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Addressing Suicide Risk: A Study of Dose Response in Collaborative Care

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Executive Summary

Suicide remains a leading cause of death among individuals aged 10-64 years in the United States. In 2022, suicide ranked among the top nine causes of death (CDC, 2024), with nearly 50,000 lives lost to suicide (HHS, 2024). In an effort to address this public health crisis, the recently released National Strategy for Suicide Prevention (2024) outlined a set of 15 goals for improving suicide prevention efforts. The Collaborative Care Model (CoCM) is an evidence-based method which improves behavioral-health outcomes for patients who seek treatment in primary care settings – this report uses data from Concert Health to demonstrate how CoCM responds to a number of the National Strategy goals. Concert Health is a behavioral health organization that provides CoCM services to primary care and other medical providers in 17 states. The following analysis examines changes in suicide risk level and treatment engagement among patients within Concert Health’s CoCM patient panel who were flagged as being at risk of suicide.

Motivation: Many patients who are disengaged from care resurface into primary care in the month of death by suicide (Luoma, 2002). As noted in the National Strategy, primary care is an essential setting for lowering suicide deaths. The Collaborative Care Model is one method for improving suicide care within primary care through the implementation of measurement-based care to identify and treat patients. Concert Health uses both the PHQ-9 and C-SSRS measurement instruments, so that patients receive care tailored to their level of suicide risk. During CoCM treatment, patients are monitored through clinical touchpoints and ongoing screenings to track symptoms over time, enabling adjustments in their care plans as needed.

Summary of Data: Between November 2021 and December 2023 Concert Health enrolled 29,507 patients in CoCM. Of these, 5,856 (19.8%) were flagged as having suicide risk. As of December 2023, CoCM care episodes were completed for 3,809 of these flagged patients – they are the subject of this report.

Patients with acute suicide risk or other acute behavior conditions are not treated in CoCM, but instead are referred to behavioral specialists or emergency care and are not included in this study.

Key Takeaways

- 76% of the patients in CoCM for 6 or more months experienced an improvement in their suicide risk level.
- Patients with “High Risk” scores received more clinical touchpoints and psychiatric consultations than patients with “At Risk” scores.
- Dose response curves display the efficacy of care managers within the CoCM model for reducing suicide risk.
- Chi-square tests confirm the Concert care pathway for suicide is effective across different age groups, diagnoses, and insurance types.

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Overview

Suicide remains a leading cause of death among individuals aged 10-64 years in the United States. In 2022, suicide ranked among the top nine causes of death (CDC, 2024). The period from 2000 to 2022 witnessed a significant increase in suicide rates, escalating by 36%, with 2022 marking the highest recorded number of deaths due to suicide (CDC, 2024).

A substantial body of research indicates that individuals who complete suicide often do not engage with behavioral health (BH) services prior to their death (Stene-Larsen & Reneflot, 2019; Walby et al., 2018). In contrast, research indicates that many individuals who die by suicide did visit their primary care provider in the month of death (Ahmedani et al., 2014; Mechanic, 2014) and patients who are disengaged from care resurface into primary care in the month of death (Luoma, 2002). Based on these patterns, primary care can be a unique setting for both identifying and caring for individuals at risk of suicide – but today primary care is not filling this role, in part because primary care settings may lack a mechanism to link individuals identified at risk with appropriate care (Katon et al., 2010).

The Collaborative Care Model (CoCM) is an evidence-based method which has been found to improve behavioral-health outcomes for patients who seek treatment in primary care settings. CoCM requires (1) use of measurement-based care, (2) support for the primary care providers by adding a psychiatric consultant and a behavioral care manager, and (3) use of a patient registry to help coordinate activities of the care team and track clinical outcomes. At Concert Health, measurement-based care involves the Patient Health Questionnaire (PHQ-9) to assess the severity of depression and the Columbia-Suicide Severity Rating Scale (C-SSRS) to evaluate suicidal ideation and behavior, providing structured and quantifiable data to guide treatment decisions. CoCM has the potential to help prevent suicide events and deaths due to its mandatory screening and enhanced treatment access, all within primary care settings.

The monthly case rate payment model for CoCM is tied to the cumulative patient care activities over the course of a calendar month. The patient-centered focus of the payment reimbursement model allows for frequent patient contact, making CoCM a high-touch protocol – which may be especially important for patients at risk of suicide. This payment model also reimburses primary care providers for time spent by behavioral care managers to refer patients with acute behavioral health conditions to behavioral health specialists outside of primary care or to emergency care.

Understanding the relationship between contact frequency and outcomes for individuals identified at risk for suicide is one of the core goals of this study, as it provides further evidence of the value of the CoCM model and associated billing structure.

Concert Health is a behavioral health organization that provides CoCM services to primary care and other medical providers in 17 states. These services include staff training and other implementation assistance; use of Concert's electronic patient registry; and ongoing patient and provider support through Concert's behavioral care managers and psychiatric consultants. Patients enrolled in Concert CoCM do not also receive concomitant behavioral services from external providers. Data for this analysis were extracted from Concert Health's Electronic Health Records. A full overview of the inclusion criteria and sample characteristics is included in Appendix A.

