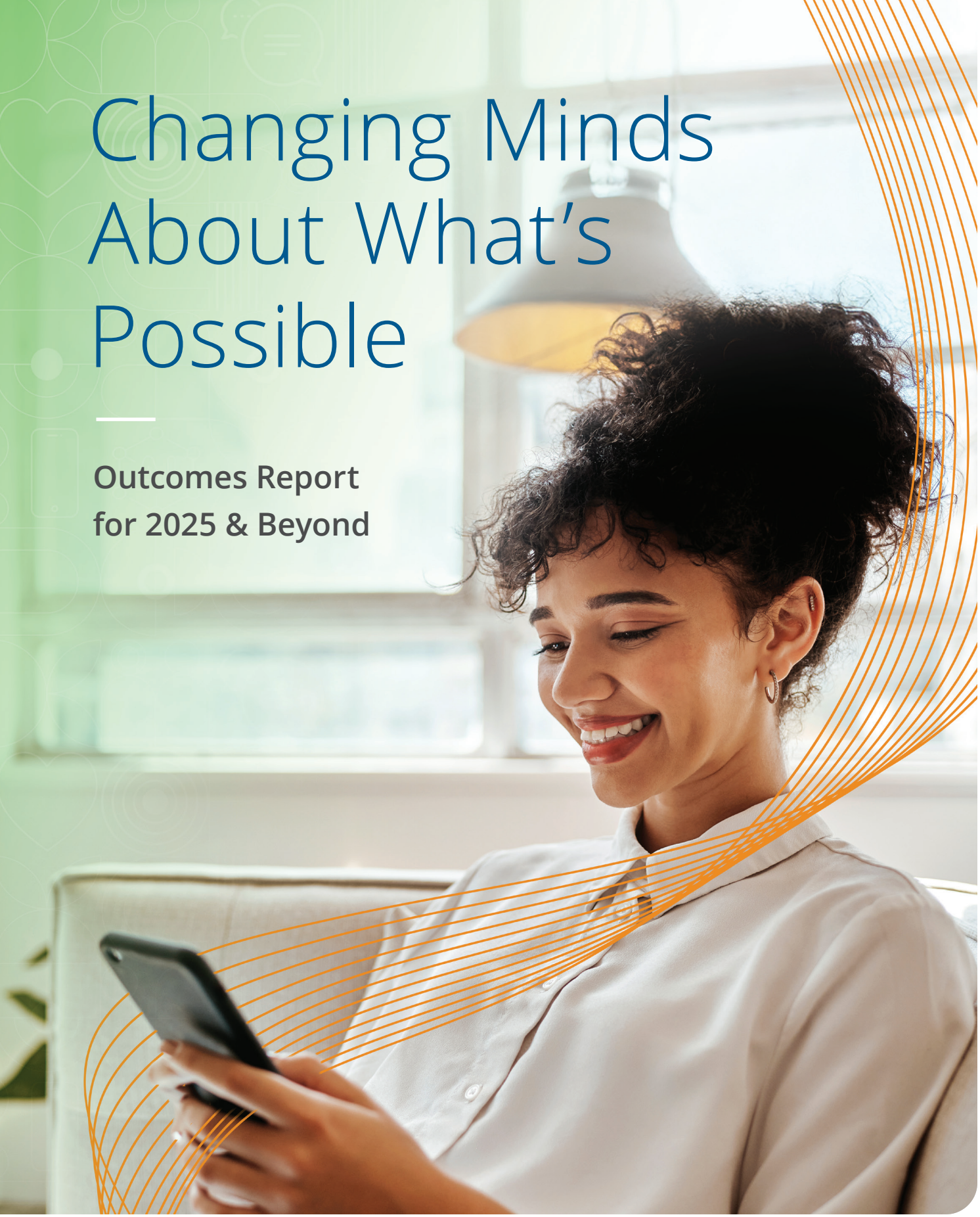
Changing Minds About What's Possible

Outcomes Report for 2025 & Beyond



DISCOVERY
Behavioral Health
Recovery Beyond Measure

DiscoveryBehavioralHealth.com

"We are extremely grateful for our research partnership with Discovery Behavioral Health. Together, we can learn what treatments an individual will respond best to, and help pave the way for more precise and personalized behavioral healthcare in the U.S."

Philip Wang, M.D., Dr.P.H.,

Director of the Center for Learning Health Systems at Brigham and Women's Hospital
Professor of the Practice of Psychiatry at Harvard Medical School
Former Deputy Director of NIMH
Former Research Director of American Psychiatric Association

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A Letter from Our President

Dear Readers,

If you have worked in the behavioral health industry for more than five years, you have undoubtedly felt the ground shifting beneath your feet. Between 2019 and 2023, our industry grew from $72.8 billion to $83.78 billion, and projections show it could reach a staggering $132.46 billion by 2032. **But this growth hasn't solved the problem of access to care—it has revealed it**.

A surge of new market entrants with varying levels of clinical capabilities has created a tyranny of choice for consumers. **We now have better access, but do we truly have better care?** More importantly, how did we end up here? It boils down to one thing: **as an industry, we lack the most critical foundation—a national standard of care. But that's about to change**.

What Gets Measured Gets Better

Our report reveals data that brings us closer to that elusive standard of care. By harnessing the power of our measurement-based Learning Health System, we have amassed valuable data and insights since our founding in 2018. It's time for a revolution in behavioral health.

Why Is Discovery Poised to Lead the Way?

- **We have the largest and most comprehensive behavioral health sample** housed in a universal electronic health record with enough statistical power to identify optimal treatment regimes.
- **Our partnerships with Mass General Brigham**, a teaching hospital of **Harvard Medical School**, and **Videra Health** has fueled unprecedented breakthroughs.
    - **With a growing database of 30,000+ patients**, we've shown improvement in PHQ-9 and RAS scores that far surpass published research in results and sample size.
    - **We have confirmation that level of care matters** with significant improvements in patients with longer lengths of stay.
    - We have unlocked insights with the potential to transform care through **biometrics, predictive analytics, standardized protocols**, and precision interventions for suicidality.

Join the Revolution

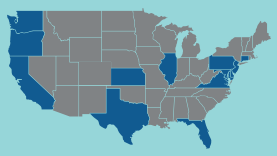
We're ready to take the next step: collaboration with providers, payers and clinicians to create an even larger shared database. We want to use measurement based care data to establish a new gold standard—one that empowers patients and clinicians alike. On page 47, you'll have an opportunity to scan a QR code to comment on our findings, share your thoughts, and join the revolution that is happening in behavioral healthcare. **The future is waiting—let's create it together**.

With determination and optimism,

John Peloquin, MBA, PhD
President & CEO
Discovery Behavioral Health

130+
Treatment Centers

27
Virtual Programs



12
States

100,000+
Patients Treated to Date

30,000+
Patients in Research Database

25+
Years of Age Specific, Gender Inclusive Programming

1st

Discovery Mood & Anxiety Program was the first adolescent residential mental health program in California

100+
Contracts with payers and managed care organizations

Partnerships

Mass General Brigham

Academic partnership and third-party validation with Mass general Brigham, the largest teaching hospital of Harvard Medical School

VIDERA HEALTH

Videra Health technology partnership for biometric and AI-enabled monitoring and assessment programs

Feinstein Institutes for Medical Research
Northwell Health

Feinstein Institute for Biomedical Research (2015-2017)

Joint Commission – Served a leading role in establishing the Joint Commission National Treatment Standards for Residential Mental Health and Eating Disorder Treatment (2016-2017)

4

Levels of Care

- Residential (RTC)
- Partial Hospitalization (PHP)
- Intensive Outpatient (IOP)
- Online

3

Service Lines

- Eating Disorders
- Mental Health
- Substance Use

1

Year of free monitoring and assessment post-discharge for continuity of care and relapse prevention

Access to Care: Breaking Barriers, Redefining Standards

Access to care—three simple words that carry immense weight in our industry—and a mission we prioritize at Discovery Behavioral Health. In some ways, access is more prevalent than ever, but the question remains: are we seeing access to quality, measurement-based care? The appropriate level and duration of care? And what is the waiting time for access if care is available?

According to the American Psychological Association's 2023 Pulse Study, the national average wait time for traditional outpatient providers is a staggering three months. For those in need, that's far too long. At Discovery, we knew meaningful change required us to challenge the status quo and reimagine how care is delivered.

In 2025 we updated and streamlined our workflows and automation, making access to care easier and faster for the people we serve. **Our patients choose when, where and how they access care, and the impact has been significant**.

> "What gets measured gets better."

Average days to admit: Discovery v. industry

	Average Days to Admit 2024	Average Days to Admit 2025	Average Days to Admit 2025 (Digital Admissions)	National Industry Average
Eating Disorders	19.4	17.7	**8.4**	3 Months
Mental Health	11.3	11.3	**8.8**	
Substance Use	5.1	5.0	**3.4**	

Outcome Data

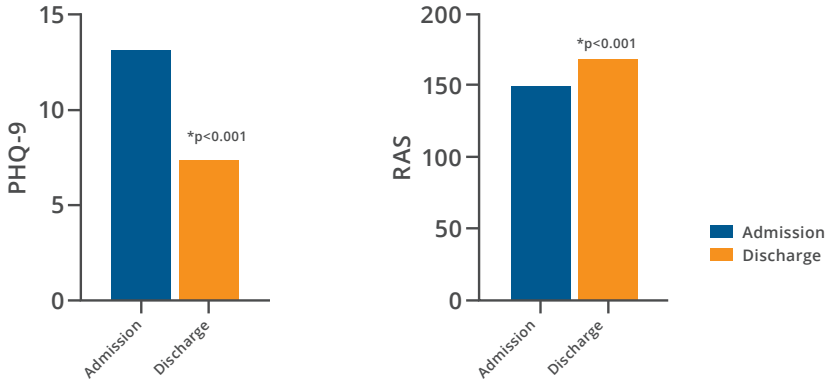
We will never address inequities or access to care problems without measurement based care. We are using what we have learned to deliver state-of-the-art behavioral healthcare.

The Patient Health Questionnaire-9 (PHQ-9) is a nine-item diagnostic tool used to screen for and assess the severity of depression. It is a widely used instrument to identify individuals who may be experiencing depression.

The Recovery Assessment Scale (RAS) is a tool used to measure an individual's perception of their own recovery by evaluating various aspects of recovery, including confidence, willingness to ask for help, and goal orientation. Higher scores on the RAS generally indicate a stronger sense of recovery.

Discovery, in partnership with Harvard via Mass General Brigham, published the largest peer reviewed sample size of 20,770 patients (27,002 treatment episodes). **In a two-year period, depression severity decreased on average 43% for Discovery patients**.

