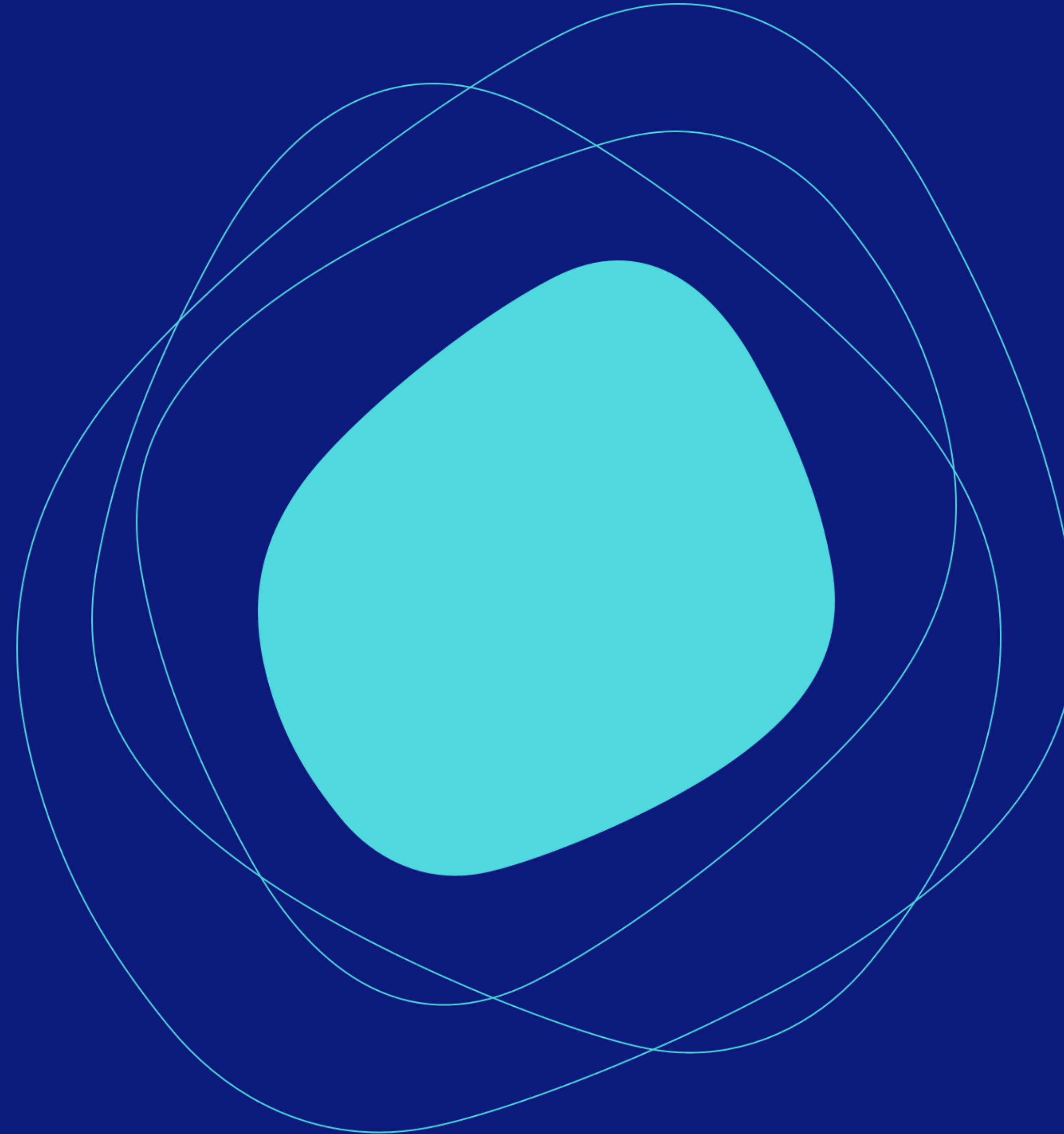


mitram

Measurement Informed Treatment Assistant for Mental Health



MITRAM: an Otsuka Concept

"We are faced with a fast-changing global healthcare market, where technology, reimbursement models and consumer expectations are changing how healthcare is delivered and managed....We believe we have many opportunities to transform business by integrating digital technology."