In November 2021, the beginning of the study period, Concert Health implemented an enhanced Suicide Safer Care Pathway (SSCP). The SSCP is used to identify and prioritize the needs of patients at risk for suicide. The SSCP stratifies such patients based on risk level – At Risk or High Risk – using the PHQ-9 and C-SSRS as a foundation to help guide the appropriate clinical response in order to reduce risk of suicide.

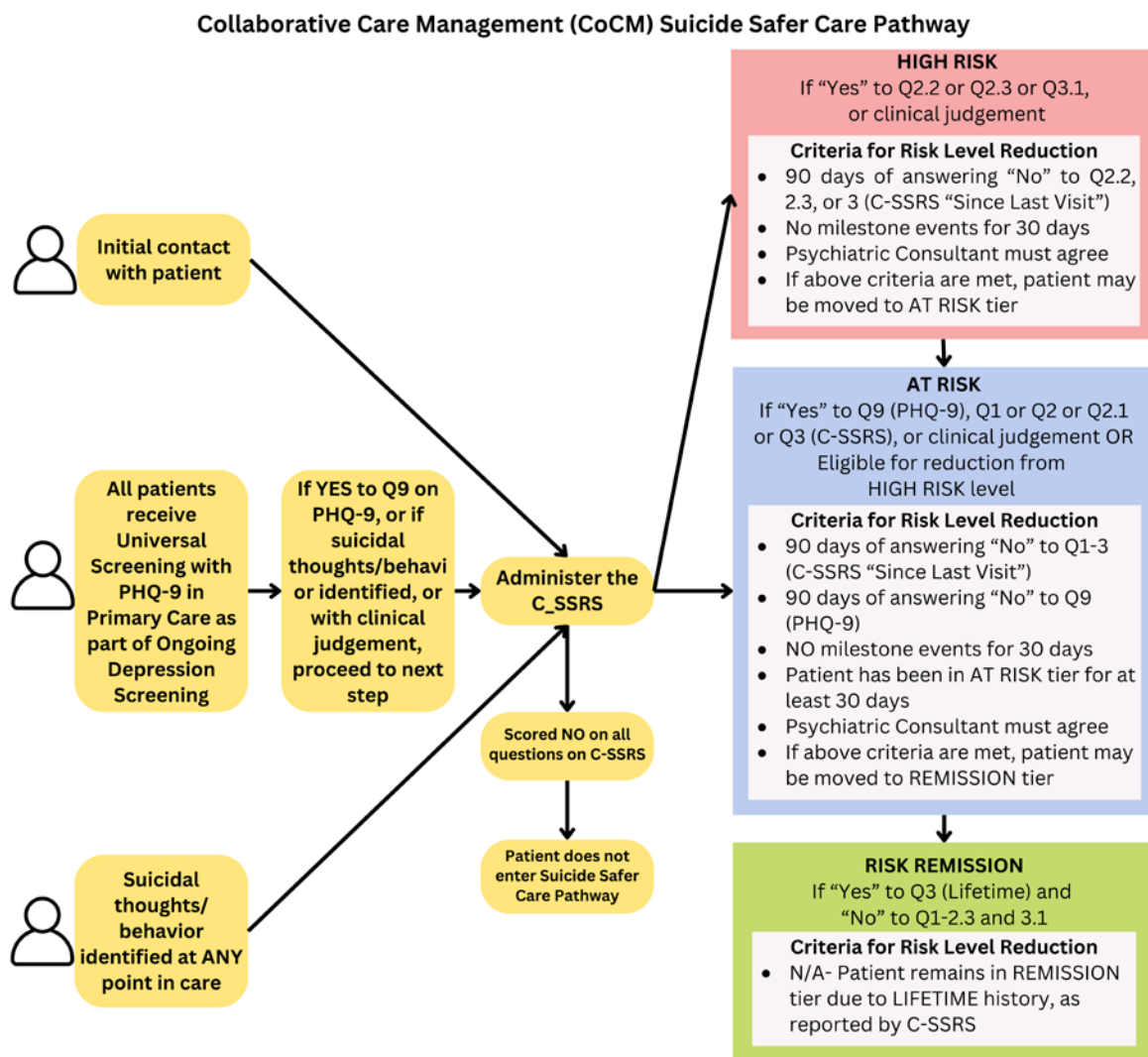
The following analysis examines changes in suicide risk level and treatment engagement among patients within Concert Health's CoCM patient panel who were flagged as being at risk of suicide. Risk flags may be upgraded in severity by any clinical team member if a patient is deemed to be at higher risk of suicide since their last visit. Downgrading a risk flag requires a more comprehensive process, which involves collaboration amongst team members considering additional risk factors, including recent transitions, medication changes or co-occurring conditions.

Section 1 - Concert Suicide Safer Care Pathway

Concert Health assigns a High Risk flag to patients who respond affirmatively to questions 2.2, 2.3, or 3.1 of the C-SSRS and an At Risk flag to patients who answer affirmatively to questions 1, 2, 2.1, or 3 of the C-SSRS or answer affirmatively to question 9 of the PHQ-9. These questions are shown in Appendix B.

