

Factors influencing virtual collaborative care outcomes for depression and anxiety

Chase Walker¹, Virna Little², Jian Joyner², Steven Fuller¹, Brandn Green¹

¹Research Department, JG Research and Evaluation, Bozeman, Montana, United States, ²Research Department, Concert Health, San Diego, California, United States

ABSTRACT

Context and Aims: In the United States, access to evidence-based behavioral health treatment remains limited, contributing to inadequate treatment for individuals with depression and anxiety disorders. The Collaborative care model (CoCM), the integration of behavioral healthcare into primary care, has been shown to be effective in addressing this issue, particularly when delivered virtually through telehealth platforms. While collaborative care has been shown to be effective, little has been studied to understand the impact of patient treatment factors on patient improvement. This study aims to analyze factors associated with patient improvement, measured by PHQ-9 and GAD-7 score changes, in patients with depression and anxiety disorders from Concert Health, a national behavioral medical group offering collaborative care across 18 states. **Methods and Material:** Stepwise logistic regression models were utilized to identify factors influencing patient improvement in standardized symptom screener scores (PHQ-9 and GAD-7). Relevant patient-level data, including demographics, clinical engagement, insurance type, clinical touchpoints, and other variables, were analyzed. Results are presented as odds ratios (ORs). **Results and Conclusions:** We find that increased clinical touchpoints were associated with improved outcomes in both depression (PHQ-9) and anxiety (GAD-7) populations. Commercial insurance was linked to a greater likelihood of improvement relative to Medicaid, and the use of C-SSRS suicide screeners had varied effects on patient outcomes depending on the diagnosis. The duration of time spent in appointments showed a nuanced impact, suggesting an optimal length for touchpoints. Psychiatric consults also impact patient outcomes in both populations. This study sheds light on factors influencing patient outcomes in virtual collaborative care for depression and anxiety disorders, which may be used to inform and motivate further research and allow providers to better optimize and understand the impacts of treatment choices in collaborative care settings.

Keywords: Anxiety, collaborative care, CoCM, depression

Introduction

In the United States, an estimated 21% of the population has a diagnosed behavioral health condition, and approximately 55% of these individuals do not receive treatment.^[1] Significant efforts have been made by public systems to increase access and quality of care, initiated by the Behavioral Health parity components of the Affordable Care Act^[2]; however, difficulties remain in ensuring access to evidence-based care throughout

the country, with 6,635 communities designated as behavioral health shortage areas.^[3] Both the lack of treatment initiation and limited behavioral health workforce impact successful treatment engagement for many individuals in the United States. Continued efforts are required to address the context of limited access and high need, including ensuring that those who access and initiate care receive effective and high-quality services. Two key strategies, integration of behavioral health in primary care and expanded use of telemedicine, have been proposed to address a lack of treatment initiation and workforce shortages.

The collaborative care model (CoCM) has been shown to help address some of these shortfalls and allow more individuals to

Address for correspondence: Dr. Chase Walker, JG Research and Evaluation, Bozeman, Montana, United States. E-mail: chase@jgresearch.org

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have access to evidence-based behavioral health treatment. In this paper, collaborative care refers specifically to the CoCM, which is an evidence-based model to treat behavioral health conditions, particularly depression and anxiety, in primary care settings through the integration of care managers and/or psychiatric consultants.^[4] This distinction is important, as the term “collaborative care” may be used differently in other care settings. Oftentimes, for example, collaborative care may refer generally to collaboration across a medical team of doctors, nurses, and other healthcare professionals cooperatively working together and sharing responsibilities within patient care.^[5]

In order to ensure that CoCM treatment is effective, it is important to understand the factors within care settings that are associated with improvement in patients. This study reports on an examination of patient records data from a remote, collaborative care provider, Concert Health, to understand the factors within patient CoCM that are associated with improvement in patients with primary diagnoses of depression or anxiety disorders, as documented through improvement of scores on the PHQ-9 and GAD-7 standardized symptom screeners.