—William H. Carson, MD

CEO Otsuka Pharmaceutical and Development Corporation



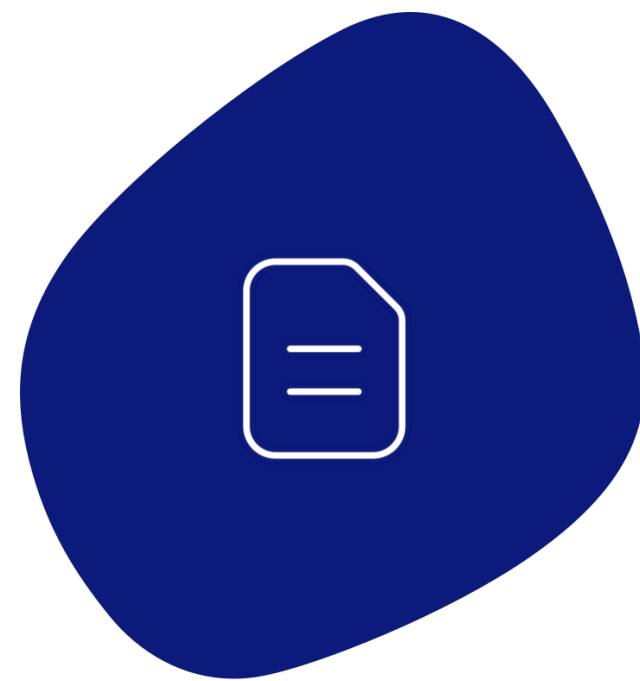
<https://www.otsuka-us.com/discover/only-otsuka-blog/transforming-the-pharmaceutical-industry-why-are-we-still-conducting-business-like-its-1988>

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Part 1: Disease State

The Healthcare Landscape, Digital
Technologies, and Measurement

Digital Technology Is Poised to Become the Fourth Wave of Evolution in Mental Health Care



1890s

Psychoanalysis¹



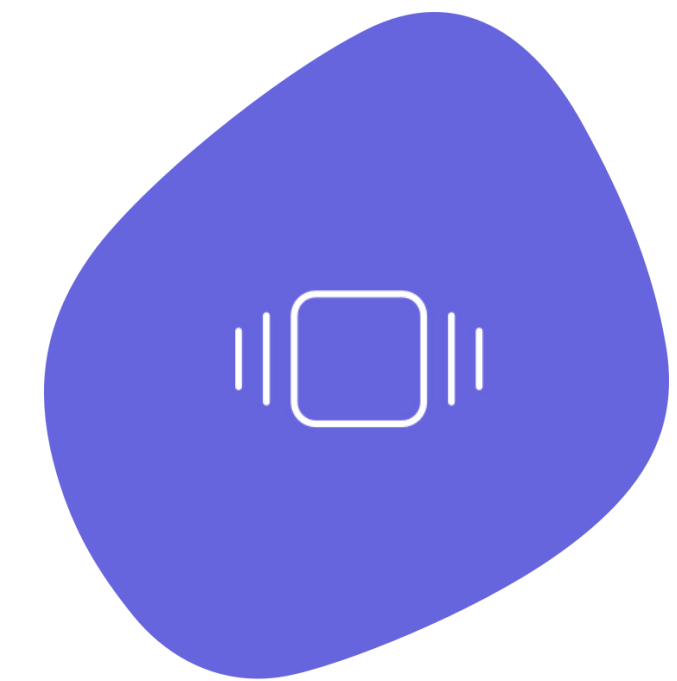
1952

Psychopharmacology²



1980s-1990s

Evidence-based practice
in mental health care^{3,4}



2015

Digital psychiatry^{5,6}

Suboptimal treatment response remains an ongoing concern⁷

1.Gleitman H, et al. Psychology. 8th ed. W. W. Norton & Company. 2011:591-633.

2.Ahuja N. A Short Textbook of Psychiatry. 7th ed. Jaypee Brothers Medical Publishers (P) Ltd. 2011:172-198.

3.Spring B. J Clin Psychol. 2007;63:611-631.

4.APA Presidential Task Force on Evidence-Based Practice. Am Psychol. 2006;61:271-285.

5.Kumar S, et al. Am J Prev Med. 2013;45:228-236.

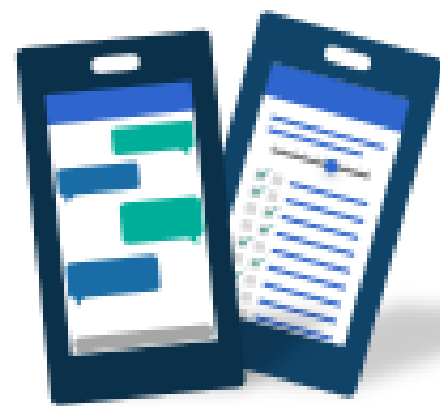
6.Mohr DC, et al. Gen Hosp Psychiatry. 2013;35:332-338.

7.Lehman AF, et al. Am J Psychiatry. 2004;161:1-184.