A patient's status can move from High Risk to At Risk to Risk Remission. A patient cannot jump from High Risk immediately to Risk Remission. Risk Remission indicates that a patient currently has no detectable suicide risk. However, there is ample evidence demonstrating that patients with a history of suicide risk are at an elevated risk for subsequent suicidal ideation (Busch et al., 2003; Doshi et al., 2020; Large et al., 2016; Large et al., 2011). For this reason, although patients may have no current detectable suicide risk, patients with a Risk Remission flag receive more measurement-based screenings and always have safety plan within the Concert Health system. Figure 2 shows the Suicide Safer Care Pathway developed by Concert Health

Figure 1. Collaborative Care Management (CoCM) Suicide Safer Care Pathway



Developed by Tej Carbone and Dr. Virna Little
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DISCLAIMER: This is a suggested pathway for assisting organizations in developing their own guidelines in congruence with local, state, and organizational policies and regulatory requirements

Section 2 – Patient Outcomes by Risk Level (N=3,809)

Figure 2 depicts the number of patients who were assessed at High Risk initially or at some point during CoCM care, and the number of patients who were assessed At Risk (but never High Risk) initially or at some point during CoCM care, as well as the risk flag for all patients at the end of CoCM care. Among those with a risk flag, initial screenings had a distribution of 30% being screened as High Risk and 70% being screened At Risk, as compared to 9% (High), 41% (At Risk), and 49% (Risk Remission) at their final risk flag post-program completion.

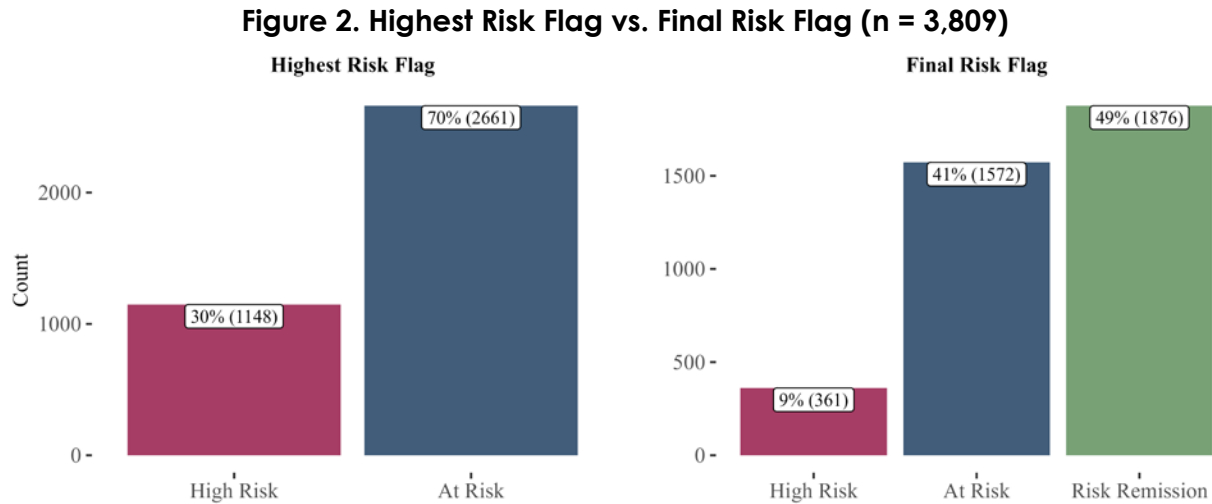
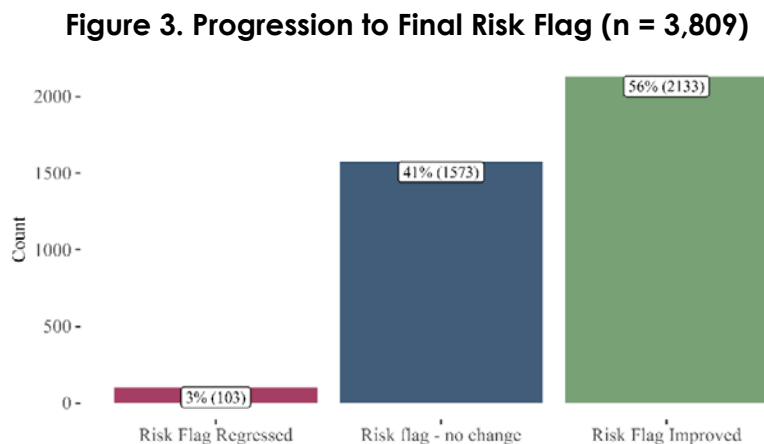


Figure 3 depicts the percent of patients who experienced an improvement, no change, or regression in risk flag from the initial screening that indicated High Risk or At Risk to the conclusion of CoCM care, with 56% of patients across both risk classifications having a risk level improvement during the treatment episode.



Note: "Risk Flag Regressed" refers to patients whose final risk score was more acute than their initial risk score. "Risk flag – no change" refers to patients that did not lower their risk score throughout treatment. "Risk flag improved" is reserved for patients that lowered their risk score — i.e., patients that lowered their risk score from High Risk to At Risk and/or At Risk to Risk Remission.

