction with the effectiveness and availability of behavioral health services. We also included items about diabetes care resources at the FQHCs and PCPs'

satisfaction with these resources to provide a standard upon which to judge the effect size of any associations between FQHC-level glycemic control and care integration. Finally, we asked PCPs, "Overall, how would you describe the status of your health center's efforts to integrate care for depression and diabetes?" Response options corresponded to the transtheoretical model's five stages of change (i.e., pre-contemplation = "We have not started thinking about it," contemplation = "We are thinking about it, but we have not started planning yet," preparation = "We are in the planning stage," action = "We have implemented some strategies, but have more work to do," maintenance = "Our implementation is complete, and we are focused on maintenance and quality improvement." ).<sup>29</sup>

Survey responses were matched with publicly available data from 2016 on FQHCs' populations and services, available through the Health Resources and Services Administration Bureau of Primary Health Care Uniform Data System (UDS). The outcome was the percentage of patients with uncontrolled diabetes, defined by an HbA1c  $\geq 9\%$ , as reported in the UDS.

**Analysis.** This cross-sectional study had a multilevel structure: PCP (level 1), clinic sites (level 2), FQHC (level 3), and state (level 4); to incorporate the hierarchical data in the analysis, PCP-level responses were transformed to FQHC-level responses using a multistage process. Because each FQHC could have multiple clinic sites, first, the mean of PCP responses within each clinic site was calculated. Then, the median response was calculated for the clinics within each FQHC.<sup>30</sup> Finally, we accounted for the nesting of FQHCs within states.

We used linear mixed models (LMM) to test associations between predictor(s) and the percentage of patients with uncontrolled diabetes at a FQHC. We first conducted bivariate analyses by adding one predictor into an LMM. We then conducted multivariate analyses of those predictors with  $p$  value  $< 0.10$  in their bivariate analyses. We imputed missing data, using the Markov chain Monte Carlo (MCMC) method. We used all predictors for the multiple imputations and generated 10 imputed datasets, which were used to calculate a mean dataset, where all missing values were filled with mean values. Among the predictors selected for the multivariate analyses, there were no issues with multicollinearity. After generating the mean dataset, we performed model selection using the least absolute shrinkage and selection operator (LASSO) method as the stopping criterion.<sup>31</sup>

## RESULTS

### Survey Response Rates

Four of the 132 MWCN-affiliated FQHCs were deemed ineligible for the Health Center Survey (Supplemental Figure 2A). Of the remaining FQHCs, 77 returned completed surveys

(60% response rate). Provider lists were obtained for 73 of these FQHCs and surveys were mailed to 1114 providers. After excluding ineligible respondents, 538 completed surveys were received from 71 FQHCs (55% adjusted response rate, Supplemental Figure 2B). The average number of PCP responses per FQHC was 7.6 (SD, 6.1), and the average number of PCP responses per clinic was 2.7 (SD, 2.7).

### FQHC and PCP Characteristics

FQHCs had an average of five clinic sites and 44% of FQHCs were in urban locations (Table 1). On average, FQHCs served 18,291 patients overall (SD, 11,994) and 2769 patients with diabetes (SD, 1928) in 2016. The FQHCs had about 26% Black/African American and 17% Hispanic/Latino patients. The mean percentage of patients with diabetes who had uncontrolled diabetes was 31%.

PCPs had been practicing for a mean of 11.9 years (SD, 5.2) and had been practicing at the surveyed FQHC for a mean of 4.7 years (SD, 3.3). On average, they reported that 21–30% of their patients had diabetes and that 11–20% of their patients had both diabetes and depression.

**Table 1 Federally Qualified Health Center and Provider Characteristics**

	Mean (SD) or N (%)
FQHC characteristics	–
Number of clinic sites	5 (4)
Location	–
Urban	34 (44)
Rural	26 (34)
Mixed urban and rural	17 (22)
PCMH status	–
All clinic sites	43 (57)
Some clinic sites	25 (33)
None	7 (9)
Patient population	–
% Black/African American	26 (25)
% Hispanic/Latino	17 (21)
% < 100% federal poverty level	68 (17)
% Medicaid	52 (16)
% Uninsured	19 (13)
% Non-English speaking	13 (16)
% Diabetes	15 (4)
% Uncontrolled (HbA1c > 9%)	30 (10)
PCP characteristics*	–
Years in practice	11.9 (5.2)
Years at health center	4.7 (3.3)
Patient panel size	2.5 (0.8)
1 = ≤ 500, 2 = 501–1000, 3 = 1001–1500, 4 = > 1500	
Percentage of patients with diabetes	3.1 (0.8)
1 = 0–10%, 2 = 11–20%, 3 = 21–30%, 4 = 31–40%, 5 = 41–50%, 6 = > 50%	
Percentage of patients with depression and diabetes	2.4 (0.7)
1 = 0–10%, 2 = 11–20%, 3 = 21–30%, 4 = 31–40%, 5 = 41–50%, 6 = > 50%	