Improvements in PHQ-9 & RAS scores



Improvements in PHQ-9 greater than reported in other studies

	Patient Population	Intervention	(Average) Time	N	Baseline Score	Mean Change
Discovery Behavioral Health Straub et al. (2025)	**Discovery Behavioral Health Treatment Centers**	**Treatment at Discovery**	**45 Days**	**18,486**	**13.1**	**-5.68**
Beck et al. (2014)	MDD patients from primary care/ behavioral health clinics	Internet-delivered MBCT	8 weeks	100	≤12	-1.98
Lindell et al. (2018)	Outpatient	Psychiatric care	11.1 weeks	117	13.9	-4.1
Härter et al. (2018)	Primary care units	Stepped and collaborative care models	3 months	569	15.3	-3.0

PaRC (PREVENTION AND RECOVERY CENTER)
HOUSTON, TX

Improvement in RAS greater than reported in other studies

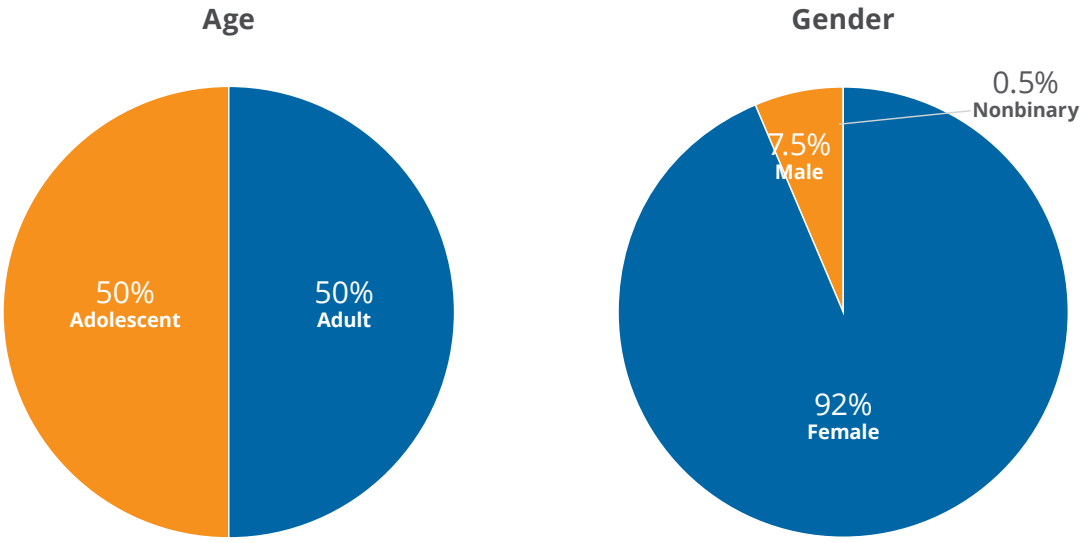
	Patient Population	Intervention	(Average) Time	N	Baseline Score	Mean Change
Discovery Behavioral Health Straub et al. (2025)	**Discovery Behavioral Health Treatment Centers**	**Treatment at Discovery**	**47 Days**	**13,660**	**150.63**	**+18.03**
Soloman et al. (2016)	SMI	Autovideography Intervention	12 weeks	10	172.1	+8.9
Wasmuth et al. (2021)	Outpatient	Narrative-informed occupational therapy	6 weeks	7	76.85	+9.72
Schweitzer et al. (2017	Patients with schizophrenia	Metacognitive narrative psychotherapy	42-88 sessions	8	159.63	+11.13

"What intervention is associated with the highest probability of a positive outcome for each patient? That is what we are identifying."

Rachel Wood, Ph.D.,
VP, Learning Health Systems
Discovery Behavioral Health

Eating Disorder Outcomes at Center for Discovery

Patient Demographics:



n= 4,200

Treatment Period: 2021-2023

"Not all that can be counted counts, and not all things that count can be counted. Discovery measures and counts one of the most extensive panels of valued-based, patient-reported objective measurements (PROMS)."

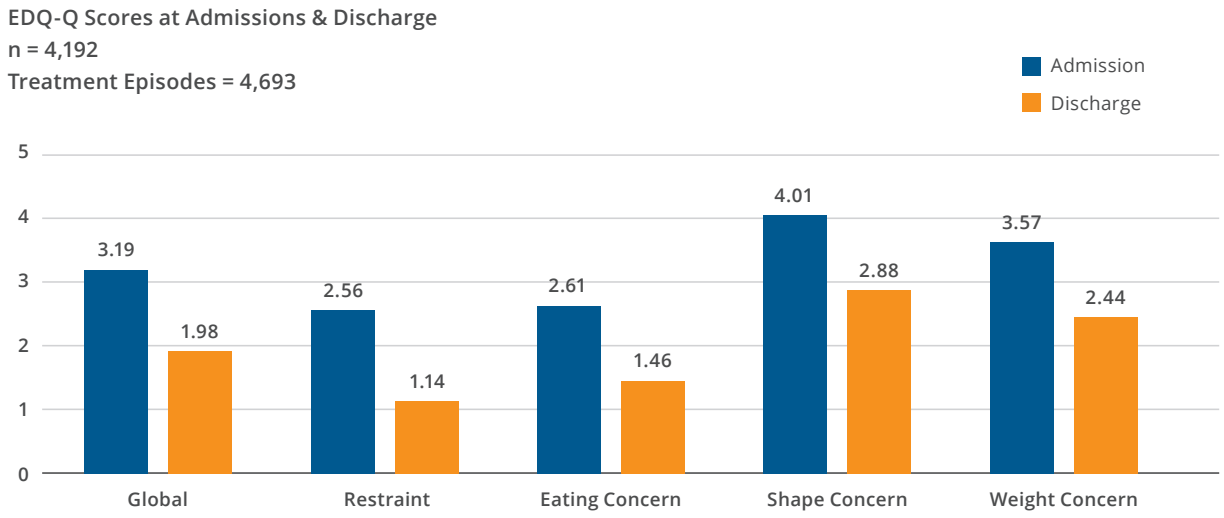
Matthew Ruble, MD

Chief Medical Officer
Discovery Behavioral Health

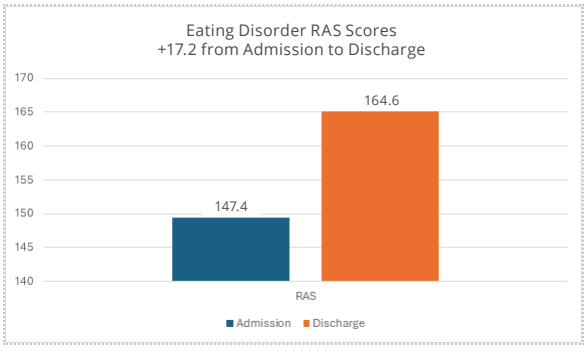
EDE-Q Scores

The EDE-Q is scored using a 7-point, forced-choice rating scale (0–6) with scores of 4 or higher indicative of clinical range. The subscale and global scores reflect the severity of eating disorder psychopathology.

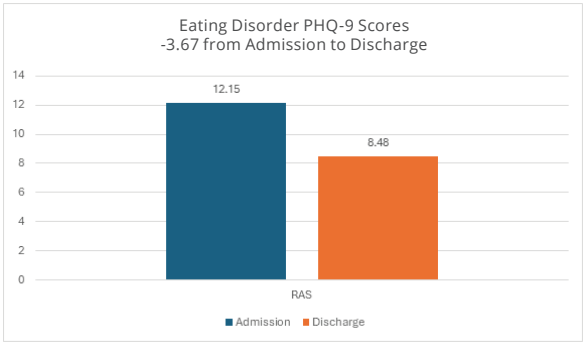
Significant improvements were noted in overall EDE-Q scores and each symptom domain (i.e., Global, Restraint, Eating Concern, Shape Concern and Weight Concern).



Standard Deviations at Admission & Discharge, Respectively: Global: 1.69, 1.58; Restraint: 2.05,1.51; Eating: 1.62, 1.38; Shape:1.87, 2.00; Weight: 1.87, 1.91



2024 Data, Discovery Behavioral Health, n= 2992



2024 Data, Discovery Behavioral Health, n= 2992

PHQ-9 Scoring Scale	
	Depression Severity
Minimal Depression	1 to 4
Mild Depression	5 to 9
Moderate Depression	10 to 14
Moderately Severe Depression	15 to 19
Severe Depression	20 to 27

"You exceeded our expectations in helping our son recover, heal and grow from this experience. My husband and I hated to leave our son and be without him for so long but we know that he gained knowledge, coping mechanisms, and his self-esteem has improved greatly. The team has been courteous, professional, kind and helpful. Our son now has the information he needs to live a great life and hopefully even help others. We can never thank you all enough for everything."

Parent of Former Discovery Patient

Key Findings

- Patients with the most severe eating disorder symptoms showed the largest improvements.
- The average length of stay was 59 days with treatment completion rates greater than 70%.
    - Longer lengths of stay were positively associated with greater reductions in eating disorder symptoms, underscoring the value of sustained care.
    - Each additional admission is associated with significant improvements (though smaller than initial treatment episode) across all eating disorder domains.
    - Residential care was associated with greater reductions in eating disorder symptomatology followed by PHP, then IOP.
- Youth show slightly more improvement than adults when it comes to restraint, eating, body, shape and weight concerns, and particularly in shape and weight concern; males show more improvement in restraint and eating, body, and shape concerns.

Mental Health Outcomes at Discovery Mood & Anxiety Program

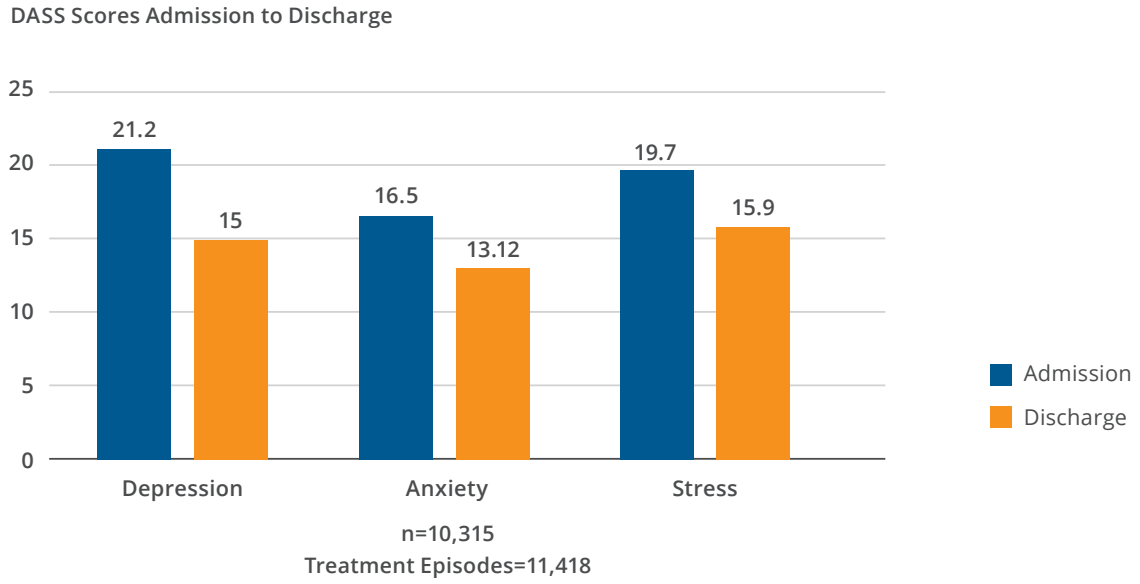
Patient Demographics

n = 10,000
Treatment Period: 2021 - 2023

The DASS

The DASS (Depression Anxiety Stress Scales) is a self-report questionnaire used to assess the severity of depression, anxiety and stress, with scores indicating the degree to which someone is experiencing these symptoms.