Of the 1,573 patients whose risk flag did not change, 82.5% remained at the At Risk level. Of the patients that experienced a risk flag improvement, 88% were lowered to the Risk Remission level (i.e., no current detectable risk).

Section 3 – Dose Response

There is a need to examine patterns of dose response within suicide treatment programs, to be able to align reimbursement models with treatment program efficacy. In this section of the report, we present a series of analyses that looked to define dose response among Concert clients enrolled in CoCM with different suicide risk levels. Figure 4 shows the percentage of patients who experienced improvement, no change, or regression categorized by the number of days they were enrolled in CoCM. **The impact of “dose” is a key finding**—patients enrolled for one month or less were most likely to see no change in their risk flag. On the other hand, patients enrolled in care for at least half a year were far more likely to see an improvement in their risk flag— 76% of such patients experienced an improvement.

Figure 4. Progression to Final Risk Flag – By Length of Care (n = 3,809)

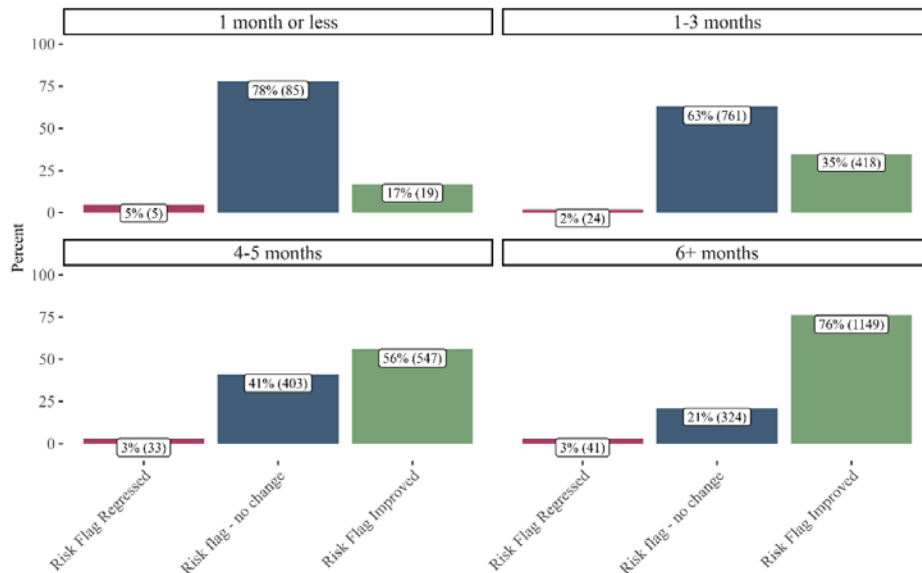
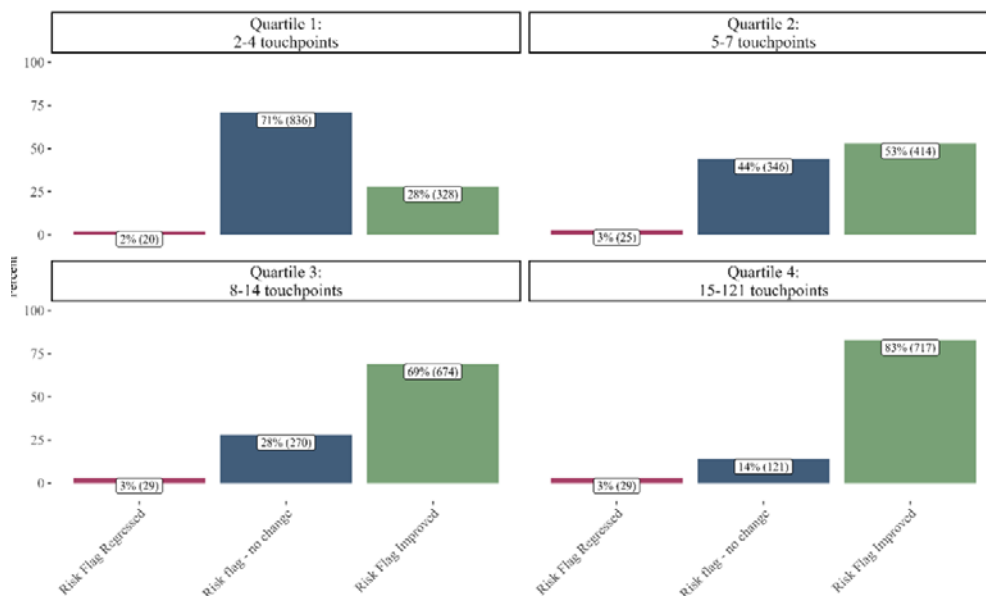


Figure 5 shows the number of patients who experienced improvement categorized by the number of touchpoints they received. Similar to months enrolled, patients that received more clinical touchpoints were more likely to see an improvement in their suicide risk score – 83% of patients who received 15 or more touchpoints demonstrated improvement.