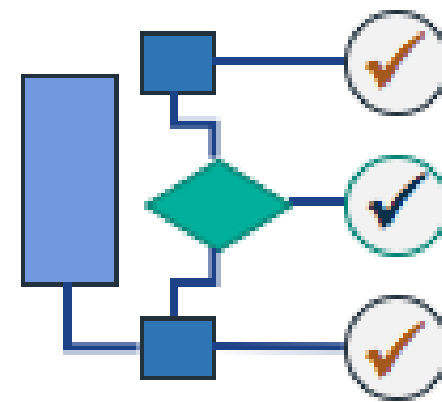
Digital Technology May Provide New Tools for the Assessment and Management of Mental Health



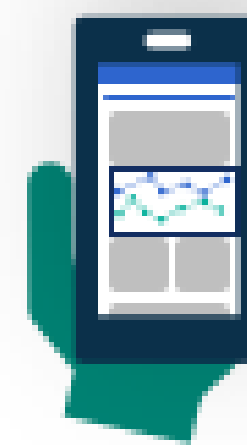
mHealth sensors¹



Digital interventions and assessments²



Clinical decision support systems³



Mobile apps for mental health⁴



Medication adherence technology^{5,6}



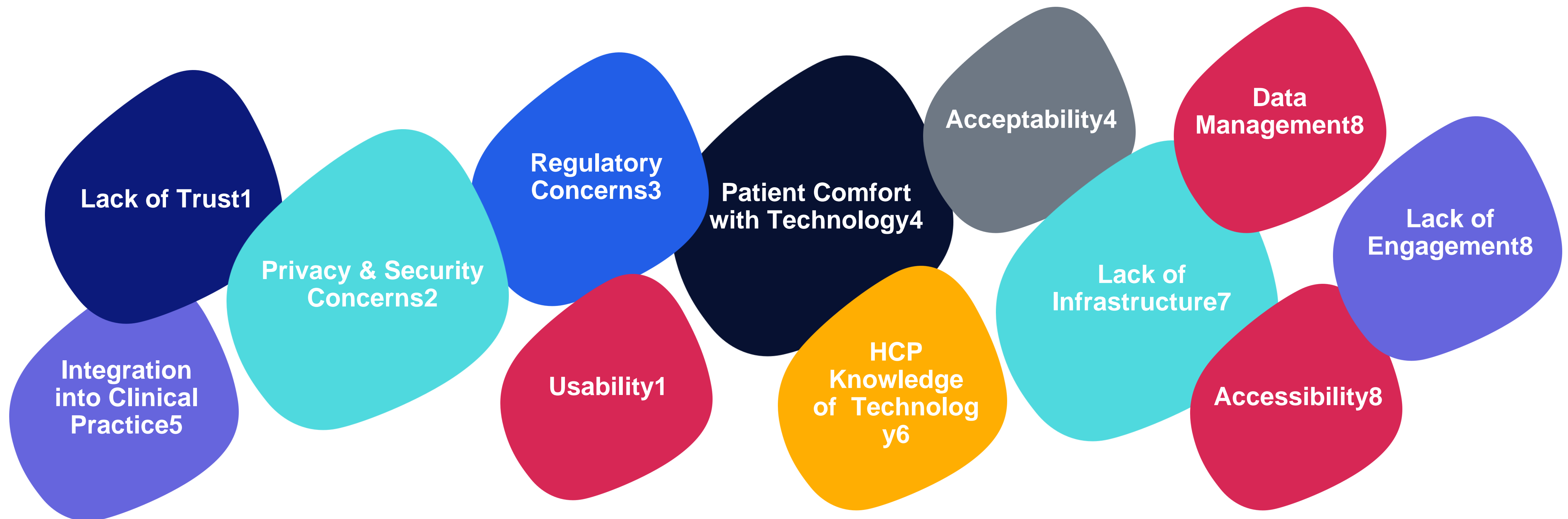
Telepsychology and telepsychiatry^{7,8}

- Ben Zeev D et al. Psychiatr Rehabil J. 2015;38(3):218-226.
- Firth J et al. J Psychiatr Research. 2016;80:3-4.
- Davis S et al. J Am Med Informatics Assn. 2017;24(4):857-866.
- Donker T et al. J Med Internet Res. 2013;15(11):e247.
- Mistry N et al. J Am Med Inform Assoc. 2015;22(e1):e177-93.

- Granholm E et al. Schizophrenia Bull. 2012;38(3):414-25.
- Joint Task Force for the Development of Telepsychology Guidelines for Psychologists. American Psychologist. 2013;68(9):791-800.
- American Psychiatric Association and American Telemedicine Associations. Best Practices in Videoconferencing-Based Telemental Health. 2018.

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Selected Barriers to the Adoption of Digital Technology in Mental Health Care



- Torous J, et al. Digit Biomark. 2017;1:87–91.
- Kumar S, et al. Am J Prev Med. 2013;45:228-236.
- NIMH. Technology and the Future of Mental Health Treatment. Available at: <https://www.nimh.nih.gov/health/topics/technology-and-the-future-of-mental-health-treatment/index.shtml>. Accessed September 14, 2018.

- Palmier-Claus JE, et al. BMC Psychiatry. 2013;13:34.
- Gittlen S. NEJM Catalyst: Survey Snapshot: What Patient Engagement Technology is Good For. July 10, 2017. Available at: <https://catalyst.nejm.org/patient-engagement-technology-good-for/>. Accessed September 2018.
- Mardon R, et al. Agency for Healthcare Research and Quality. 2014. Publication No. 14-0047-EF.