Literature Review

CoCM adds two individuals to the primary care team, a behavioral healthcare manager and psychiatric consultant who utilize a registry to deliver patient-centered measurement-based care.^[6-8] CoCM is an evidence-based model to identify and treat patients with depression and anxiety in healthcare settings which demonstrates significant improvement in depression and anxiety outcomes compared with usual care. CoCM is widely embraced as an effective addition to traditional clinical pathways for adult patients with depression and anxiety.^[9] In prior studies on the impact of CoCM on depression, a 2021 meta-analysis of randomized controlled trials confirmed the effectiveness of the model in the management of depressed patients.^[10] Regarding anxiety disorders specifically, a systematic review found CoCM to be a promising strategy for improving primary care for anxiety disorders.^[11] While the literature supporting the use of CoCM for treating depression and anxiety continues to grow, gaps remain regarding the use of the model for patients with multimorbidity, including the comorbidity of depression and anxiety.^[12]

The adaptability and sustainability of CoCM within the primary care setting make it an effective model for improving behavioral health access, a shortage that has only grown since the COVID-19 pandemic.^[13] Most patients with anxiety and depression are treated in primary care, which is especially true in underserved areas where there are few behavioral health providers and behavioral health resources.^[14] The CoCM is patient centered and flexible, and reimbursed by a monthly case rate which makes the model well suited to reach rural populations with limited behavioral health workforce and need for virtual-based access to care. Additionally, CoCM has been found to provide the support that makes primary care screening more effective.^[15] In areas where behavioral health providers are scarce, the use

of telephonic-based CoCM has proven an effective vehicle for providing behavioral health access.^[16,17]

The COVID-19 pandemic resulted in a dramatic rise in the use of virtual care, including in the provision of behavioral health.^[8,18] CoCM, since inception, has embraced telephonic components in order to enhance flexibility and patient centeredness.

As a contribution to the growing research base on the effectiveness of CoCM delivered virtually for depression and anxiety, this study examines outcomes as they specifically are related to the frequency of follow-up visits and source of payment. For instance, previous studies have found that close follow-up after the initial visit has been shown to be associated with better depression outcomes in CoCM patients.^[13] It has also been demonstrated that the use of care managers in collaborative primary care improved the symptoms for patients with depression at the 12- and 24-month follow-ups.^[19] While the role of proactive monitoring and follow-up for preventing relapse in CoCM treatment of depression has been studied, the current study expands on our understanding of how the frequency of touch points affects outcomes within a population receiving care through virtual services.

The evidence base on how payment source affects mental health outcomes in CoCM settings is also lacking. Prior studies of CoCM's cost-effectiveness when treating depressive disorders have produced ambiguous results.^[20] Previously completed studies have also explored different health insurance payment models while investigating how health plans facilitate and/or discourage behavioral health integration with unclear results.^[21] There is a gap that remains in examining how and if payor source impacts patient experiences and treatment outcomes. In this study, as opposed to approaching payment from the perspective of the provider and how it affects the cost or facilitation of integrated behavioral healthcare, the project approaches the variable of payment source as a variable of the patient and explores the relationship with patient outcomes.

The authors utilize data from Concert Health, a national behavioral medical group that provides CoCM to primary care, pediatric, and women's health providers and organizations. Concert Health provides the core components and requirements of CoCM: behavioral healthcare managers, psychiatric consultants, and a registry. Care is delivered in accordance with the evidence-based model and consistent with the dedicated CPT code guidelines, with virtual contact via video or telephone consultation being the standard of care and treatment choices such as medication adherence, talk treatment, symptom monitoring, and goal setting being tailored to patient preferences.

Methods

Data

Patient-level clinical data from the Concert Health registry were used to analyze which factors in the CoCM setting led to patient improvement in GAD-7 or PHQ-9 scores. The outcome variable for improvement is defined as a patient who had improvement

in their GAD-7 or PHQ-9 scores from baseline, relative to patients who did not improve or had their scores regress from baseline. Two separate datasets were used to analyze differences in improvement, one dataset for the analysis of GAD-7 scores for patients diagnosed with anxiety disorders, and one dataset for the analysis of PHQ-9 scores for patients diagnosed with a depression disorder. The authors hypothesize that there may be differences in reasons for score improvement between patients diagnosed with anxiety or depression, which led to the decision to use separate datasets. The datasets were created by filtering the full Concert Health database by primary diagnosis and then using the patients with a primary diagnosis of an anxiety disorder for the GAD-7 dataset, and patients with a primary diagnosis of depression for the PHQ-9 dataset. To be included, patients also needed to have completed their treatment episode, have completed at least two screenings of GAD-7 or PHQ-9, and have complete information on predictors, such as demographic information, payor source, clinical touchpoint data, and other factors of care within their treatment episode such as whether they received a suicide risk screening or psychiatric consults. An IRB was submitted to Western IRB and determined to be exempt under 45 CFR 46.104(4) on March 9th, 2023.