Figure 5. Progression to Final Risk Flag - By Clinical Touchpoints Received (n = 3,809)



Section 4 – Tailoring Care to Level of Risk

Adhering to the principles of measurement-based care, Concert Health tailors its clinical care according to the assessed risk level of patients. Patients identified as At Risk are scheduled for a minimum of bi-weekly contacts between the patient and a behavioral care manager to ensure ongoing support, along with monthly contact between the care team and the psychiatric consultant to re-evaluate the patient’s diagnosis and/or treatment. Conversely, patients classified as High Risk receive more intensive care, including weekly contacts with a behavioral care manager or more frequently, if necessary, along with psychiatric consultation for the care team on a weekly basis. “Clinical touchpoints” are engagements by the behavioral care manager at Concert with the patient. This evidence-based approach ensures that the intensity of care is aligned with the severity of the patient’s risk, facilitating targeted interventions that are crucial for effective suicide prevention.

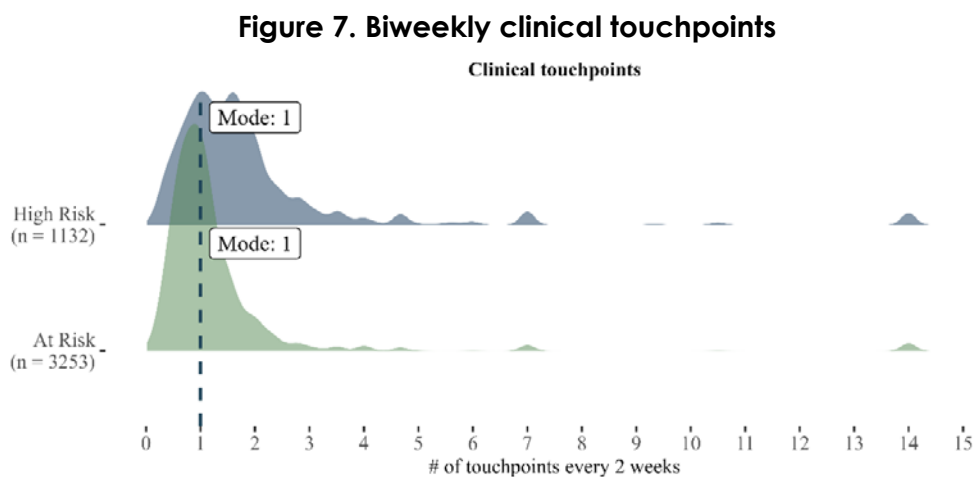
Figure 6 shows the summary statistics for continuous independent variables in the dataset, which include the number of clinical touchpoints (i.e., an encounter with a behavioral care manager lasting 5 or more minutes), the number of days enrolled, and the number of risk flag changes a patient had in their treatment.

Figure 6. Summary Statistics of Numeric Variables (n =3,809)

Patient Characteristic	Mean	Median	Standard deviation	Maximum	Minimum
Clinical Touchpoints	11	7	10.4	121	2
# of Days Enrolled	161	121	125.4	1,476	9
# of Flags	1.64	1	1.0	19	1

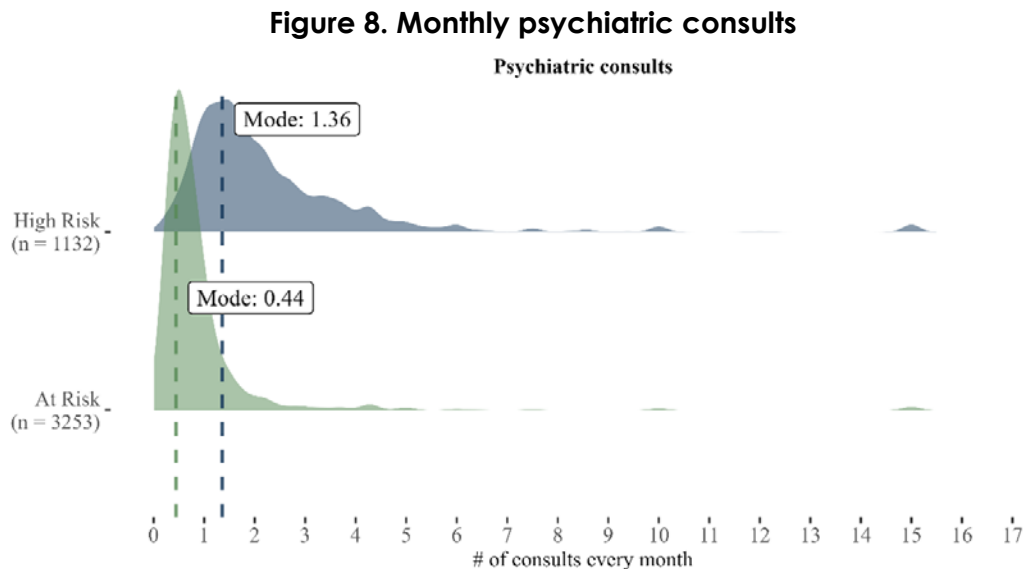
Note: The noticeable difference between the mean and median values suggests the presence of outliers in the data, with some patients remaining in care for significantly longer durations. These outliers skew the mean towards larger values, indicating a non-uniform distribution in the length of care.

Figure 7 illustrates the cadence of clinical touchpoints for High Risk patients versus At Risk patients. The mode of 1 indicates that most patients receive a clinical touchpoint every two weeks. However, the distribution of the High Risk patients is bimodal, indicating that many of the High Risk patients are receiving more than one touchpoint every two weeks.