Significant Improvements in DASS scores were observed from admission to discharge, including in overall DASS scores and in each symptom domain:

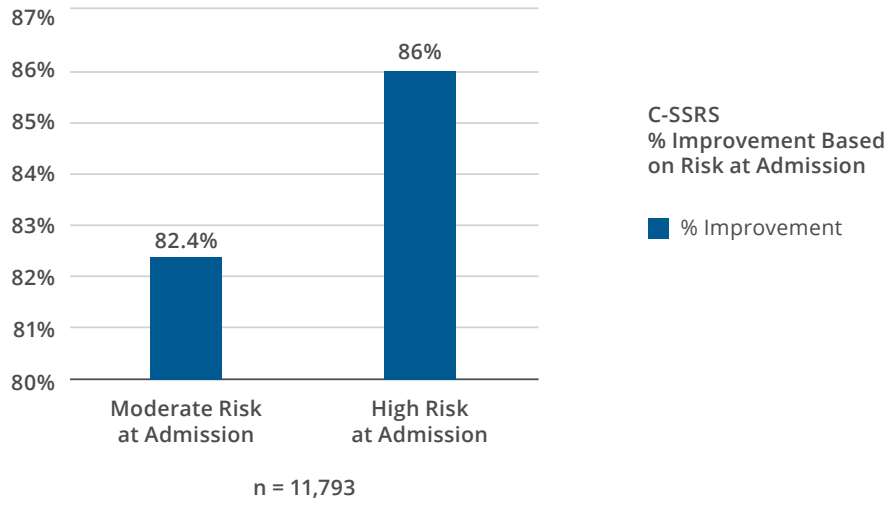


C-SSRS

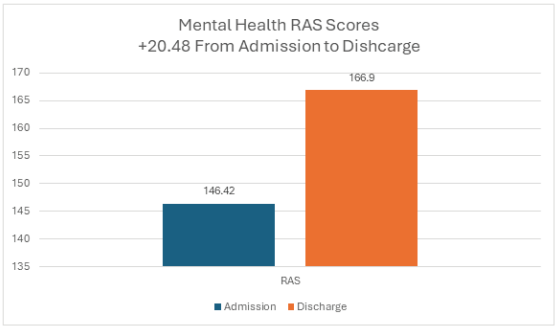
The Columbia-Suicide Severity Rating Scale (C-SSRS) assesses suicide risk with a series of questions; answers identify whether someone is at risk for suicide, determine the severity and immediacy of risk, and gauge the level of support the person needs:

- Whether and when they have thought about suicide (ideation)
- What actions they have taken — and when — to prepare for suicide
- Whether and when they attempted suicide or began a suicide attempt that was either interrupted by another person or stopped of their own volition

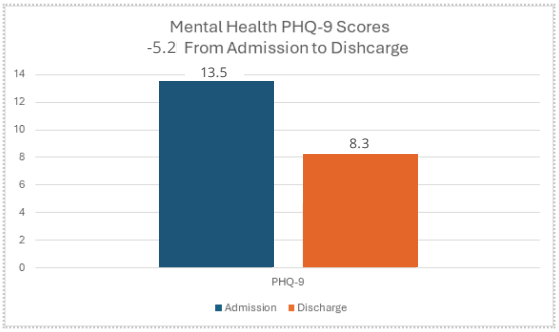
Significant improvements in suicide risk levels were observed from admission to discharge for low, moderate and high-risk groups:



n = 11,793



2024 Data, Discovery Behavioral Health, n= 4667



2024 Data, Discovery Behavioral Health, n= 4667

PHQ-9 Scoring Scale	
	Depression Severity
Minimal Depression	1 to 4
Mild Depression	5 to 9
Moderate Depression	10 to 14
Moderately Severe Depression	15 to 19
Severe Depression	20 to 27

Key Findings

- Severity Matters: Patients with higher suicide risk on admission showed the largest improvements (e.g., 82.4% of Moderate Risk and 86% of High Risk patients were in lower risk groups at discharge).
- Program Type Impact: RTC had modestly greater improvements than IOP) and PHP.
- Length of Stay: Extended treatment durations were positively associated with greater improvements in suicide risk levels.
- Demographics: Adults and male patients showed somewhat greater improvements in suicide risk levels. Patients had an average length of stay of 47 days, with high variability (±35.79 days), reflecting a tailored approach based on individual needs.
    - Longer stays are associated with larger reductions in stress, anxiety and depression, highlighting cumulative treatment benefits.
    - Extended treatment durations were positively associated with greater improvements in suicide risk levels.
- Patients with the highest levels of stress, anxiety and depression experienced the greatest reduction in stress, anxiety and depression.
- Residential treatment shows the strongest reductions across all symptoms of stress, anxiety and depression relative to outpatient. This is controlling for severity at admission suggesting there is something inherently beneficial about residential treatment)
- Youth have greater improvement in stress and anxiety.
- Males have greater reductions in anxiety and stress.
- Patients with higher suicide risk on admission showed the largest improvements.

Suicidality Findings

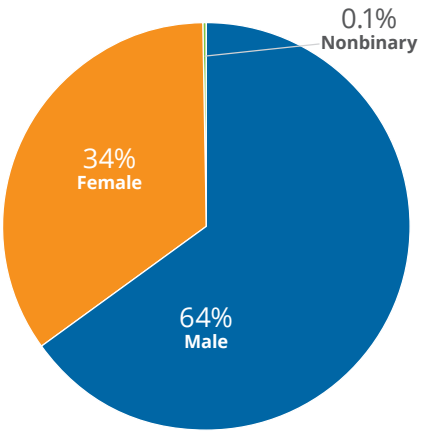
- 80% of patients admitted with suicide risk leave in the low-risk category with longer lengths of stay resulting in greater improvements.
- Controlling risk scores at admission, residential treatment resulted in greater reductions in suicide risk scores.

Substance Use Disorder Outcomes at Discovery Behavioral Health

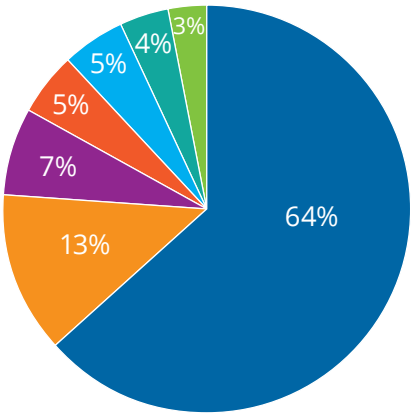
CLIFFSIDE MALIBU
MALIBU, CA

Patient Demographics

Gender

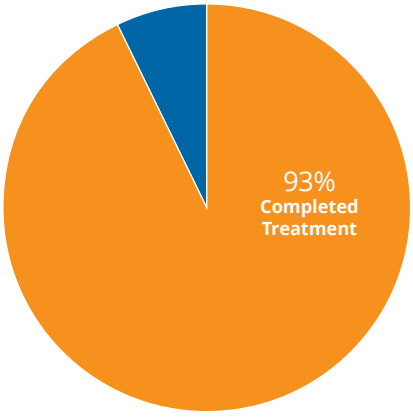


Substance Use



- 64% Alcohol
- 13% Opioids
- 7% Cannabis
- 5% Amphetamines
- 5% Cocaine
- 4% Sedatives
- 3% Other Substances

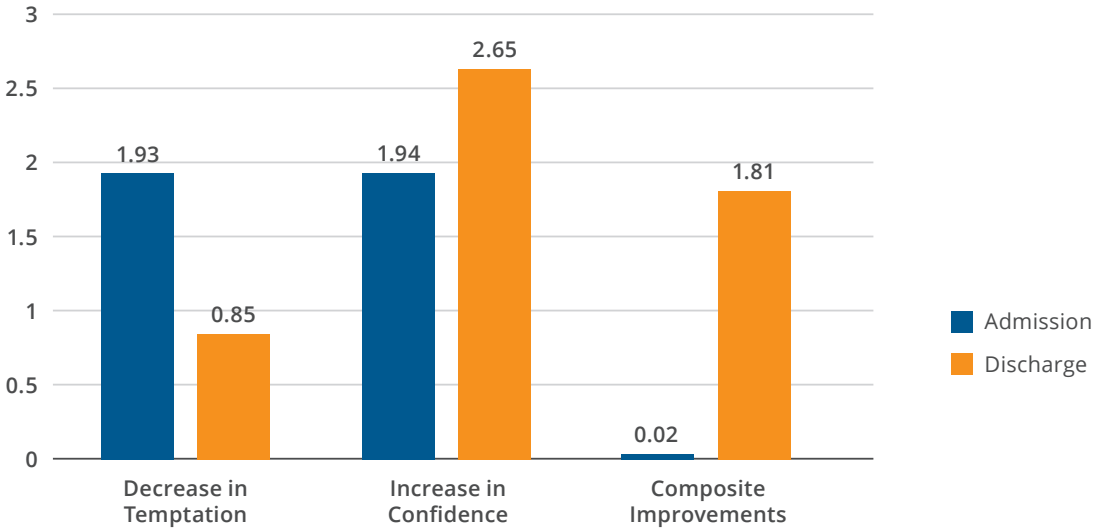
93% completed treatment with an average length of stay of 32 days



n = 3,600

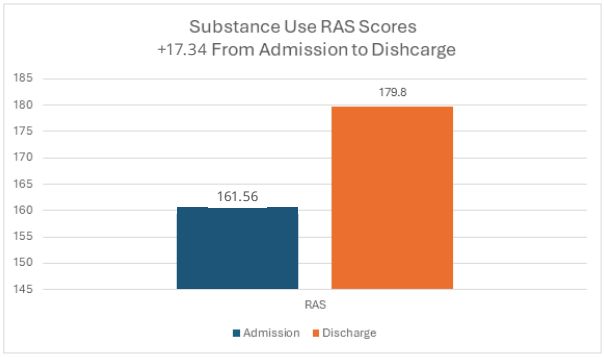
Treatment Period: 2021 - 2023

SASE* Scores at Admission & Discharge N = 3,620 | SUD Episodes, 4,251

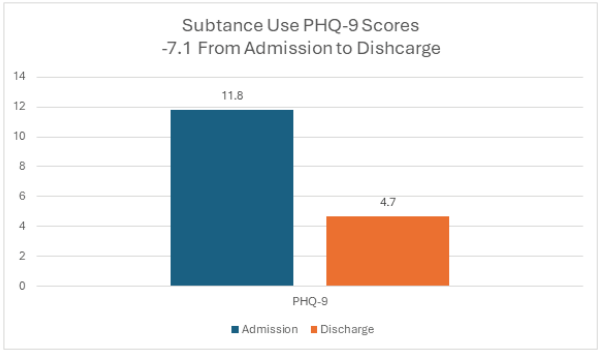


Standard Deviation in Temptation, Confidence and Composite at admission and discharge, respectively: .92, .75; .99, 1.26; 1.61, 1.61)

*See appendix page 48-51.



2024 Data, Discovery Behavioral Health, n= 7262



2024 Data, Discovery Behavioral Health, n= 7262

PHQ-9 Scoring Scale	
	Depression Severity
Minimal Depression	1 to 4
Mild Depression	5 to 9
Moderate Depression	10 to 14
Moderately Severe Depression	15 to 19
Severe Depression	20 to 27

"What you did for me was the one thing I could not do for myself. You protected me from me. That was September 30, 2017, and I haven't had a drink since."

Former Discovery Patient

Key Findings

- Higher severity scores at admission showed the most significant treatment effect. Note: Patients with opiate use disorders and "other substance use disorders" had worse discharge scores than other SU categories.
- Longer lengths of stays are associated with greater improvements overall and specifically with temptation reduction and confidence.
- Patients who completed treatment tended to have greater improvements overall.
- Evidence-based therapies used by patients with SUD:
    - Motivational interviewing (91%) is nearly universal underscoring Discovery's adherence to best practices in addiction care.
    - Frequent use of CBT (69%), Stages of Change (51%), Family Systems (45%) and MBCT (44%) indicate Discovery clinicians apply comprehensive approaches to meet their patients' specific needs.