The complete Concert Health dataset for GAD-7 has 14,398 patient-level observations and the PHQ-9 dataset has 13,767 patient-level observations. Information and summary statistics on predictors used are included in Tables 1-4.

Demographic data included only age, as other demographic information such as sex and race were not recorded in the Concert Health registry. Within the Concert Health data, the following age groups were predefined: 11 and under, 12–17, 18–30, 31–45, 46–64, and 65+. For this analysis, we combined the 11 and under and 12- to 17-year-old age groups as less than 18. It is assumed that patient experiences within the Concert Health system are highly relevant to determining whether a patient experiences improvement over their engagement in CoCM. Patient experiences and variables assumed to influence improvement include the level of engagement with providers or clinics, their payment types, the length of time in the program, and the severity of their symptoms (as measured by whether they engaged with their psychiatric consultant or if they were flagged for suicide risk). A psychiatric consult is defined as a touchpoint directly with the psychiatric consultant, while suicide risk is determined by whether a patient was administered a C-SSRS. Furthermore, the authors used patient insurance type, the number of clinical touchpoints a patient has, the average time per touchpoint for each patient, the total number of days enrolled for each patient, and the change in both GAD-7 and PHQ-9 from baseline to the last score before a patient disengaged from care to determine if there are significant differences in disengagement between the known and unknown disengagement populations that could be attributed to these measures.

Of note in Tables 2 and 4 is the fact that there is a substantial portion of patients who have received zero psychiatric consults

Table 1: Descriptive statistics – GAD-7 – continuous variables

Variable	Mean	Std. Dev
Clinical touchpoints	8.02	8.66
Average touchpoint Time (min)	25.18	9.26
# of Days enrolled	141.29	115.53

Summary statistics for all continuous variables in analysis of anxiety population

Table 2: Descriptive statistics – GAD-7 – categorical variables

Category	Variable	n	%
Age groups	<18	1,166	8.10
	18–30	3,935	27.33
	31–45	4,345	30.18
	46–64	3,221	22.37
	65+	1,731	12.02
Insurance types	Commercial	8,270	57.44
	Medicaid	4,127	28.66
	Medicare advantage	1,074	7.46
	Medicare	927	6.44
Psychiatric consults	1–2	6,204	43.09
	Zero	5,583	38.78
	3–5	1,794	12.46
	6–10	616	4.28
Received C-SSRS	11 +	201	1.40
	No	13,006	90.33
	Yes	1,392	9.67

Summary statistics for all categorical variables in analysis of anxiety population

Table 3: Descriptive statistics – PHQ-9 – continuous variables

Variable	Mean	Std. Dev.
Clinical touchpoints	8.78	9.38
Average touchpoint time (min)	25.11	9.11
# of days enrolled	145.88	118.04

Summary statistics for all continuous variables in analysis of depression population

Table 4: Descriptive statistics – PHQ-9 – categorical variables

Category	Variable	n	%
Insurance type	Commercial	6,816	49.51
	Medicaid	3,978	28.90
	Medicare advantage	1,567	11.38
	Medicare	1,406	10.21
Psychiatric consults	1–2	5,991	43.52
	Zero	4,372	31.76
	3–5	2,131	15.48
	6–10	890	6.46
	11+	383	2.78
Received C-SSRS	No	10,303	74.84
	Yes	3,464	25.16

Summary statistics for all categorical variables in analysis of depression population

in both the GAD-7 and PHQ-9 populations, 5,583 and 4,372, respectively. Psychiatric consultation is an important component of CoCM and essential in supporting patients, providers, and care managers. While psychiatric consultation is a core component

of the model, it is not required for engaged patients to have psychiatric consultations in a given month. For the patients who did not receive psychiatric consultation, although not considered a best practice, many of these patients were likely not on medications, were not at risk, and/or were experiencing symptom improvement. While all patients within Concert have a psychiatric consultant as part of their care team, not all patients directly engage the consultant, which is why many have zero psychiatric consults in their treatment episodes.