Note: If a patient was at both High Risk and At Risk during treatment then they are included in this figure twice. The mode is calculated by estimating the maximum of the distribution. If a patient was at one risk level for less than one day, then the number of days was rounded up to 1 to prevent mathematical errors. The number of touchpoints is calculated as number of clinical touchpoints At Risk level/ days At Risk level x 14. There were a few patients that received, on average, more than 15 biweekly touchpoints, but the x-axis is truncated for illustrative purposes.

Figure 8 illustrates the estimated densities of psychiatric consults. There is a clear pattern of High Risk patients receiving a higher frequency of psychiatric consultations as compared to At Risk patients.



Note: If a patient was at both High Risk and At Risk during treatment then they are included in this figure twice. The mode is calculated by estimating the maximum of the distribution. If a patient was at one risk level for less than one day, then the number of days was rounded up to 1 to prevent mathematical errors. The number of consults is calculated as number of consults At Risk level/ days At Risk level x 30. There were some patients that received, on average, more than 17 consults in a month, but the x-axis is truncated for illustrative purposes.

Section 5 - Statistical associations between clinical variables and treatment outcomes

The outcomes of the Suicide Care Pathway can be assessed by examining whether there is a statistical significance between the outcome and clinical variables associated with a patients' treatment. The outcomes are classified into three categories: improvement (indicating a transition from High Risk to At Risk, or from At Risk to Risk Remission), regression (the opposite trajectory), and no change (where a patient's risk level upon entering the suicide care pathway remains unchanged). Using chi-square tests, we determine whether the outcome was associated with the primary diagnosis, age group, or insurance type on closed patient enrollment episodes. This analysis aims to discern how different variables may influence the likelihood of a patient's risk level improvement, regression, or stasis during their enrollment in the Suicide Care Pathway. There were no meaningful differences identified by primary diagnosis or age group. There was a statistically significant but small difference by insurance type.

Primary diagnosis:

In the table below, the outcome of a patient's treatment is similar across diagnosis categories. Across all diagnosis categories, 54-56% of patients experience a risk flag improvement.

Figure 9a. The outcome by primary diagnosis (n=3,809)

Primary diagnosis	Risk Flag Improved	Risk Flag Regressed	Risk Flag No Change	Total
Anxiety Disorder	648 (56%)	19 (2%)	487 (42%)	1,154
Depressive Disorder	1,404 (56%)	78 (3%)	1,024 (41%)	2,506
Other	81 (54%)	6 (4%)	62 (42%)	149

There is no statistical association between diagnosis category and outcome. This could mean that the Concert Suicide Care Pathway is equally effective for all diagnoses.

Figure 9b. Chi-square of outcome by diagnosis

Test statistic	Degrees of freedom	p-value	Significance
7.71	4	0.103	None

Age group:

Figure 10a. The outcome by age group

Age group	Risk Flag Improved	Risk Flag - no change	Risk Flag Regressed	Total
11 and under	6 (75%)	2 (25%)	0 (0%)	8
12-17 years	156 (60%)	100 (38%)	5 (2%)	261
18-30 years	688 (55%)	528 (42%)	46 (4%)	1,262
31-45 years	566 (56%)	435 (43%)	17 (2%)	1,018
46-64 years	475 (55%)	363 (42%)	24 (3%)	862
65+ years	242 (61%)	145 (36%)	11 (3%)	398

Due to fewer than five observations in the under 11 age group for two of the outcome categories, this age group was excluded from the subsequent statistical analysis. The analysis revealed no statistical association between age category and treatment outcome. This finding suggests that the Concert Suicide Care Pathway may be effective across all age groups, indicating its broad applicability and potential effectiveness regardless of age.

Figure 10b. Chi-square of outcome by age group

Test statistic	Degrees of freedom	p-value	Significance
15.3	8	0.053732	None

Insurance Types:

Figure 11a. The outcome by insurance

Insurance	Risk Flag Improved	Risk Flag Regressed	Risk Flag - no change	Total
Commercial	1171 (58%)	46 (2%)	799 (40%)	2,016
Medicaid	604 (51%)	39 (3%)	536 (45%)	1,179
Medicare	358 (58%)	18 (3%)	238 (39%)	614

There is evidence against the null hypothesis that insurance type is not associated with the treatment outcome. According to the data presented in the table, patients on Medicaid are slightly less likely to be discharged from treatment with an improved suicide risk score (i.e., 51% for Medicaid versus 57% for Commercial and Medicare). While the test indicates an association between insurance type and unchanged risk scores upon discharge, it does not attribute Medicaid as the causative factor for this outcome.

Figure 11b. Chi-square of outcome by insurance

Test statistic	Degrees of freedom	p-value	Significance
17.24	4	0.0017	**

Section 6 – Reasons for Discharge

Figure 12 indicates that the predominant reasons for patients exiting treatment from the Suicide Safer Care Pathway were “disengaged from care”, referring to those who left for reasons not specified, and “met treatment goals”. Half of the patients classified as High Risk at their final assessment, and 61% of patients classified as “At Risk”, exited the program for unspecified reasons. Logically, many patients with a final risk status categorized as Risk Remission concluded their treatment upon meeting their established treatment goals, underscoring a successful outcome for these patients.