*Based on December 2024 TTA for FBS https://pmc.ncbi.nlm.nih.gov/articles/PMC8161431/

Discovery365®: Post-Treatment Monitoring and Support

A well-kept secret, and one related to a lack of standards in care, is our industry's staggering relapse rate. The average relapse rates within the first year of recovery are:

- Eating Disorders - 40%
- Depression - 60%
- Substance Use - 70 - 85%

To address the crucial first year following discharge, we created Discovery365®, also called D365. This AI-enabled platform provides patient monitoring and assessment for one full year post discharge. A live care team is alerted when D365 detects signs of struggle or potential relapse. D365 is vitally important for patient growth and intervention. Because of its asynchronous nature, patients can engage at a time that suits them. The patient receives an email or text alert from D365 24 hours after treatment, weekly for the first month and monthly for the first year. These 16 additional touch points can mean the difference between relapses or lifelong recovery. **Our third-party validated study shows that D365 was associated with better discharge outcomes in terms of lower depression scores (PHQ-9)**.

> "I'm hopeful right now because I'm taken care of. I feel confident in my recovery goal."
>
> **Former Discovery Patient**

Study Sample Explanation

The study sample consists of 7,960 patients who met specific eligibility criteria. To be included, participants must have:

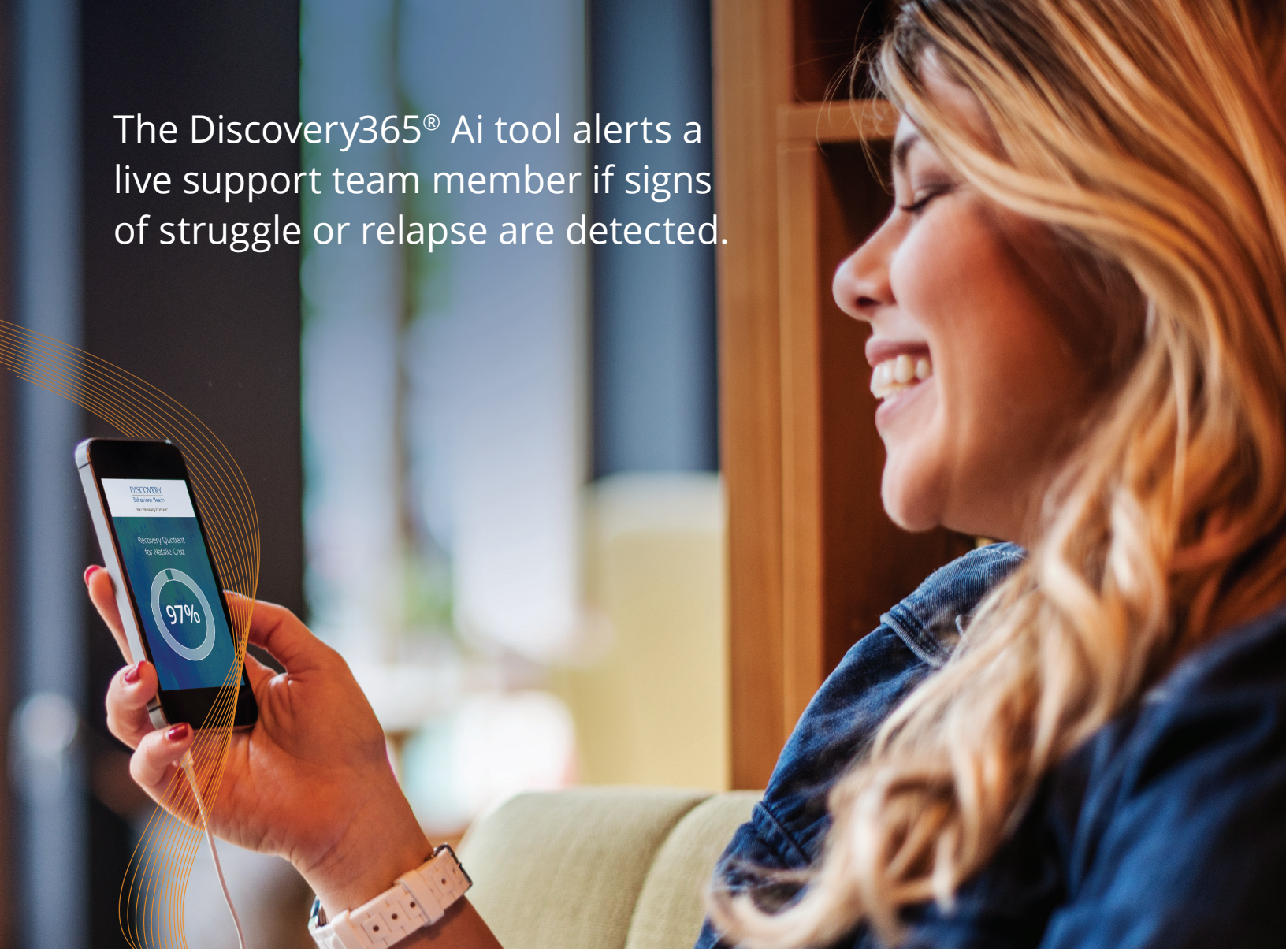
- Completed both the PHQ-9 (a depression assessment) and the RAS (a recovery assessment) at the time of admission and discharge.
- Completed one or more D365 sessions or patients who allowed their invitations to expire (i.e., non-completers).
- Have non-missing characteristics in the demographic data.

This selection process ensures that the sample provides comprehensive data on both completers and non-completers for analysis.

Key Findings

- Completing D365 was associated with a higher likelihood of completing treatment, while not completing D365 was associated with a higher likelihood of leaving against treatment advice, requiring a higher level of care, or being transferred.
- Completing D365 was associated with better discharge outcomes in terms of lower depression scores (PHQ-9), although no significant differences were found in recovery scores (RAS) or in the changes in outcomes between the two groups.

> "We had four alerts over the weekend, and we were able to reach out to support former patients...we would have never been able to find these patients in time without this system."
>
> **D365 Support Team Member**



D365 Results

D365 Session Outreach

- 15,691 (5,982 users) Sessions Completed*
  - Eating Disorders: 2,554 (1,130 users)
  - Mental Health: 4,332 (1,969 users)
  - Substance Use: 8,805 (2,883 users)
- 9,915 Alerts

D365 alerts are notifications received by our live support team from the patient or the platform itself. These notifications let us know what type of support is needed by the patient. In some cases, it's for information or resources. In other cases, the patient is struggling and needs intervention.

*See appendix page 48-51.

> "I like the idea of the video. It makes it nice and easy instead of having to type everything out...It's good to see that there's follow-up and that people care."
>
> Former Discovery Patient

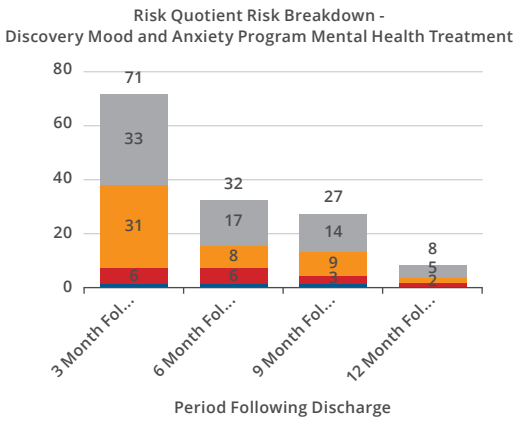
Recovery Quotient

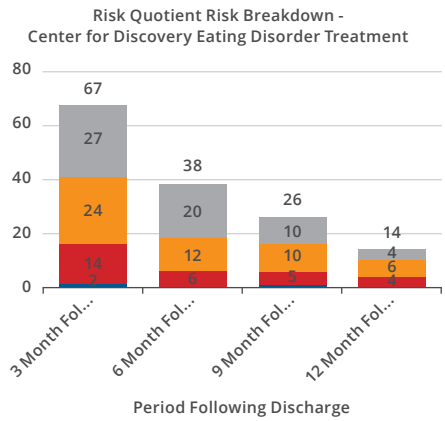
The Recovery Quotient (RQ) is a proprietary measure that includes weighted scores on the five domains of Social Determinants of Health, recovery function and diagnosis specific symptoms and behaviors.

D365 assessments measure recovery across six domains. Higher scores are better and indicate more protective factors, meaning less risk of relapse.

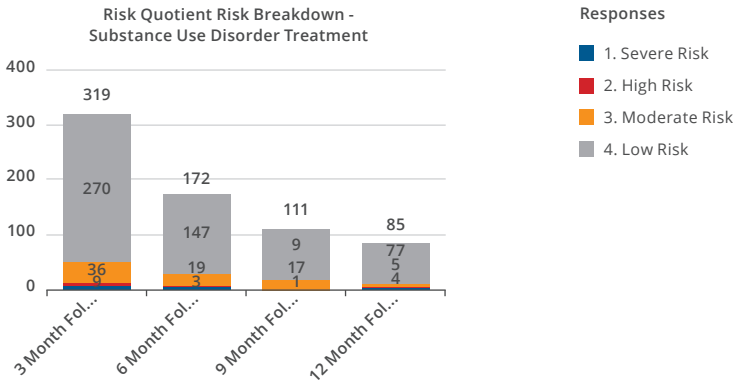
RQ Score	Range
High P Factor	83 - 100
Moderate P Factor	59 - 82
Moderate Risk Factor	38 - 58
Severe Risk Factor	17 - 37

Recovery Quotient





Recovery Quotient (continued)



Patients are at their highest risk category in the first 3 months post discharge, and increase in protective factors (i.e. low risk) over time.

Recovery Quotient Correlations

RQ predicts patient success and recovery outcomes

	Pearson R Correlation
Depression (PHQ-V)	-0.680
Anxiety (GAD-V)	-0.656
Trauma (PCL-V)	-0.665

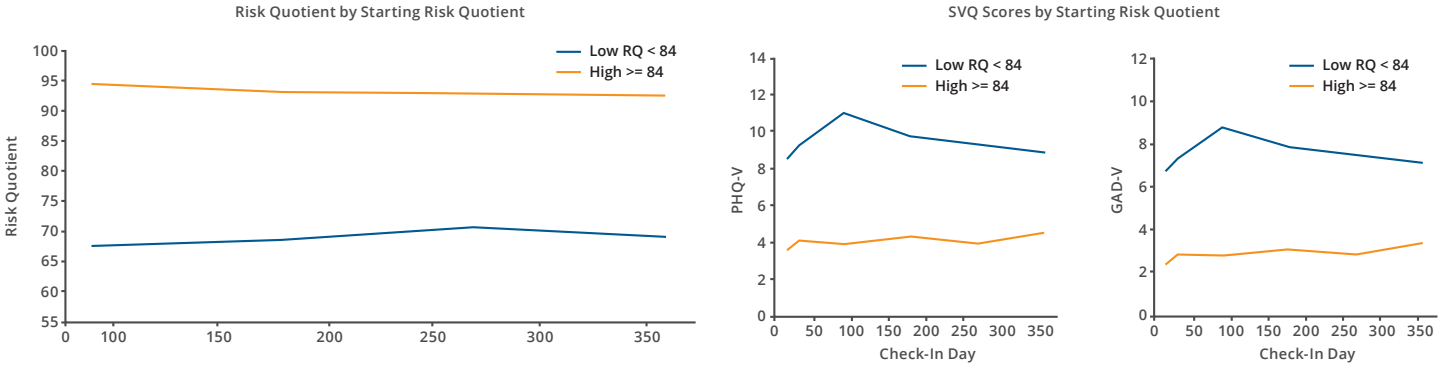
	Pearson R Correlation
Patient Readmittance	-0.53
Referrals	-0.42

A high recovery quotient (RQ) is correlated with lower levels of depression, anxiety and trauma, as well as lower readmittance and referral rates.