FQHC federally qualified health center, PCMH patient-centered medical home, PCP primary care provider

\*PCP-level responses were transformed to FQHC-level responses through a multistage process. Because each FQHC could have multiple clinic sites, first, the mean of PCP responses within each clinic site was calculated. Then, the median response was calculated for the clinics within each FQHC. Finally, the mean (SD) across FQHCs was calculated and reported in this table

### Diabetes Care Services

Many diabetes care interventions were available at FQHCs (Table 2). FQHC leaders reported that a diabetes screening protocol ( $N = 62$ , 81%) and patient tracking system (e.g., registry;  $N = 67$ , 87%) were present in over 80% of FQHCs. The tracking systems usually had clinical decision support ( $N = 51$ , 76%) and tracked HbA1c values ( $N = 59$ ,  $N = 77%$ ). About half of tracking systems also tracked patients' diabetes medications ( $N = 40$ , 52%). Fewer systems tracked referrals or other medical conditions. Diabetes self-management education was present at 79% of FQHCs (SD, 31%), stepped care protocols (i.e., treatment intensification based on glycemic levels and goals) were present at 64% (SD, 30%), and a care manager was present at 43% (SD, 39%).

In general, PCPs were satisfied with diabetes care resources and interventions. In particular, PCPs agreed that their diabetes screening protocol was accurate, efficient, and followed consistently. PCPs were also satisfied with their diabetes stepped care protocol. The diabetes patient tracking system was rated less

**Table 2 Diabetes Care Services at Federally Qualified Health Centers**

	Mean (SD) or N (%)
FQHC resources	
Diabetes screening protocol	62 (81%)
Diabetes tracking system (e.g., registry)	67 (87%)
Included in diabetes tracking system	
Clinical decision support	51 (76%)
A1c	59 (77%)
Medications	40 (52%)
Referrals	35 (45%)
Medical diagnoses	28 (36%)
Self-management education*	79% (31%)
Support group*	22% (32%)
Group visits*	10% (22%)
Care manager*	43% (39%)
Clinical decision support tools*	44% (32%)
Stepped care protocol*	64% (30%)
PCP perceptions*	
Satisfied with diabetes screening protocol accuracy	4.1 (0.7)
Satisfied with diabetes screening protocol efficiency	4.0 (0.9)
Diabetes screening protocol is followed consistently	4.0 (0.8)
Satisfied with implementation of diabetes stepped care protocols	4.0 (0.7)
Satisfied with diabetes patient tracking system	3.6 (0.9)
Diabetes patient tracking system helps provide better care	3.7 (0.9)
Diabetes patient tracking system helps monitor treatment goals	3.6 (0.9)

FQHC federally qualified health center, PCP primary care provider

\*Questions from the provider survey. Resource questions on the provider survey were binary (0 = resource is not available, 1 = resource is available). Perception questions on the provider survey were rated on a scale of 1 = strongly disagree to 5 = strongly agree. PCP-level responses were transformed to FQHC-level responses through a multistage process. Because each FQHC could have multiple clinic sites, first, the mean of PCP responses within each clinic site was calculated. For binary questions, the mean equals the percentage of PCPs who responded affirmatively. Then, the median was calculated for the clinics within each FQHC. Finally, the mean (SD) across FQHCs was calculated and reported in this table

favorably in terms of PCP satisfaction and whether it helped to provide better care and monitor treatment goals.

### Behavioral Health Services and Integration with Diabetes Care

Behavioral health services were also commonly available at FQHCs (Table 3). The majority of FQHCs had colocated behavioral health ( $N = 62$ , 81%), provided health behavior counseling ( $N = 61$ , 79%), and had behavioral health appointments available the same day as primary care appointments ( $N = 57$ , 74%). Nearly two-thirds of FQHCs had both diabetes and behavioral health patient tracking systems ( $N = 50$ , 65%), and 43% of FQHCs had the same person managing both tracking systems ( $N = 33$ ). About half of diabetes tracking systems also tracked depression screening ( $N = 40$ , 52%); tracking of other mental health conditions, medication adherence, and diabetes distress were less frequent.