Figure 12. Top ten discharge reasons - closed enrollment (n=3,809)

Discharge reason	Final risk level			Total
	At Risk	High Risk	Risk Remission	
Disengaged from care	955 (61%)	181 (50%)	390 (21%)	1,526 (40%)
Met treatment goals	24 (2%)	4 (1%)	1,220 (65%)	1248 (33%)
Discontinued services	327 (21%)	56 (16%)	72 (4%)	455 (12%)
Declined treatment	160 (10%)	50 (14%)	51 (3%)	261 (7%)
Non-responsive	47 (3%)	39 (11%)	11 (1%)	97 (3%)
Patient has met treatment goals with a relapse prevention plan	0 (0%)	1 (0%)	86 (5%)	87 (2%)
Patient disengaged from treatment with reduced survey score	13 (1%)	5 (1%)	34 (2%)	52 (1%)
Pending	15 (1%)	2 (1%)	9 (0%)	26 (1%)
Refused service	7 (0%)	13 (4%)	0 (0%)	20 (1%)
No insurance coverage	7 (0%)	8 (2%)	1 (0%)	16 (0%)

Section 7 – Limitations

A large number of randomized controlled trials, which include a control group, have demonstrated the efficacy of CoCM in treating depression – a condition found in many patients with suicidal risk. The analysis in this report does not include a comparison group that received “treatment as usual” (TAU) for suicide risk in primary care. Therefore, this study alone does not rule out the possibility that the reductions in suicide risk among the study population resulted from other factors that pushed the At Risk client population toward regression to the mean risk for the overall population.

However, the findings from prior studies that did include a control group have found results similar to those presented in this study, thereby potentially muting this limitation. The IMPACT study of older adults (Unützer et al., 2006), which was (to our knowledge) the largest CoCM randomized controlled trial (n = 1,801) of suicide risk, found no reduction in the percent of TAU patients with suicidal ideation over a 2-year period. In fact, the percent of such patients with suicidal ideation increased slightly. This was despite the fact that IMPACT’s “treatment as usual” included (a) repeated screening, (b) notifications of detected suicide risk sent to patients’ PCPs (with more than half of TAU patients receiving antidepressants from their PCPs), and (c) for those that indicated that they were at risk of acting on their suicidal ideation or were deemed to be at such risk, referral to local care as well as contact by a local clinician.

The PROSPECT randomized controlled trial (n = 599) of older adults (Alexopoulos et al., 2009) did show decline in the percent of patients with suicide risk in the TAU group, but the results of this study were summarized as follows: “Intervention patients had a higher likelihood to receive antidepressants and or psychotherapy (84.9–89% vs. 49–59%) and a 2.2 times greater decline in suicidal ideation than usual care patients over 24 months.”

A meta-analysis regarding the effect of CoCM with respect to suicide risk in 28 trials (Grigoroglou et al., 2021) was limited to the examination of the 4–6-month period following randomization. Nonetheless, the summary of this study’s findings is of interest: “The main message of this study is that CC [Collaborative Care] can be a potentially viable and effective framework for managing suicidal ideation in primary care settings...Considering that suicidal ideation can be persistent and strongly predictive of future episodes of self-harm or deaths by suicide, prospective suicide prevention strategies which integrate CC in primary care are highly encouraged by our findings.”

Section 8 – Summary of Findings

From November 2021 to December 2023, Concert Health initiated and completed CoCM treatment for 3,809 patients with suicide risk across 17 states. The majority of patients concluded their treatment with improved final risk scores, while a very small proportion experienced a worsening of their scores.

The likelihood of reduced risk rose substantially with a higher “dose” of CoCM, measured in terms of months of care or in terms of the numbers of encounters.

Following the principles of measurement-based care, the frequency of encounters with healthcare professionals was tailored to a patient’s individual needs. Patients with higher risk scores received more clinical touchpoints and psychiatric consultations.