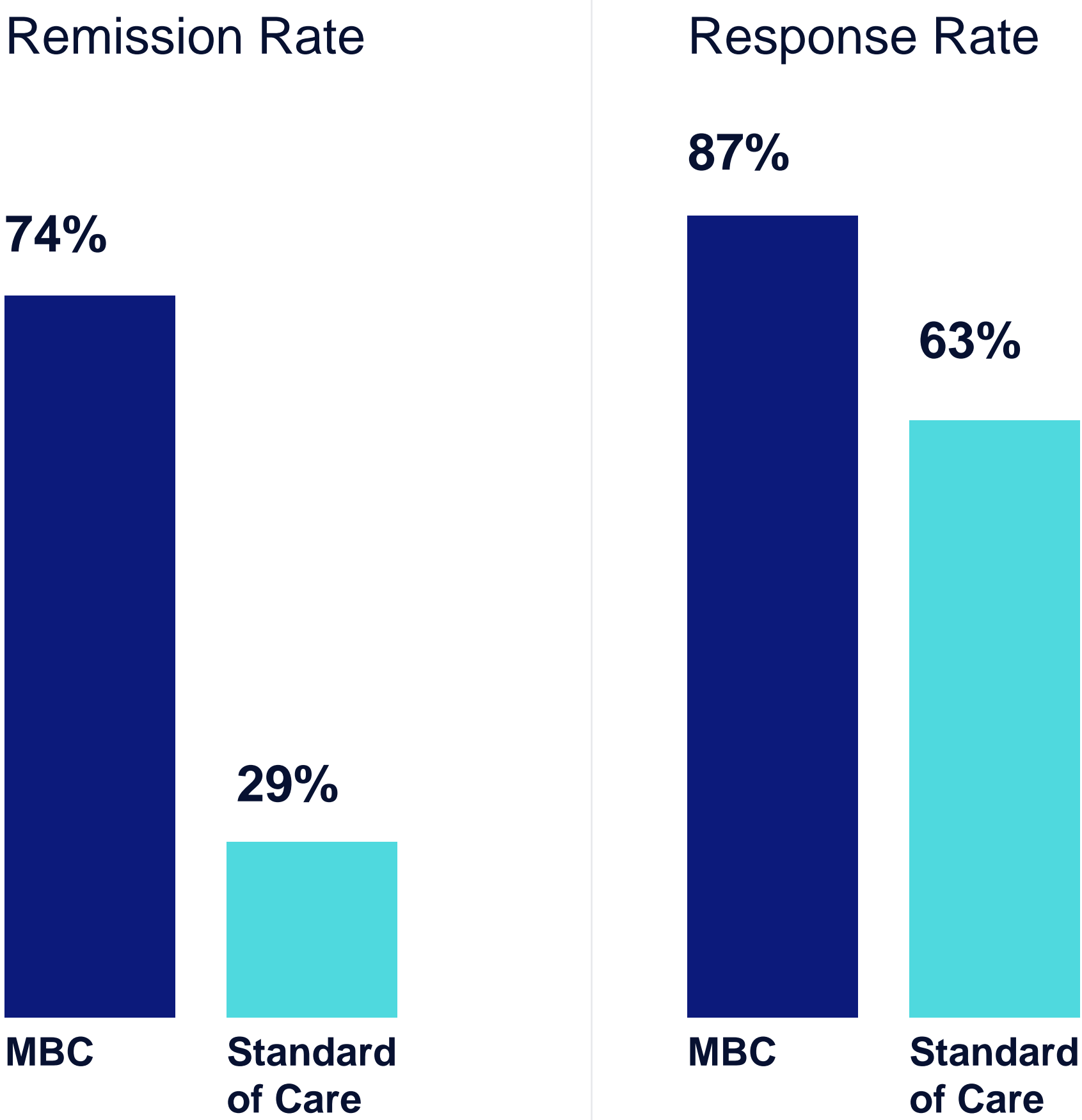
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"If you can't measure it, you
can't improve it."

Peter Drucker

Late Business Educator and Thought Leader

Measurement Based Care (MBC)



Integration into the treatment planning process, the systematic collection of objective, quantifiable data from scientifically validated scales