> "Because [D365] is video based, it gives the staff the very information that you would be looking to observe if the patient was sitting across from you in your office."
>
> **D365 Support Team Member**

RQ Predicts Long-Term Outcomes

The RQ at discharge strongly predicts outcomes over the next year. Patients with low initial RQ stay lower than those with high initial RQ.



Note: Patients report elevated anxiety and depression at three months after discharge which is why we are targeting personalized interventions for those intervals.

> "The patient may have had an accident, lost a job or been divorced. They couldn't get their medications. D365 is a solution that gives us visibility so we can prevent relapse."
>
> D365 Support Team Member

Recovery Quotient by Alert

- **Sponsor/Sober Living:** Shows a long-term growing positive impact.
- **Patient Readmit:** Predicted by a low recovery quotient.
- **Referrals:** Predicted by a low recovery quotient.
- **Mental Health:** Strong correlation between SVQ metrics (PHQ-9, GAD-9, PCL-V) and RQ scores.

*Session invites and reminders via SMS and email

**Patients completing a session and/or replying via SMS text

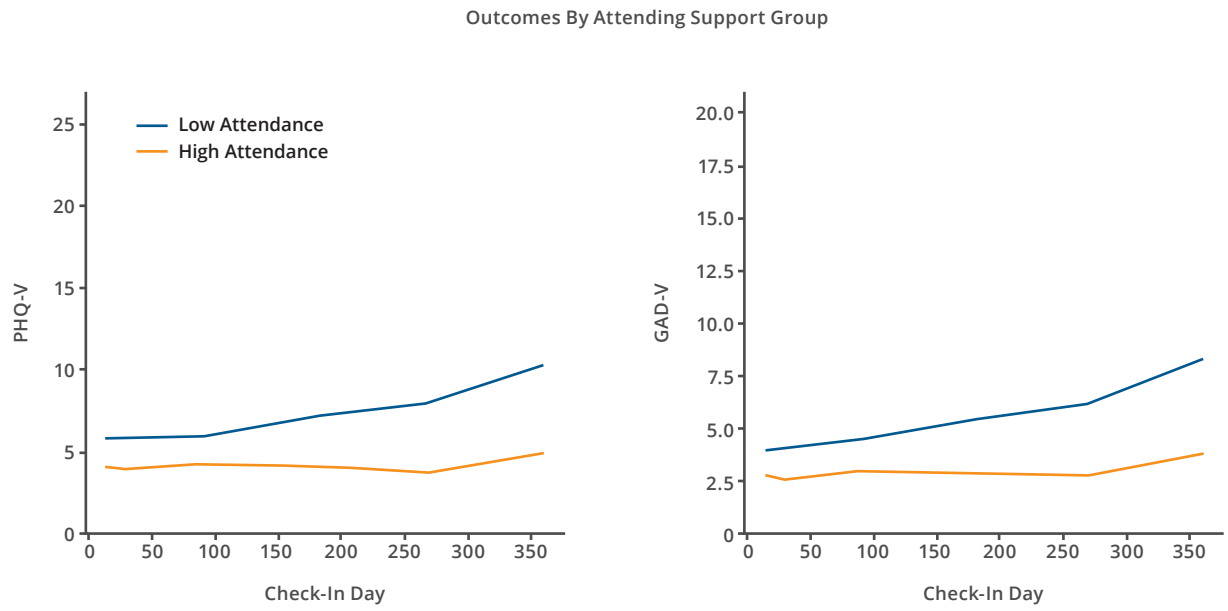
***Alerts surfaced across 15 different alert types including clinical, operational and SDOH

Source: Videra Health

"This was a great way to transition out of treatment. I really appreciate the continued support. It didn't feel like it was just, 'Okay, see you, go on your way.'"

Former Discovery Patient

Post-Discharge Support Improves Outcomes

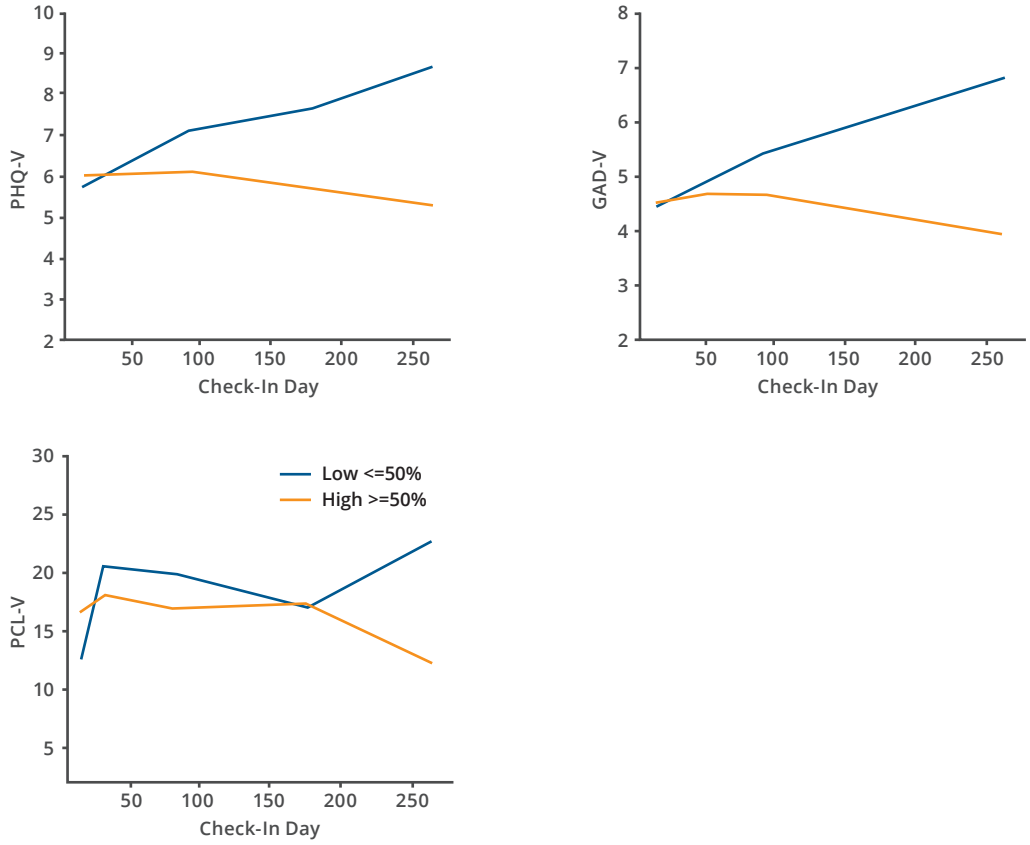


Not attending a support group leads to significantly higher depression (PHQ-V) and anxiety (GAD-V) over time. Attending support groups is associated with lower levels of anxiety and depression.

Engagement Lowers Depression, Anxiety and Trauma

Great engagement in D365 reduces depression (PHQ-V), anxiety (GAD-V) and trauma (PCL-V) scores compared to lower engagement.

Risk Quotient by Engagement Rate



"Checking in with my husband before the video check-ins was helpful because it made us reflect on what we might need, what's going well and what our challenges are. Sometimes we needed resources, and [a D365 support team member] would reach back out in response...it made us feel like there was a person on the other side.. It was like a safety net that sometimes insurance doesn't provide."

Parent of Former Discovery Patient

Average GAD-V

SUD

At 2 weeks -
1 month - 3 months

14 days: 3.2	**Mild**
30 days: 3.3	**Mild**
90 days: 3.3	**Mild**

14 N=524, 30 N=479, 90 N=272

MH

At 2 weeks -
1 month - 3 months

14 days: 7.0	**Mild**
30 days: 7.4	**Mild**
90 days: 8.7	**Mild**

14 N=149, 30 N=117, 90 N=67

ED

At 2 weeks -
1 month - 3 months

14 days: 7.3	**Mild**
30 days: 7.0	**Mild**
90 days: 8.3	**Mild**

14 N=111, 30 N=84, 90 N=64

"These little videos are really helpful to review my progress."

Former Discovery Patient

Average PHQ-V

SUD

At 2 weeks - 1 month - 3 months

14 days: 4.5	**Mild**
30 days: 4.7	**Mild**
90 days: 4.7	**Mild**

14 N=524, 30 N=479, 90 N=272

MH

At 2 weeks - 1 month - 3 months

14 days: 8.5	**Mild**
30 days: 9.3	**Mild**
90 days: 10.5	**Mild**

14 N=149, 30 N=117, 90 N=67

ED

At 2 weeks - 1 month - 3 months

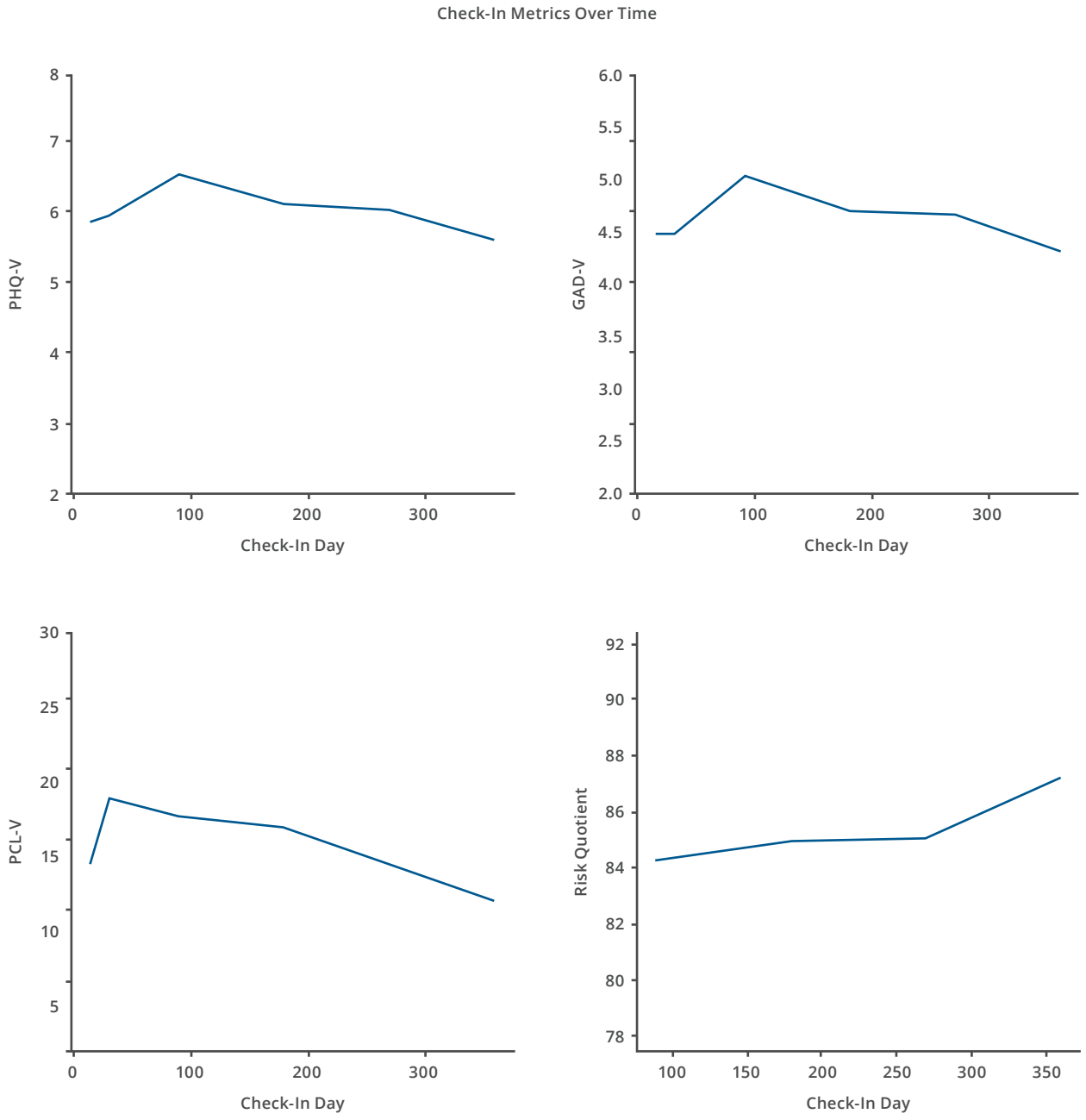
14 days: 9.0	**Mild**
30 days: 8.7	**Mild**
90 days: 10.4	**Mild**