**Table 3 Behavioral Health Services and Integration with Diabetes Care at Federally Qualified Health Centers**

	Mean (SD) or N (%)
FQHC resources	–
Colocated behavioral health	62 (81%)
Health behavior counseling	61 (79%)
Same-day behavioral health appointments availability	57 (74%)
Behavioral health indicators included in diabetes tracking system	
Depression screening	40 (52%)
Mental health diagnoses	28 (36%)
Medication adherence	24 (31%)
Diabetes distress	16 (21%)
Anxiety screening	16 (21%)
Diabetes and behavioral health patient tracking systems managed by the same person	33 (43%)
Behavioral health provider with diabetes knowledge*	42% (33%)
PCP perceptions*	–
Confident referrals to health behavior counseling will be scheduled	4.1 (0.6)
Confident referrals to mental health counseling will be scheduled	4.1 (0.7)
Ease of doing warm hand-offs during clinic visits <sup>†</sup>	3.9 (0.5)
Stage of depression and diabetes care integration <sup>‡</sup>	3.7 (0.8)
Satisfied with status of depression and diabetes care integration	3.4 (0.6)

FQHC federally qualified health center, PCP primary care provider

\*Questions from the provider survey. Resource questions on the provider survey were binary (0 = resource is not available, 1 = resource is available). Unless otherwise stated, perception questions on the provider survey were rated on a scale of 1 = strongly disagree to 5 = strongly agree. PCP-level responses were transformed to FQHC-level responses through a multistage process. Because each FQHC could have multiple clinic sites, first, the mean of PCP responses within each clinic site was calculated. For binary questions, the mean equals the percentage of PCPs who responded affirmatively. Then, the median was calculated for the clinics within each FQHC. Finally, the mean (SD) across FQHCs was calculated and reported in this table

<sup>†</sup>Response options were as follows: 1 = not possible, 2 = very difficult, 3 = somewhat difficult, 4 = somewhat easy, 5 = very easy

<sup>‡</sup>The category options of stage of depression and diabetes care integration were as follows: 1 = We have not started thinking about it, 2 = We are thinking about it, but we have not started planning yet, 3 = We are in the planning stage, 4 = We have implemented some strategies, but have more work to do, 5 = Our implementation is complete, and we are focused on maintenance and quality improvement

PCPs were generally confident that referrals for health behavior and mental health counseling would be scheduled, and they reported that it was somewhat easy to do warm hand-offs during clinic visits (i.e., introduce patients to behavioral health providers during clinic visits). According to PCPs, the average stage of integration for diabetes and depression care was between preparation and action (mean, 3.7; SD, 0.8). PCP satisfaction with the status of integration was between neutral and agree, on a 5-point Likert scale ranging from “strongly disagree” to “strongly agree” (mean, 3.4; SD, 0.6).

### Associations with Percentage of Patients with Uncontrolled Diabetes

**Bivariate Analysis.** In bivariate analysis, the percentage of patients at the FQHC level with uncontrolled diabetes was lower at rural vs. urban locations ( $-5\%$ ,  $p = 0.03$ ) (Supplemental Table 1). The percentage of patients with uncontrolled diabetes was higher at FQHCs with more patients who were Black/African American ( $+13\%$  per 100% increase in Black/African American patients,  $p = 0.003$ ) or with Medicaid insurance ( $+15\%$  per 100% increase in patients with Medicaid,  $p = 0.02$ ). Also, FQHCs with PCPs who had practiced for more years, and specifically practiced at their clinics for more years, had a lower percentage of patients with uncontrolled diabetes ( $-0.5\%$  per additional year in practice,  $p = 0.02$ ;  $-1\%$  per additional year in practice at their clinic,  $p < 0.001$ , respectively). Additionally, FQHCs with PCPs who reported having more patients with diabetes had higher percentages of patients at the FQHC level with uncontrolled diabetes ( $+3\%$  per 1-level category increase in patients with diabetes,  $p = 0.02$ ). Associations with other FQHC and PCP characteristics were not significant.