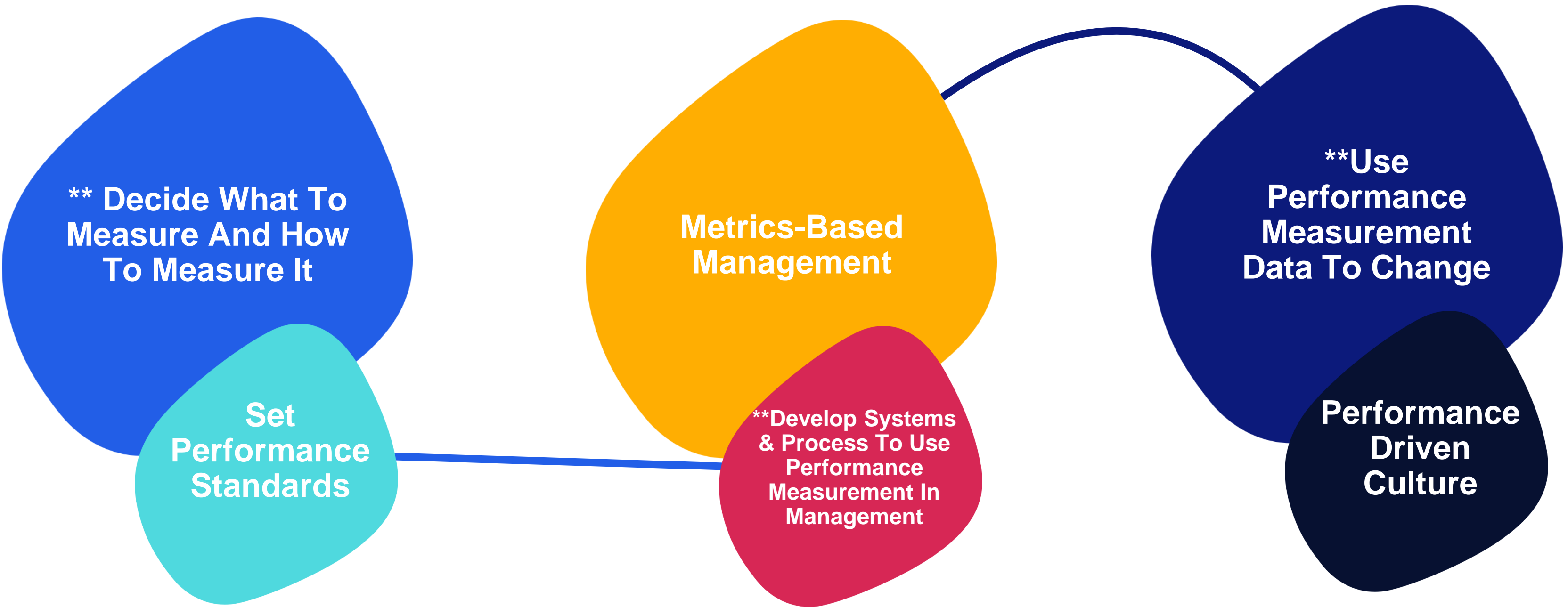
Few clinicians use MBC2 because of the lack of easy-to-use platforms3

This is an enormous problem but a unique opportunity for innovative organizations to use technology to improve patient outcomes

1. Guo T et al. Am J Psychiatry. 2015;172(10):1004-1013
2. Zimmerman M, McGlinchey JB. J Clin Psychiatry. 2008;69:1916-1919.
3. Trivedi, MH & Daly. Drug and Alcohol Dependence: 2007 ; 99 (Supplement 2): S61-S71.

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Road to Value-based care



• Oss, M.E. (2016). Are you really ready for value-based payment? [Presentation]. Presentation given at the 2016 OPEN MINDS Performance Management Institute. Clearwater, FL.

Lag In Developing & Implementing Quality Measures In Behavioral Health

Worldwide, compared with physical health, mental health has been slow to develop, adopt, and implement standardised performance measures.

Why?

01

Lack Of Evidence To Support
Definition Of Specific, Clearly
Defined Measures

02

Lack Of Infrastructure To
Gather & Record Necessary
Data

03

Lack Of Strategy For
Widespread Implementation
Across Settings

Recommendations For Providers: Moving To A High-Value Health Care Delivery System

**Organize into
integrated
practice units**

**Measure
Outcomes and
Costs for every
patient**

**Move to
bundles
payments for
care cycles**

**Integrate care
delivery across
separate
facilities**

**Expand
excellent
services across
geography**

Build an enabling information technology platform¹

¹ <https://hbr.org/2013/10/the-strategy-that-will-fix-health-care>

Opportunities for Organizations

- **Provider organizations adopting new technology through pilot studies can speed innovation and “best practice” models**
- **Opportunity to achieve First Mover advantage**
 - o As the mental health system moves to value-based reimbursement, the organizations defining “value” will shape the treatment system.
- **Digestible and actionable data designed to enable stakeholder decision making is in demand**

Oss, M. (2018) What Will Mental Health Treatment Look Like In The Years Ahead? Retrieved from <http://www.openminds.com>

Part 2: Introduction to MITRAM



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Goal at Open Minds: Identify 3 Collaborators

- **We have created a technology platform but have not exposed it to clinical practice settings.**

- Let's explore if MITRAM can ease the burden of capturing the tech-enabled, data-driven content which informs clinical and administrative decision making.

- **We want to capture feedback from administrators, prescribers and patients**

- What works? What does not? How can we improve? What can we learn from technology integration?

- **Reciprocity of Partnership:**

- You can assist us to enhance our technology while we attempt to improve efficiencies and enhance the care of the individuals you serve.