14 N=111, 30 N=84, 90 N=64

BROOKDALE PREMIER ADDICTION RECOVERY
SCOTRUN, PA

Follow-Up Metrics Over Time

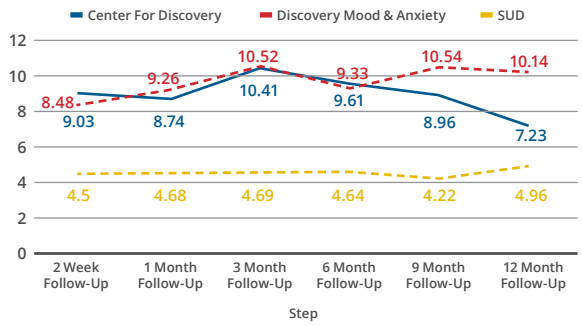
Patient using D365 **see improvements over time:** higher recovery quotient (RQ) and lower mental health outcomes (depression, anxiety, trauma).



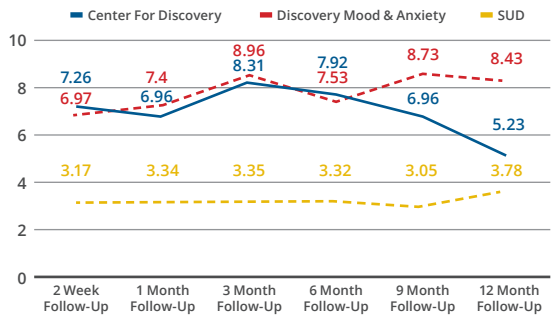
"It allows me to check in to be accountable. It lets me know that [Discovery] cares about my well-being."

Former Discovery Patient

PHQ-V Average



GAD-V Average



Discovery patients decrease in acuity over time

"I understand my discharge plan."

78% Overall

(Strongly Agree and Agree)

At 48 hours

64% Strongly Agree
24% Agree
6% Neutral
2% Disagree
3% Strongly Disagree

N=1,031

At 48 hours

35% Strongly Agree
37% Agree
15% Neutral
7% Disagree
5% Strongly Disagree

N=245

At 48 hours

39% Strongly Agree
30% Agree
13% Neutral
9% Disagree
8% Strongly Disagree

N=210

"I have attended at least one aftercare appointment."

68% Overall
(Strongly Agree and Agree)

At 1 Week

79% Yes
24% No

N=1,031

At 1 Week

58% Yes
42% No

N=203

At 1 Week

66% Yes
34% No

N=170

"I have been abstinent from substances for the past 30 days."

At 1 Month Post-Discharge

91% Replied Yes

N=443

"I have/my child has been hospitalized for psychiatric or behavioral reasons since discharge from the program."

At 1 Month Post-Discharge

89%
Overall
replied No

N=225, includes both patient and parent responses

"I have not restricted/purged/binged in the past 30 days for the purpose of weight management or body image."

66%
Overall
replied Yes

Restricted
49%
replied Yes

Purged
79%
replied Yes

Binged
70%
replied Yes

D365 Next Steps In Continuity of Care

By giving patients an added safety net at no additional cost to them, we can offer support as needed while patients transition from the structure of treatment to full independence. D365 also allows us to track outcome data post discharge to determine when patients are struggling most.

We can see differences in recovery from a patient who is dealing with an eating disorder or an addiction, or an adult vs. an adolescent. These nuances will help us to create future programs to anticipate when a struggle is likely to occur and plan for early prevention. D365 puts more power into the hands of the patient to take control of their recovery.

Looking Forward: Discovery's Plans for High-Risk Patients and Clinical Research

Measurement-based care is more than our practice—it's our mission. At the heart of our approach is a commitment to extend the impact of our data and insights far beyond the walls of our treatment centers. Through meaningful collaborations with leaders in academia, healthcare and technology, we're advancing innovations that elevate care across the industry. We're excited about the progress underway and look forward to keeping you informed as we implement the next generation of solutions.

"Together, we can learn what treatments an individual will respond best to, and help pave the way for more precise and personalized behavioral healthcare in the U.S."

Philip Wang, M.D., Dr.P.H.,

Director of the Center for Learning Health Systems
at Brigham and Women's Hospital
Professor of the Practice of Psychiatry at Harvard Medical School
Former Deputy Director of NIMH
Former Research Director of American Psychiatric Association

CASA PALMERA
LOS ANGELES, CA

Suicidality: Precision Interventions Begin with Measurement-Based Care

In partnership with Mass General Brigham, Harvard's largest teaching hospital, Discovery examined which factors drive initial therapeutic modality choice, how that choice influences suicide-risk trajectories, and how outcomes might have improved under each patient's empirically "ideal" therapy. The goal is to shift care for high-risk patients from trial-and-error to precision treatment by quantifying the impact of first-line decisions and the factors behind them. The following research is slated for submission to the Journal of American Medical Association (JAMA).

The Reality of Suicide and Treatment

Suicide claims over 800,000 lives annually and ranks among the top 10 causes of years of life lost globally[1]. Psychotherapies have been shown to be among the most effective interventions in medicine; however, treatment decisions rely on group-level outcomes despite the variability of individual responses.

The Problem: Lack of Industry Standardization

Stratified psychiatry, powered by EHR-scale data, has been proposed as the fastest path toward precision mental health care, but 60% of providers report never using standardized progress measures and only 13% report use them monthly. Additionally, gathering data is not the equivalent of generating predictive models that can deploy real-time, individualized best practices.

Improved Outcomes Improve Access

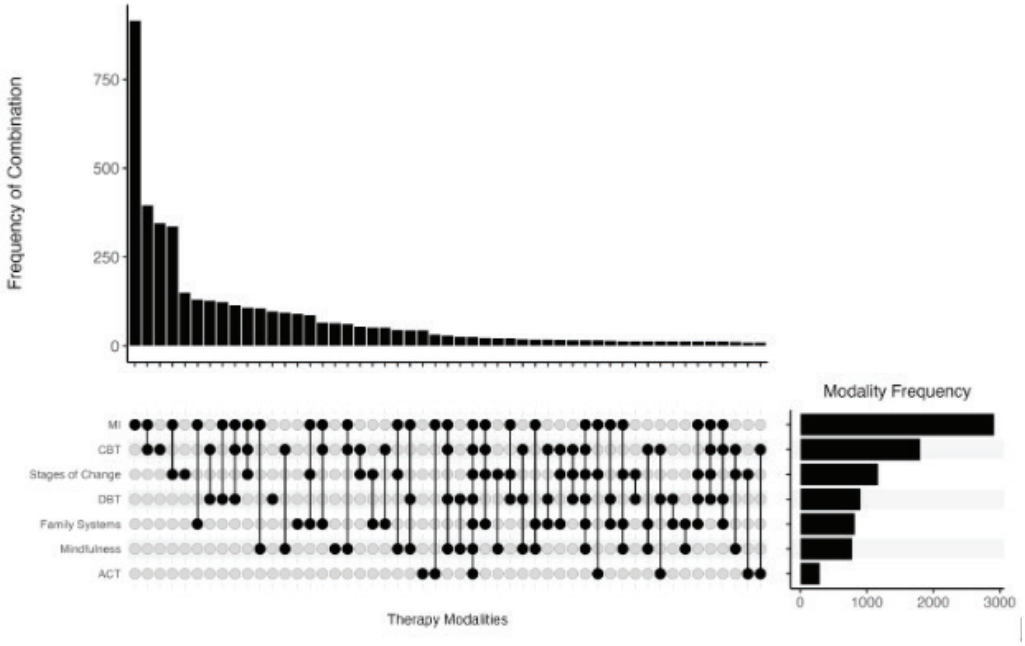
The only pathway to mitigating access issues, health disparities and improving overall outcomes is measurement and the application of data. The following models demonstrate interventions that begin at intake and predictive models for improvement based on individual patient profiles.

"Knowing exactly what increases the probability of a positive outcome increases efficiencies, decreases trial and error, reduces time in treatment and frees up access to treat more people seeking help."

Rachel Wood, PhD,

VP, Learning Health Systems
Discovery Behavioral Health

Figure 1. Frequency of Initial Psychotherapy Modality Combinations Among Patients at *Intake at Discovery Behavioral Health*



This figure displays the most common combinations of psychotherapy modalities initiated at the start of care across a cohort of moderate- to high-risk patients. Each row corresponds to a specific modality (e.g., CBT, DBT), and each column represents a unique combination of modalities. Filled dots indicate the inclusion of a modality in that combination. The top bar chart shows the number of patients who received each combination. In contrast, the right bar chart reflects the total number of patients who received each modality regardless of combination.

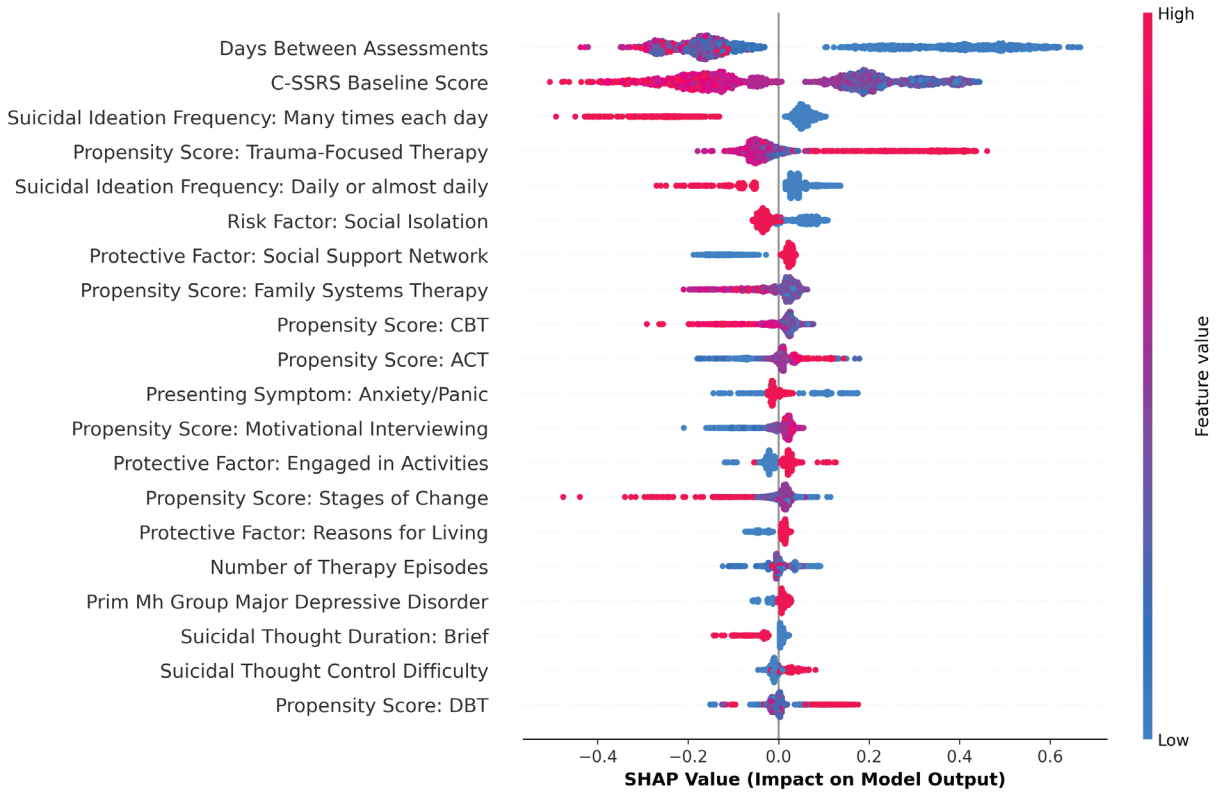
Figure 2: Machine Learning Model Feature Importance and Patient-Specific Prediction Explanations for Suicide Risk Improvement