Several diabetes care services were associated with lower percentages of patients with uncontrolled diabetes at the FQHC level (Supplemental Table 2). FQHCs with diabetes self-management education had 12% fewer patients with uncontrolled diabetes ( $p = 0.001$ ), and FQHCs with diabetes care managers and tracking systems were each associated with 7% fewer patients with uncontrolled diabetes ( $p = 0.01$  and  $p = 0.02$ , respectively), compared to FQHCs without these services. A higher level of PCP satisfaction with the implementation of diabetes stepped care protocols was associated with a lower percentage of patients with uncontrolled diabetes ( $-6\%$  per 1-point higher level of agreement on Likert scale;  $p = 0.03$ ). FQHCs where PCPs reported greater satisfaction with the diabetes tracking system and higher levels of agreement with the statements that diabetes patient tracking systems “help provide better care” and “help monitor treatment goals” had 5% fewer patients with uncontrolled diabetes ( $p = 0.003$ ,  $p < 0.001$ , and  $p = 0.002$ , respectively).

Some behavioral health services were also associated with lower percentages of patients with uncontrolled diabetes at the FQHC level (Supplemental Table 3). The availability of same-day behavioral health appointments was associated with a 5% lower percentage of patients with uncontrolled diabetes ( $p =$

0.046). Higher levels of PCP confidence that mental health referrals would be scheduled were also associated with 5% fewer patients with uncontrolled diabetes ( $p = 0.003$ ). Higher levels of PCP satisfaction with the status of integration of depression and diabetes care were associated with 4% fewer patients with uncontrolled diabetes ( $p = 0.02$ ). Other resources, interventions, and PCP perceptions were not associated with the percentage of patients with uncontrolled diabetes at the  $p < 0.05$  level.

**Multivariate Analysis.** All of the variables included in the final multivariate model are shown in **Table 4**. FQHCs with higher percentages of Black/African American patients had more patients with uncontrolled diabetes (+ 10% per 100% change,  $p = 0.002$ ). The number of years PCPs had practiced at the FQHC was inversely related to the percentage of patients with uncontrolled diabetes (− 1% per 1-year increase,  $p = 0.002$ ). As expected, on-site diabetes self-management education and a diabetes tracking system were associated with fewer patients with uncontrolled diabetes (− 7%,  $p = 0.007$ , and − 11%,  $p = 0.001$ , respectively). Interestingly, higher levels of agreement by PCPs that they were satisfied with the diabetes tracking system were associated with more patients with uncontrolled diabetes (5% per 1-level of change,  $p = 0.02$ ), but higher levels of agreement that the diabetes tracking system helps provide better care were associated with fewer patients with uncontrolled diabetes (− 5%,  $p = 0.004$ ). Higher levels of agreement by PCPs that they were confident that referrals to mental health counseling would be scheduled were associated with 3% fewer patients with uncontrolled diabetes ( $p=0.03$ ). At FQHCs where PCPs perceived a higher stage of diabetes and depression care integration, there was a lower percentage of patients with uncontrolled diabetes (− 3% per 1-point increase in the stage of integration,  $p = 0.01$ ).

### Diabetes and Behavioral Health Care Services Needs Assessment

Over half of responding PCPs wanted targeted behavioral health interventions for patients with diabetes ( $N = 310$ , 61%) (Supplemental Table 4). About half of PCPs wanted integration of diabetes and behavioral health registries ( $N = 244$ , 48%), and 43% ( $N = 219$ ) wanted additional training in managing patients with comorbid depression and diabetes. Also, about half of PCPs wanted clinical decision support tools at the point of care for diabetes treatment initiation ( $N = 223$ , 44%) and titration ( $N = 272$ , 54%). About 30–40% of PCPs wanted more training in motivational interviewing, health behavior counseling, medication management of depression, health behavior counseling for patients with diabetes, and mental health counseling.

## DISCUSSION

Our study found that FQHCs with PCPs who perceived a higher stage of diabetes and depression care integration had fewer patients with uncontrolled diabetes. In addition, on-site diabetes self-management education and the presence of a diabetes tracking system had their expected inverse relationship with the percentage of patients with uncontrolled diabetes. We also found that the percentage of Black/African American patients at the FQHC was associated with more patients with uncontrolled diabetes, which is unsurprising, since national data have demonstrated Blacks have worse glycemic control compared to Whites.<sup>32</sup>

**Table 4 Federally Qualified Health Center Characteristics, Provider Characteristics, and Diabetes and Behavioral Health Care Services Associated with the Percentage of Patients with Uncontrolled Diabetes, Final Model ( $N = 77$ )**