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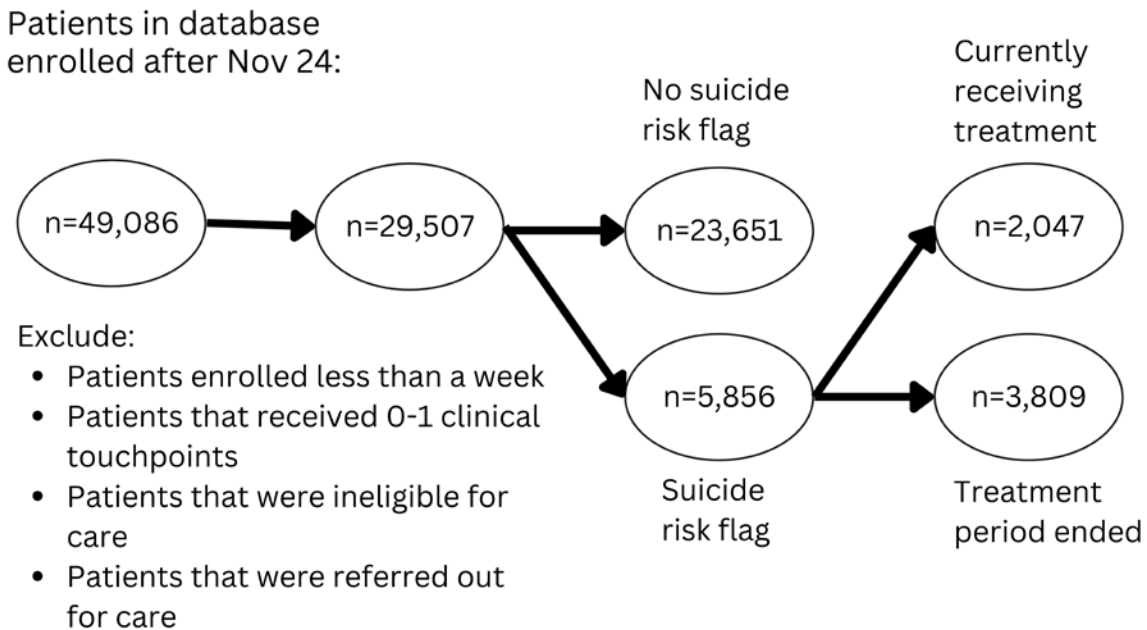
JG Research and Evaluation has a contractual agreement with Concert Health to conduct comprehensive assessments of clinical records for the purpose of quality improvement and evaluation.

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Appendix A — Demographic Profile of Concert Patients

Sample Definition Process

Figure 13. Sample description



Between November 24, 2021 and December 31, 2023 (the Study Period), 49,086 total patients were enrolled in the Concert electronic health record database. Of these, 29,507 patients met the initial inclusion criteria. There were a total of 5,856 patients with a suicide risk flag in the revised population, and 3,809 of those had a closed enrollment period. The final sample for this study is 3,809.

Figure 14 in this appendix presents summary statistics for all categorical independent variables and includes patient age groups, diagnosis categories, insurance types, and clinical practice type for all clinical records, including patients whose treatment ended or closed during the study period (n = 3,809).

Inclusion criteria (n=3,809)

- Patients flagged as At Risk or High Risk during the study period
- Patients need to have been enrolled in a collaborative care episode for at least a week.
- Patients need to have received 2 or more clinical touchpoints.
- Patients need to have a completed enrollment during the Study Period.

Exclusion criteria (n=45,277)

- Patients enrolled less than a week
- Patients with 0-1 touch point
- Patients ineligible for care
- Patients discharged for reasons that made them ineligible for treatment (changed to external
- Primary care provider, provider contract ending, etc.).
- Patients referred out for care (e.g., engaged in outside behavioral health care).
- Patients with an open CoCM enrollment as of December 31, 2023.

Figure 14. Summary Statistics of Individuals with Suicide Risk Flag (n=3,809)

Variable	Category	Current patients (n = 2,047)	Treatment ended patients (n = 3,809)
Age group			
	11 and under	0% (4)	0% (8)
	12-17 years	6% (126)	7% (261)
	18-30 years	31% (635)	33% (1,262)
	31-45 years	27% (558)	27% (1,018)
	46-64 years	25% (508)	23% (862)
	65+ years	11% (216)	10% (398)
	Total	100% (2,047)	100% (3,809)
Diagnosis			
	Anxiety Disorder	33% (671)	30% (1,154)
	Depressive Disorder	64% (1,316)	66% (2,506)
	Other	3% (60)	4% (149)
	Total	100% (2,047)	100% (3,809)
Insurance			
	Commercial	52% (1,066)	53% (2,016)
	Medicaid	30% (618)	31% (1,179)
	Medicare	18% (363)	16% (614)
	Total	100% (2,047)	100% (3,809)
Practice type			
	FQHC	5% (99)	7% (262)
	Health System	81% (1,659)	74% (2,834)
	Independent Physician Association	1% (18)	1% (53)
	Private Outpatient Practice	9% (184)	13% (514)
	Rural Health Clinic	4% (87)	4% (146)
	Total	100% (2,047)	100% (3,809)

Appendix B – Columbia-Suicide Severity Rating Scale (C-SSRS) as used by Concert Health

Figure 15. Columbia Suicide Severity Rating Scale, Screen Version- Recent (e.g. Screener “Ever”)

	Past Month	
1. Have you wished you were dead or wished you could go to sleep and not wake up?	Yes	No
2. Have you actually had any thoughts of killing yourself?	Yes	No
2.1. Have you been thinking about how you might do this?	Yes	No
2.2. Have you had these thoughts and had some intention of acting on them?	Yes	No
2.3. Have you started to work out or worked out the details of how to kill yourself? Do you intend to carry out this plan?	Yes	No
	Lifetime	
3. Have you ever done anything, started to do anything, or prepared to do anything to end your life?	Yes	No
	Past 3 Months	
3.1. Was this in the past 3 months?	Yes	No

Figure 16. PHQ-9 Depression Scale

Over the last 2 weeks, how often have you been bothered by any of the following problems?	NOT AT ALL	SEVERAL DAYS	MORE THAN HALF THE DAYS	NEARLY EVERY DAY
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3