Statistical analysis

The authors applied stepwise logistic regression models to identify the combination of variables that best statistically explains patient improvement in GAD-7 and PHQ-9 scores. Backward stepwise regression was performed on both the GAD-7 and PHQ-9 datasets, beginning with a model that includes all independent variables and iteratively testing all combinations of variables by adding and removing different combinations of these variables. AIC values for each of the regression models were compared, and the model with the best fit was used. The final GAD-7 model included the independent variables: age group, insurance type, clinical touchpoints, average touchpoint time, time between first touchpoint and enrollment, number of days enrolled, number of psychiatric consults, and whether the patient received a C-SSRS screening. The final PHQ-9 model includes the same independent variables as the GAD-7 model, with the exception of age group, which was not determined to be a statistically relevant predictor in the PHQ-9 population according to the stepwise regression exercise. Odds ratios (ORs) for each variable were calculated and presented with 95% confidence intervals (CIs). All data analysis was completed using RStudio.^[22]

Results

ORs from each of the models are presented in Table 5 (GAD-7) and Table 6 (PHQ-9). Variables shown to significantly impact whether a patient's score improved for each model are displayed within the tables, with some variation in the significant variables between the GAD-7 and PHQ-9 populations. Across both populations, insurance type, the number of clinical touchpoints a patient receives, the number of psychiatric consults a patient receives, and whether a patient received a suicide risk screening are significant factors in determining improvement.

Additionally, the average touchpoint time, time in days between the first touchpoint and enrollment, and total number of days enrolled are shown to be statistically significant factors in patient improvement in both populations. However, the ORs for each of these variables are all close to one, indicating that small changes in any of them do not lead to substantial changes in improvement, despite their statistical significance. Among the statistically significant variables, of most interest is the average touchpoint time, which shows that for each minute increase in a patient touchpoint, the odds of improving decline. The effect is minimal for a one-minute increase, but if it is assumed that a touchpoint time increases by 10 min, the odds of improvement

have a fairly substantial decline. This suggests that there may be an optimal appointment time and that having a longer time period per appointment is not beneficial for patients.

Also of interest in both populations is that Medicaid patients have significantly lower odds of improvement than patients with commercial insurance (GAD-7 OR: 0.729, PHQ-9 OR: 0.878) and that increasing the number of clinical touchpoints a patient receives increases the odds of improvement (GAD-7 OR: 1.131, PHQ-9 OR: 1.132). Psychiatric consults also have a statistically significant impact on whether a patient improves, with the odds of improving for patients being lower if they receive either zero consults or more than one to two consults, with the exception of the PHQ-9 population where the odds of improving are greater for patients who receive three to five consults (OR: 1.222). Finally, there are differences between the GAD-7 and PHQ-9 populations in patients who received a C-SSRS at any point in their treatment, with GAD-7 patients who received a C-SSRS being less likely to improve (OR: 0.750), and PHQ-9 patients who received a C-SSRS being more likely to improve (OR: 1.308).

Discussion

The analysis of factors that lead to improvement in patient outcomes, as measured by changes in screener scores over a patient's time engaged in CoCM, has revealed several important factors within the clinical setting that are likely to significantly impact whether a patient improves. Of most relevance across both of the anxiety and depression disorder-diagnosed populations are first, increasing the number of clinical touchpoints appears to lead to improvement, and two, patients with commercial insurance are statistically significantly more likely to improve than patients on Medicaid. Additionally, patients who receive C-SSRS screeners at any point in their treatment tend to have different outcomes depending on whether they have a primary diagnosis of depression or anxiety, with anxiety patients who receive a C-SSRS are less likely to improve and depression patients are more likely to improve.