"In our partnership with Discovery Behavioral Health, we are using novel machine learning techniques to uncover heterogeneous treatment effects and design adaptive, patient-specific psychotherapy sequences that most effectively reduce suicide risk. These insights translate into dynamic, session-by-session recommendations, giving clinicians real-time, data-driven guidance for every patient encounter."

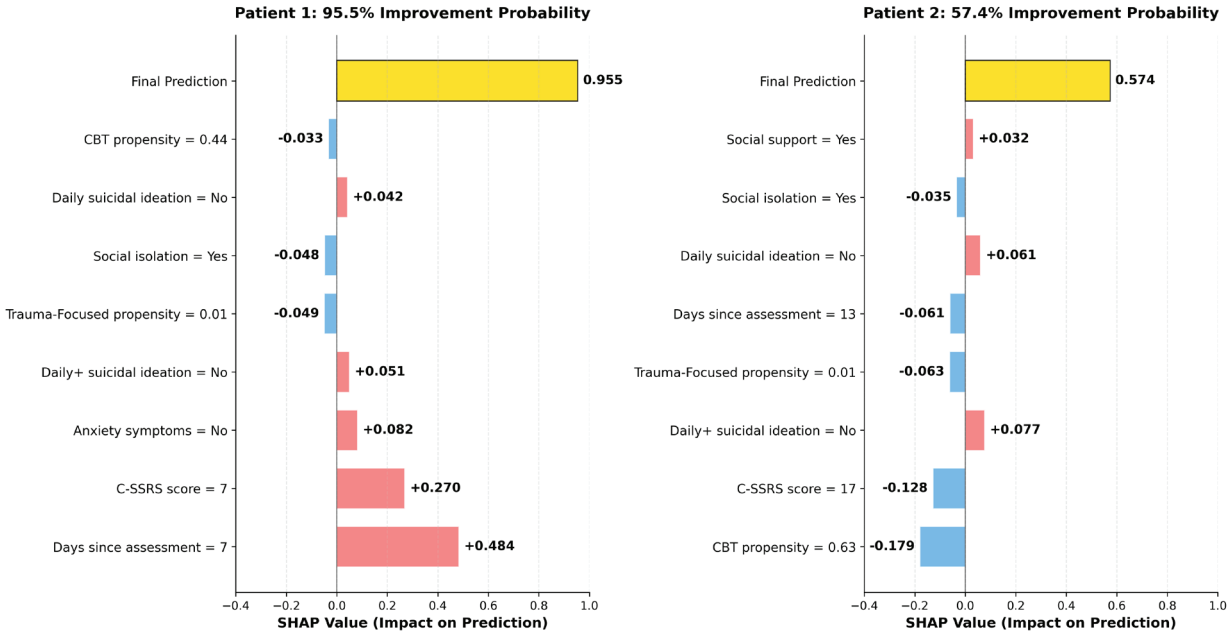
Jacob Jameson

Educational Innovation Scholar at the
Harvard Center for Health Decision Science

Feature Impact on Suicide Risk Improvement Prediction



DISCOVERY Behavioral Health



a Global feature importance showing the impact of clinical characteristics on suicide risk improvement predictions across all patients. Each dot represents one patient, with red indicating higher feature values and blue indicating lower values. Features are ranked by mean absolute SHAP value, representing the average magnitude of each feature's contribution to model predictions. Positive SHAP values increase the probability of suicide risk improvement, while negative values decrease it.
b Individual patient prediction explanations for two representative patients with contrasting risk profiles. Patient A demonstrates high improvement probability (95.5%) while Patient B shows lower improvement probability (57.4%). Horizontal bars show SHAP values for the most influential clinical features for each patient, with red bars indicating factors that increase improvement probability and blue bars indicating factors that decrease it. The final prediction represents the model's personalized assessment combining all patient characteristics. These explanations demonstrate how the model integrates multiple clinical factors to generate individualized treatment recommendations, supporting precision psychiatry approaches in suicide prevention.

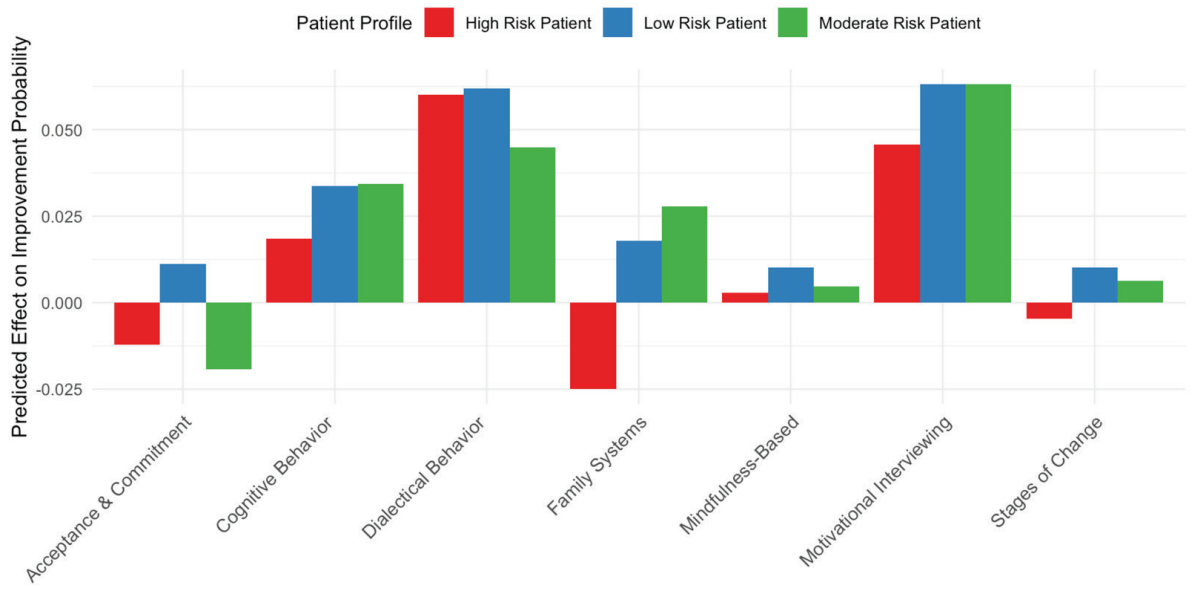
"Discovery is using machine learning to predict the most effective sequences of care for individuals with mental health and substance use disorders. This approach moves beyond static guidelines by learning from real-world data to recommend personalized, adaptive treatment pathways over time. The goal is to equip providers with tools that support more precise, evidence-driven decisions to improve treatment engagement, retention, and outcomes for patients."

Dr. Jason Brian Gibbons

Investigator, Brigham and Women's Hospital
and Member of Faculty Harvard Medical School

Predicted Treatment Effects for Different Patient Profiles

How different patient types respond to each therapy approach.



Recovery Is Not Linear

Recovery is not linear - this has become a common phrase. If we as an industry believe this, it is incumbent upon us to adapt to what that truly means and not let the clock run its course relying solely on subjective clinical instincts. We have found:

- Commonly administered therapy like dialectical behavior therapy is not only unhelpful for some patients, but detrimental.
- For some patients, family therapy is the modality that will, in a material way, increase the probability of a successful recovery.
- Not all patients benefit from all modalities, and we are beginning to learn why.

Clinical Research & Trials: Discovery Receives NIDA Approval for Opiate Use Disorder Treatment

Having received initial approval from NIDA (National Institute of Drug Abuse), Discovery Behavioral Health plans to begin studying optimal treatment regimes in opiate use disorder which we believe will lead to fundamental changes in the understanding of opioid use disorder treatment response dynamics and lead to predictive algorithms that can inform the way we deliver care to our thousands of our patients.

Deaths as a result of overdose reflect a 2.6-fold increase in the past decade, suggesting the crisis continues to worsen. Traditional treatment methods have shown limited success, with high relapse rates and low adherence. According to health economist and Discovery partner, Dr. Jason Gibbons, there are several factors as to why that may occur:

- First, existing research and opiate use treatment practices have primarily focused on static approaches with limited consideration for the significant temporal variation in treatment response and illness progression.

- Second, conventional statistical and care approaches commonly used to study and treat OUDs often fail to account for treatment effect heterogeneity based on individual characteristics. This has led to broad clinical recommendations that are not optimized for OUD patients facing unique clinical, social and environmental circumstances.

- Finally, while there is a growing recognition of the importance of using patient-reported outcome measures to inform clinical practice, there is a current shortage in collecting these measures and integrating them into clinical decision-making processes. The NIDA sponsored research in collaboration with Discovery Behavioral Health, Mass General Brigham led by Dr. Gibbons aims to address these gaps by using cutting-edge statistical and machine learning techniques in combination with a novel OUD severity measure to tailor treatments to individual patient needs over time, with the long-term goal of turning the resulting models into clinical decision support tools.

Mass General Brigham and Cambridge Study on Suicide Disorders

Discovery Behavioral Health has also partnered with Mass General Brigham and Cambridge Health Alliance for a proposed NIMH trial developing dynamic treatment regimes and testing the outcomes of a clinical decision support system (CDSS) for suicide disorders in youth nationally.

The burden of suicidal thoughts and behaviors (STBs) on children and adolescents (youth) is increasing. In 2021, suicide was the second leading cause of death in people aged 10 to 24 years, a 52% increase from 2000 (CDC). Providers and health systems seeking to address this crisis face several challenges: 1) static STB risk factors fare little better than chance in predicting STB outcomes (Nock, 2017), 2) mental disorders associated with STBs are characterized by treatment heterogeneity across and within patients over time (Murphy; 2007), 3) preventive interventions are less effective because they are not personalized and do not account for a particular patient's risk factors. Current clinical practice is limited by the failure to address these challenges such that the status quo of mental health care is trial-and-error decision making that can place individuals at unnecessary risk.

The first goal of the study and partnership with the Cambridge Health Alliance and Harvard's Department of Psychiatry, Discovery Behavioral Health will develop dynamic treatment regimes to reduce suicide thoughts and behaviors in youth nationally. Next, is to design an empirically driven system of decision support rules that operationalize the dynamic treatment regimes. Lastly, a pilot trial will be conducted to optimize adaptive decision supports.