Value Proposition for Potential Collaborators

MITRAM is a digital platform which assists organizations to monitor psychiatric disorders in the individuals they serve through

–Completion of scientifically validated scales remotely by patients on their phones and tablets

–Customizable prescriber and administrator dashboards to convey patient progress and treatment guidelines

–Integration with electronic medical records to ensure continuity of care and claims data to ensure payer reimbursement

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- Problem: challenge to reliably and easily capture metric based outcomes
- Problem: challenge to provide communication vehicles for patients and providers
- Problem: inability to make informed decisions and utilize evidence
- Problem: challenge to maximize re-imbursement through HEDIS and payer levers

Platform customization for collaborators

- **We may customize platform to meet specific needs of collaborators**
 - We have created rules and modules which can capture details of interest to the agency
- **The platform has been designed to be highly adaptable and compatible with scheduling systems, electronic medical records (EMRs), and claims data systems**
 - Integration of systems prevents duplication of services
 - Ability to aggregate and illustrate objective data trends over time
 - Correlation of interventions, scale scores, and HEDIS outcomes

Collaboration checklist

- Champions of innovation and enthusiasm for technological solutions
- Tolerance for ambiguity and willingness to collaborate
- Must have EMR in place or have one coming soon
- Have appropriate patient population

BONUS:

- Experience in securing governmental grants to study efficiencies or outcomes
- Academic affiliations among clinicians and staff

Privacy Concerns

*Any data encountered in the HIPAA compliant MITRAM platform will be completely anonymized and certified as such.

*Privacy is our highest priority.

Organizational connectedness to clinicians and patients

- How do you connect with your patients?
- Do your patients care about the organization?
- Do patients, providers and the organization share similar goals?
- What kind of progress your patients and clinicians are making?

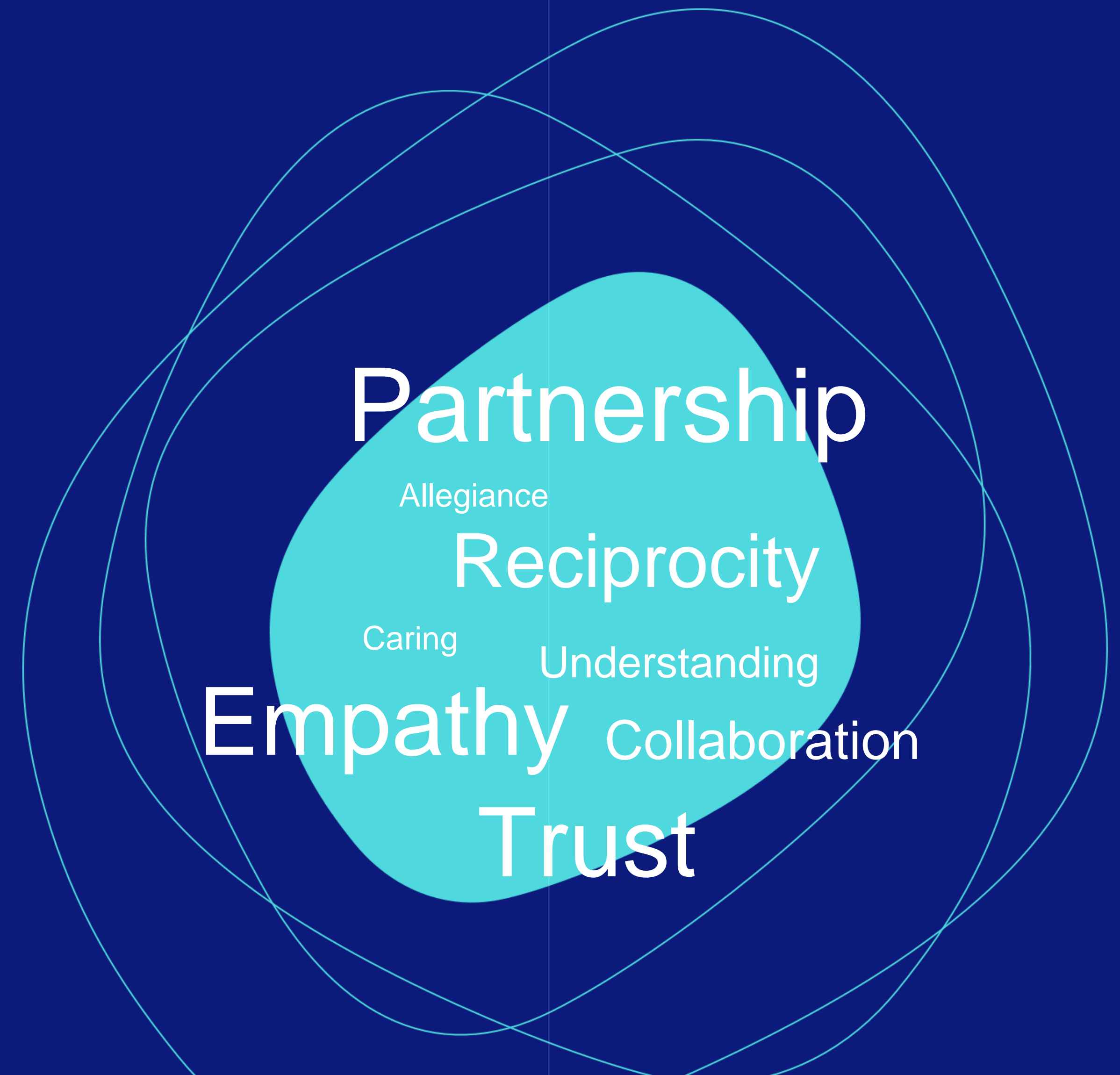
MITRAM story

MITRAM means “friend” in Sanskrit

It can be a vehicle through which patients, providers and organizations connect to achieve common goals.