It is clear that the greater the number of touchpoints that a patient has, the more engaged they are in care, which is likely why touchpoints have been shown in this analysis to lead to better outcomes. Patients are able to check in with providers more frequently and receive the necessary care that is required to reduce symptoms of anxiety or depression. In both the anxiety and depression-diagnosed populations, each additional touchpoint a patient has led to a little over 13% increase in the odds of improving (GAD-7 OR: 1.131, PHQ-9 OR: 1.131). This is consistent with prior research showing that close follow-ups after the initial visit are associated with better depression outcomes in CoCM and that the use of care managers in collaborative primary care shows improved symptoms over 12- and 24-month follow-ups.^[19,23] Additionally, our findings are consistent with those of O'Connor *et al.*^[24] who found that "frontloading" of skilled nursing visits by home health providers, or more

Table 5: Anxiety population analysis

Outcome: Score improved=1

	Variable	Odds Ratio	95% CI
	Intercept	0.7108	0.588–0.859***
Reference=Age <18 (OR=1)	Age 18–30	1.1829	1.019–1.373**
	Age 31–45	1.1047	0.952–1.281
	Age 46–64	1.1583	0.992–1.352*
	Age 65+	1.3395	1.080–1.662***
	Reference=Commercial (OR=1)	Medicaid	0.7287
	Medicare	0.7561	0.617–0.927***
	Medicare advantage	0.7841	0.649–0.947**
	Clinical touchpoints	1.1310	1.118–1.144***
	Average touchpoint time (min)	0.9893	0.985–0.993***
	# of days enrolled	1.0036	1.003–1.004***
Reference=1–2 consults (OR=1)	11+consults	0.1030	0.066–0.164***
	3–5 consults	0.9651	0.837–1.114
	6–10 consults	0.4254	0.332–0.546***
	Zero consults	0.6560	0.604–0.713***
Reference=No C-SSRS (OR=1)	Received C-SSRS screening	0.7504	0.658–0.856***

Notes: These data are totals across all years within the Concert Health database. All patients with incomplete information were removed from data. Age group and diagnosis category are both categorical variables. The reference category for age is the 46–64-year-old age group, the reference category for insurance type is commercial, and the reference category for psychiatric consults is 1–2 consults. Statistical significance levels: ***<0.01, **<0.05, *<0.1

Table 6: Depression population analysis

Outcome: Score improved=1

	Variable	Odds Ratio	95% CI
	Intercept	0.8185	0.704–0.952***
Reference=Commercial (OR=1)	Medicaid	0.8781	0.801–0.962***
	Medicare	0.9569	0.833–1.100
	Medicare advantage	1.0068	0.878–1.154
	Clinical touchpoints	1.1312	1.118–1.145***
	Average touchpoint Time (min)	0.9853	0.981–0.989***
	# of days enrolled	1.0038	1.003–1.005***
Reference=1–2 consults (OR=1)	11+consults	0.1332	0.091–0.197***
	3–5 consults	1.2222	1.066–1.403***
	6–10 consults	0.6973	0.551–0.887***
	Zero consults	0.6648	0.608–0.727***
Reference=No C-SSRS (OR=1)	Received C-SSRS screening	1.3082	1.182–1.449***

Notes: These data are totals across all years within the Concert Health database. All patients with incomplete information were removed from data. Age group and diagnosis category are both categorical variables. The reference category for age is the 46–64-year-old age group, the reference category for insurance type is commercial, and the reference category for psychiatric consults is 1–2 consults. Statistical significance levels: ***<0.01, **<0.05, *<0.1

frequent contacts, would promote greater patient engagement and outcomes.

The difference in outcomes between patients on Medicaid relative to commercial insurance is quite substantial in both populations, with commercial insurance patients being shown to be significantly more likely to improve than patients on Medicaid. Within the anxiety-diagnosed population, the magnitude of difference is also large, as Medicaid patients are around 22% less likely to improve than commercial patients (OR: 0.729). There is also a fairly large difference in the depression-diagnosed population for Medicaid patients; however, it is to a lesser degree than within the anxiety population, as Medicaid patients are about 12% less likely to improve than commercial insurance patients (OR: 878). In the anxiety population, Medicare patients are also less likely to improve relative to commercial insurance. To our knowledge, there is little prior research on how insurance

type impacts patient outcomes. Clear explanations for this finding are outside of the scope of our analysis but suggest opportunities for future studies to use insurance type of a patient characteristic in outcome studies for anxiety and/or depression.