> "We count and measure what is most important to patients, their families, and their communities. We measure recovery. We can measure the risk of relapse and prevent relapse."
>
> **Matthew Ruble, MD**
>
> Chief Medical Officer
> Discovery Behavioral Health

Discovery's Dynamic Learning Health System

It is easy for hospital systems and physicians to discreetly track blood pressure, cholesterol, and other physical outcomes at scale. In contrast, in behavioral health, only 14% of providers report using measurement-based care. Many providers still rely on paper and pencil charts or use electronic records with no real way of extracting meaningful recovery measures.

Further, having data for the population between acute inpatient and traditional outpatient therapy affords an opportunity to track the population that doesn't improve during a traditional outpatient psychotherapy and psychiatry service delivery or short-term inpatient stays that average 1–1.5 weeks.

Discovery's Learning Health System includes data sets for 30,000+ patients and incorporates data before, during and after treatment to improve protocols for future Discovery patients and the industry, through published findings, additional research and partnerships with world-class academic, technology and healthcare partners.

"While effective behavioral health care exists, it remains challenging to predict specific treatments to which an individual patient will best respond. We are grateful for the opportunity to learn from the responses of prior Discovery Behavioral Health patients, to provide current and future patients with their probabilities of recovering on different treatment strategies. In this way, we hope our research partnership with Discovery will help pave the way towards more precise and personalized behavioral health care in the U.S."

Philip Wang, M.D., Dr.P.H.,

Director of the Center for Learning Health Systems at Brigham and Women's Hospital
Professor of the Practice of Psychiatry at Harvard Medical School
Former Deputy Director of NIMH
Former Research Director of American Psychiatric Association

What's Ahead: A Tectonic Shift in Behavioral Health

Discovery Behavioral Health stands at the forefront of a long-awaited transformation in mental health and addiction treatment—where measurement, science and humanity converge. By leveraging real-world data, cutting-edge machine learning, and world-class academic collaborations, we are building a future where precision care replaces guesswork, and treatment decisions are tailored to the individual, not the average. Our partnerships with institutions like Mass General Brigham, Videra and the National Institute on Drug Abuse mark a turning point—bringing the rigor of medical science to the behavioral health field. For the first time, providers will have access to real-time, personalized insights that can guide care in the moments that matter most.

This is more than progress—it's a moral imperative. Through standardization, earlier interventions and disparity reduction, Discovery's vision is not only to change outcomes for our patients, but to raise the standard of care for the entire industry. The future of mental health is here—and it's measurable, personalized and full of promise.

"Discovery is recreating healthcare synergistically. We utilize advances in technology. We are strengthening cultural acceptance of behavioral health. We provide caring, superior recovery promoting longitudinal care. Why? Our top priority is to recreate, perfect and protect the most potent healing agent of change in all of healthcare: human collaboration. Patients and clinicians, one person helping another person."

Matthew Ruble, MD

Chief Medical Officer
Discovery Behavioral Health

Join the Revolution

We are leading the charge to change our industry for the better and we invite you to join us. Together, we can build a system that embraces collaboration over competition and thrives in the face of rapid growth. We're not just predicting the future; we're creating it. Let's make it happen—together.

Scan the QR code below to join us on this transformative journey. You'll gain access to a landing page where you can.

- Share your thoughts
- Stay connected for future research updates
- Secure your spot at our next groundbreaking event with Harvard and Mass General Brigham
- Join a study

As our body of data grows, so does our determination to create a system where every patient can thrive—empowered by shared knowledge, experiences and best practices.

Be part of the conversation and the solution.
Join us today.

CENTER FOR DISCOVERY
TEMECULA, CA

Appendix

SASE is a self-report measure of SUD treatment effectiveness consisting of 3 scores:

Temptation:

Represents patients' temptation or desire to engage in behaviors that may hinder their recovery.

- Often used to measure the effectiveness of treatment in helping patients manage cravings or urges;
- Lower Temptation Scores indicate stronger resistance to relapse or high-risk behaviors.
- Changes in temptation score can signal treatment progress, as a reduction typically reflects improved coping skills.
- Measures how tempted patients feel to use substances in certain situations

DISCOVERY MOOD & ANXIETY PROGRAM
DADE CITY, FL

Confidence:

Measures self-confidence or assurance patients have in managing their recovery and resisting relapse.

- This score can indicate how well treatment fosters resilience and self-efficacy in patients.
- Higher confidence scores suggest patients feel more capable of maintaining sobriety and handling challenges.
- Increases in confidence are seen as a positive outcome, signaling growth in patients' self-management and belief in their recovery
- Measures how confident patients feel that they won't use a substance in certain situations

Composite:

Combines elements from temptation and confidence in an overall measure of treatment effectiveness.

- Calculated as Confidence – Temptation
- Higher composite scores indicate more favorable outcomes, and gives a comprehensive view of improvements in behavioral control and self-assurance.

Table 1. Characteristics of Patients Completing One or More D365 Sessions versus Patients Completing No D365 Sessions

Variable Description	Completed D365 at Least Once	Did Not Complete D365 ever	P-Value
Total Patients (N,%)	1,651 (20.7%)	6,309 (79.3%)	
Line of Service			
Eating Disorder (N,%)	337 (20.4%)	1,505 (23.9%)	0.003
Mental Health (N,%)	648 (39.2%)	2,325 (36.9%)	0.073
Substance Use Disorder (N,%)	666 (40.3%)	2,479 (39.3%)	0.439
Care Setting			
Residential (N,%)	1,021 (61.8%)	4,025 (63.8%)	0.142
Intensive Outpatient (N,%)	630 (38.2%)	2,284 (36.2%)	0.142
Discharge Type (N,%)			
Completed Treatment	1,109 (67.2%)	3,906 (61.9%)	0.000
Administrative Discharge	30 (1.8%)	142 (2.3%)	0.281
Against Treatment Advise	82 (5.0%)	441 (7.0%)	0.003
Higher Level of Care	57 (3.5%)	308 (4.9%)	0.013
Insurance Denial	54 (3.3%)	218 (3.5%)	0.713
COVID-19	5 (0.3%)	9 (0.1%)	0.167
Transfer	51 (3.1%)	282 (4.5%)	0.013
Age Group			
Adult (N,%)	1,054 (63.8%)	4,015 (63.6%)	0.880
Adolescent (N,%)	597 (36.2%)	2,294 (36.4%)	0.880
Gender			
Male (N,%)	649 (39.3%)	2,417 (38.3%)	0.458
Female (N,%)	928 (56.2%)	3,701 (58.7%)	0.072
Nonbinary (N,%)	27 (1.6%)	79 (1.3%)	0.227
Age (Mean, STD)	31 (16.2)	28 (14.63)	0.000
Length of Stay (Mean, STD)	50 (38.05)	48 (37.56)	0.450
Discharge Outcomes			
RAS (Mean,STD)	174 (22.8)	170 (23.72)	0.153
PHQ9 (Mean,STD)	5.66 (5.82)	6.41 (6.08)	0.012
Admission Outcomes			
RAS (Mean,STD)	151 (24.13)	150 (23.67)	0.398
PHQ9 (Mean,STD)	13.4 (7.3)	13.48 (7.33)	0.993
Change in Outcomes			
RAS (Mean,STD)	23 (24.31)	20 (24.77)	0.277
PHQ9 (Mean,STD)	-7.74 (7.46)	-7.07 (7.55)	0.457

Table 2. Association between Patient Characteristics and Extensive and Intensive Use of D365

Variable Description	Extensive Margin (Logistic)	Intensive Margin (GLM)	Overall Marginal Effect
Line of Service			
Substance Use Disorder [Reference]	–	–	–
Eating Disorder (N,%)	-0.123 (-0.318, 0.073)	-0.013 (-0.204, 0.178)	-0.056 (-0.181, 0.069)
Mental Health (N,%)	0.061 (-0.123, 0.245)	-0.015 (-0.188, 0.157)	0.017 (-0.098, 0.132)
Care Setting			
Intensive Outpatient [Reference]	–	–	–
Residential (N,%)	-0.173* (-0.328, -0.017)	0.063 (-0.078, 0.204)	-0.037 (-0.132, 0.058)
Discharge Type (N,%)			
Completed Treatment [Reference]	–	–	–
Administrative Discharge	-0.237 (-0.648, 0.175)	-0.093 (-0.560, 0.375)	-0.142 (-0.433, 0.148)
Against Treatment Advise	-0.380** (-0.635, -0.126)	-0.432*** (-0.588, -0.275)	-0.374*** (-0.509, -0.239)
Higher Level of Care	-0.300 (-0.609, 0.009)	-0.249* (-0.467, -0.030)	-0.248** (-0.417, -0.079)
Insurance Denial	-0.023 (-0.340, 0.295)	-0.268* (-0.489, -0.047)	-0.146 (-0.318, 0.025)
COVID-19	0.555 (-0.544, 1.654)	0.329 (-0.459, 1.116)	0.391 (-0.207, 0.989)
Transfer	-0.347* (-0.664, -0.030)	-0.122 (-0.397, 0.153)	-0.202* (-0.392, -0.011)
Age Group			
Adolescent [Reference]	–	–	–
Adult (N,%)	-0.040 (-0.189, 0.109)	0.265*** (0.125, 0.404)	0.120* (0.025, 0.214)
Gender			
Male [Reference]	–	–	–
Female (N,%)	-0.065 (-0.189, 0.059)	-0.043 (-0.144, 0.057)	-0.048 (-0.120, 0.023)
Nonbinary (N,%)	0.284 (-0.174, 0.741)	0.128 (-0.200, 0.455)	0.179 (-0.069, 0.428)
Length of Stay (Mean, STD)	0.001 (-0.001, 0.002)	0.001 (-0.001, 0.003)	0.001 (0.000, 0.002)
Year of Admission	-0.150** (-0.252, -0.047)	-0.078 (-0.172, 0.016)	-0.100** (-0.164, -0.036)
Discharge Outcomes			
RAS (Mean,STD)	0.005** (0.002, 0.009)	0.000 (-0.003, 0.003)	0.002* (0.000, 0.004)
PHQ9 (Mean,STD)	-0.012 (-0.025, 0.001)	0.006 (-0.005, 0.017)	-0.002 (-0.009, 0.006)
Admission Outcomes			
RAS (Mean,STD)	-0.001 (-0.004, 0.001)	0.006 (-0.005, 0.017)	-0.002 (-0.009, 0.006)
PHQ9 (Mean,STD)	0.004 (-0.005, 0.013)	-0.010* (-0.018, -0.002)	-0.003 (-0.009, 0.002)
Constant	300.994** (93.456, 508.531)	158.946 (-31.365, 349.256)	–

Publications: Psychiatric Services
https://psychiatryonline.org/doi/10.1176/appi.ps.20240187

Changes in Recovery Assessment Scale Scores During a Treatment Episode Among Patients in a Large Behavioral Health Care System

Psychiatric Research Communications:
https://www.sciencedirect.com/science/article/pii/S277259872400031X?via%3Dihub

Association between depression severity, mental health recovery and dropout from behavioral health care treatment

"I've found that shred of hope again that life can be beautiful. And I'm so eternally grateful for the friendships that I've made. And I look forward to the day when I can look my kids in the face and say, 'Mommy did it. Mommy stayed sober this time.'"

Former Discovery Patient

"Our top priority is to recreate, perfect and protect the most potent healing agent of change in all of healthcare: human collaboration. Patients and clinicians, one person helping another person."

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