Optimal data has

- Stakeholder investment in the technology
- End users willingness to submit the right inputs
- Engaged participants who interact regularly with app
- Patient engagement to expedite the flow of information



Part 3: Otsuka Capabilities

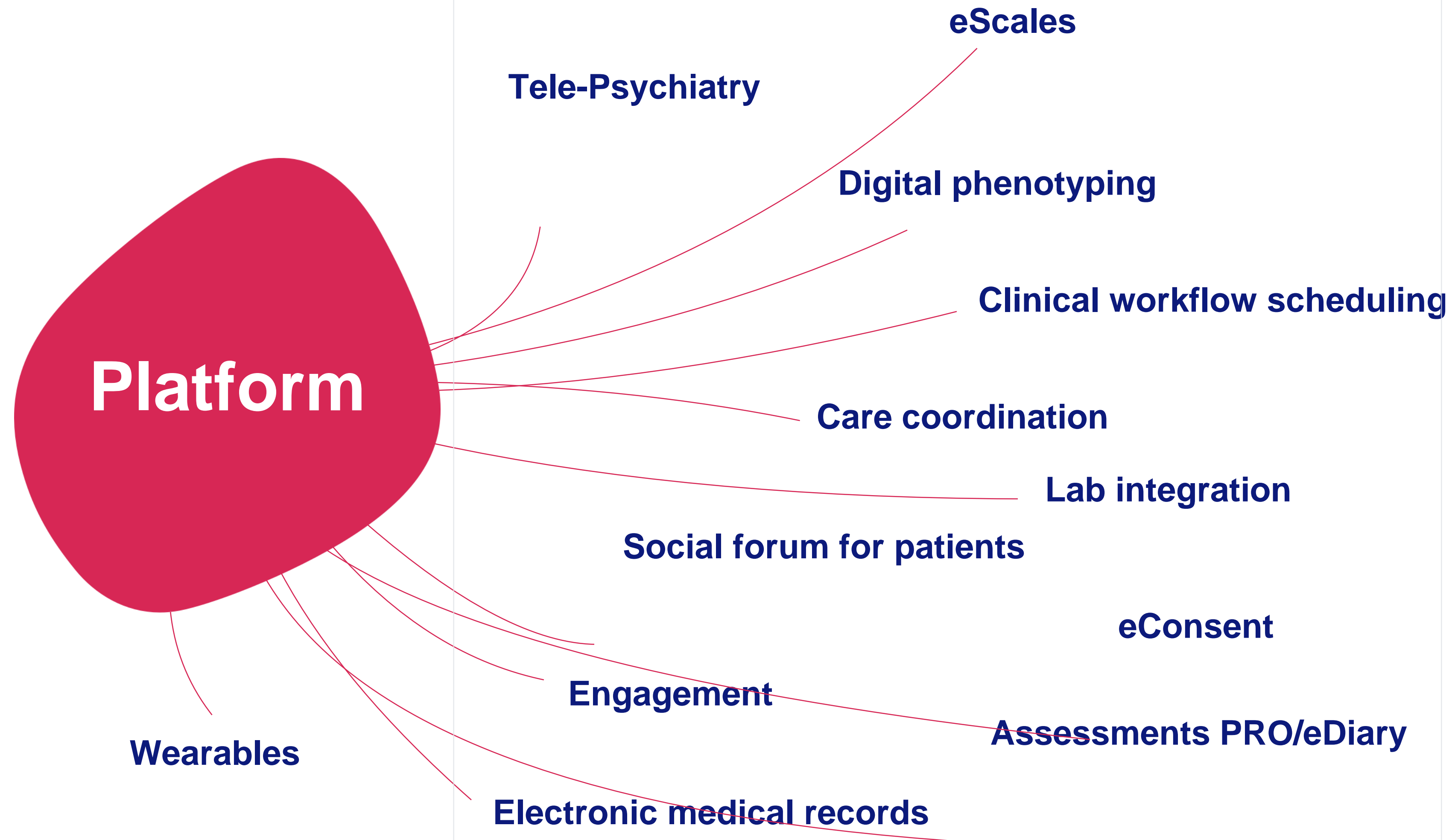
Clinical Trials Technology

Building Technology Platforms

- **The Otsuka data collection process for clinical trials is evolving from site centric to patient centric.**
 - Data inputs from digital wearables, e-scales, speech and video, and physiological biomarkers
 - Patient engagement to prevent and identify small problems before they become large, e.g. side-effects
- **Clinical trial innovation through protocol driven technology automation and customization**
- **Building efficiencies in clinical and administrative workflows through remote monitoring and early intervention**
- **Why does this matter? We know how to build technology platforms for mental health.**