	Percentage change in patients with HbA1c > 9%	
	Estimate	<i>p</i> value
FQHC characteristics		
Percentage of Black/African American patients, per 100% change	10	0.002
PCP characteristics		
Years in practice at health center, per year	− 1	0.002
Patient panel size, per 1-level change (1= ≤500, 2= 501-1000, 3= 1001-1500, 4= >1500)	− 2	0.052
Diabetes care		
Self-management education (yes vs. no)	− 7	0.007
Tracking system (yes vs. no)	− 11	0.001
Clinical decision support in tracking system or EHR (yes vs. no)	5	0.050
Satisfied with tracking system, per 1-level change in agreement (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)	5	0.02
Diabetes patient tracking system helps provide better care, per 1-level change in agreement (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)	− 5	0.004
Behavioral health care		
Confident that referrals to mental health counseling will be scheduled, per 1-level change in agreement (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree)	− 3	0.03
Integration of diabetes and behavioral health Stage of depression and diabetes care integration, per 1-level change in stage (1 = We have not started thinking about it, 2 = We are thinking about it, but we have not started planning yet, 3 = We are in the planning stage, 4 = We have implemented some strategies, but have more work to do, 5 = Our implementation is complete, and we are focused on maintenance and quality improvement.)	− 3	0.01

*FQHC federally qualified health center, PCP primary care provider*  
*\*All variables included in the final model are shown in the table. Variables were included simultaneously in the model. Other variables examined in multivariate analyses but not retained in the final model were as follows: rural location, % Hispanic/Latino, % < 100% federal poverty level, % Medicaid, years in practice, % of PCPs' patients with diabetes, diabetes care manager, satisfaction with diabetes screening accuracy, satisfied with stepped care protocol implementation, diabetes tracking system helps monitor treatment goals, same-day behavioral health appointments, ease of doing warm hand-offs, satisfaction with depression and diabetes care integration*

The inverse relationship between the percentage of patients with uncontrolled diabetes and the presence of onsite diabetes care management and diabetes tracking system was expected. Most of the FQHCs in our study had many diabetes services, including onsite diabetes self-management education, a diabetes tracking system, and a diabetes screening protocol. The high rate of diabetes care services at these FQHCs is in part due to HRSA's focus on improving diabetes care at FQHCs and their funding of the Health Disparities Collaboratives, of which many clinical sites within MWCN were participants.<sup>33, 34</sup> Nationally, rates of diabetes self-management education are low, with only about 40% of US counties having at least one ADA-accredited program, and there is a geographic mismatch between the rates of diabetes and the presence of diabetes self-management education services.<sup>35</sup> We found that onsite diabetes self-management education was associated with a 7% lower percentage of patients with uncontrolled diabetes at the FQHC, which aligns with the literature that diabetes self-management education is associated with better glycemic control.<sup>36–39</sup>

We found no significant associations between behavioral health care services at the FQHC and the percentage of patients with uncontrolled diabetes. However, we did find that FQHCs had modestly fewer patients with uncontrolled diabetes if their PCPs perceived greater integration of diabetes and depression care and if they were more confident that referrals to mental health counseling would be scheduled. These findings in concert suggest that the presence of separate diabetes and behavioral health care services may be important but not sufficient for improvement in glycemic control at the system level; integration of diabetes and depression care may be critical. Our findings are supported by results from the TEAMcare (Team treatment Enhancement, Activation and Motivation) study, which was a randomized trial that compared usual care to a collaborative care model tailored for patients with diabetes. The TEAMcare model is the most advanced stage of depression and diabetes care integration because a care manager monitors glycemic control and other risk factors, in addition to depressive symptoms. This model decreased the rate of major depressive disorder by half and improved glycemic control.<sup>40, 41</sup> Our study supports integration of depression and diabetes care services in the FQHC setting to improve glycemic control. Importantly, we also found that our study population was interested in systems-level approaches to improving behavioral health care for patients with diabetes.

Our study has several limitations. Importantly, the study was cross-sectional and, therefore, we were unable to make any causal inferences. Many other services were analyzed and not found to be statistically significant in multivariable models, e.g., diabetes care manager and same-day behavioral health appointments. Some services, for example, a diabetes screening protocol and colocated behavioral health, were highly prevalent across FQHCs, thus making it difficult to see differences in final models. We also were likely

underpowered to find many differences based on our sample size. Another limitation to this study is its reliance on self-reported data that is subject to social desirability bias.

In conclusion, we found that a higher perception of the stage of diabetes and depression care integration at FQHCs was associated with a modestly lower rate of uncontrolled diabetes at Midwestern FQHCs. Future studies to elucidate what defines this integration and determine directionality of associations may be important to designing interventions to improve the quality of depression and diabetes care at FQHCs.

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#### **Compliance with Ethical Standards:**

**Conflict of Interest:** The authors declare that they do not have a conflict of interest.

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