It is unclear why patients with a primary diagnosis of anxiety who receive a C-SSRS are less likely to improve, while patients with a primary diagnosis of depression are more likely to improve. One possibility is that depression is associated with a high risk for suicide.^[25] This is confirmed in other research, where it is generally found that suicide risk is higher for patients with depression disorder or a comorbidity relative to patients with an anxiety disorder.^[26,27] Therefore, because patients with depression are predisposed to a higher suicide risk, we assume that C-SSRS suicide screenings are more common in their treatment episodes and are an important factor in their symptom improvement. Alternatively, because anxiety patients are shown to be at lower

relative risk to suicide, it may be less common to receive a suicide screening, so the patients who do receive a screening may have other conditions or characteristics that could be associated with lack of improvement. It is unclear what these characteristics or conditions may be, as there is not sufficient data on secondary diagnoses to identify and control for potential comorbidities in this study.

A meta-analysis of studies on screening for depression, anxiety, and suicide risk in primary care settings also found that depression screening interventions, of which many included additional intervention components, were found to be associated with a lower prevalence of depression after six to twelve months. In this study, there was no evidence that there were advantages to screening for a single condition versus multiple conditions simultaneously. Additionally, they found that there was generally little benefit to screening for anxiety or suicide prevention, but that there is a large body of research supporting treatment for anxiety.^[28] Our findings that depression patients who are screened for suicide improve while anxiety patients who receive suicide screenings do not improve may simply be further evidence that depression screenings are more effective or do a better job of identifying conditions. Further research on this subject may be warranted in the future.

This research study makes several contributions to the literature. First, it provides further evidence that an adequate number of touchpoints for patients is an important factor for patient improvement, which is consistent with *a priori* hypotheses and previous literature on CoCM. We found that as the number of touchpoints increases, patients are more likely to improve. While having frequent clinical touchpoints is important, our results show some evidence that there is an optimal time per touchpoint, as we found that increasing the time per touchpoint is associated with a decline in improvement in patients. This is a relevant finding for providers and suggests that frequent, but relatively brief, touchpoints may be the most effective for patients with depression or anxiety.

Insurance type appears to play a role in patient improvement as well, with commercial insurance patients in both the depression and anxiety-diagnosed populations being more likely to improve relative to Medicaid patients. While insurance type has been researched from the perspective of the provider, its role in patient outcomes, particularly in CoCM, has not previously been examined to our knowledge. With Medicaid and Medicare only fairly recently having begun to reimburse for collaborative care codes, and with differences across states in reimbursement, future research on the influence of payment source in CoCM outcomes from the patient and provider perspectives is warranted.

Finally, our findings show evidence that the number of psychiatric consults a patient receives significantly impacts whether they improve, with patients receiving one to two psychiatric consults showing the most likelihood of improving in the anxiety population and patients with three to five consults

being most likely to improve in the depression population. This finding makes sense, as consultants are typically engaged when patient symptoms are declining, and patients would reasonably be expected to improve after a psychiatric consultant engages. Additional future research into these findings will likely be valuable.

There are differences in improvement between the GAD-7 and PHQ-9 populations that received suicide screenings as well, with anxiety-diagnosed patients who receive a C-SSRS being less likely to improve, and depression-diagnosed patients who receive a C-SSRS being more likely to improve. It is unclear why these differences exist within the Concert Health population; however, the differences between the GAD-7 and PHQ-9 populations are fairly consistent with prior research that has shown that suicide risk and screening for suicide is more prevalent and effective for patients with depression.

These findings may be used to better inform the design of CoCM services, such as scheduling, staffing considerations, and patient treatment and screening decisions. Additionally, they provide motivation for future research and a deeper look into the mechanisms that lead to differences in outcomes across patient populations. As CoCM expands across the healthcare system in the United States, understanding how treatment choices and factors are associated with patient improvement will be crucial to the success of the model moving forward.

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Conflicts of interest

Please note that the authors, Virna Little and Jian Joyner, were employed by Concert Health at the time this manuscript was written. The author, Chase Walker, was employed by JG Research and Evaluation at the time of writing and conducted all data analysis. JG is under contract with Concert to examine clinical records for quality improvement and evaluation purposes. JG staff had full autonomy for data analysis, which was taken independently of Concert staff to ensure independence in the study.

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