Data analytics

Architecture for Otsuka technology



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Predicting outcomes : Example 1

- **Access to large EHR data sets including the VA to predict outcomes, risk factors, and health care utilization**

–In a study of 150,000 schizophrenic and mood disorders patients, using logistic regression, we predicted the risk factors for re-hospitalization

- ETOH withdrawal, cocaine abuse, and lack of housing

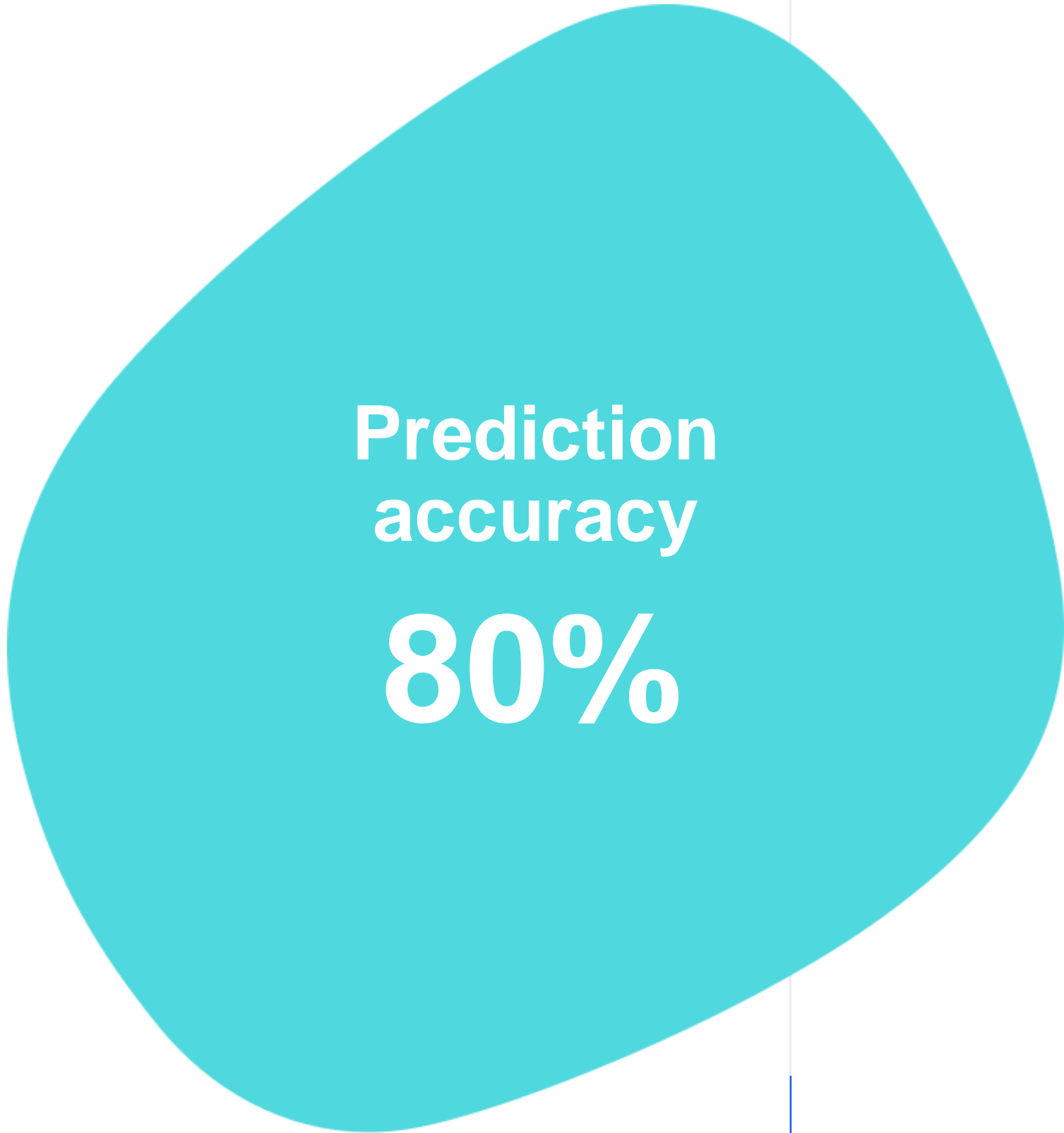
–In the same study, the clinical notes revealed that the risk factors were

- SUD treatment programs, lack of housing, and suicidality

- **When deep learning was applied on entire patient journey combined with clinical notes, the prediction accuracy of hospitalization increased dramatically.**

Impact of research

- Why does this matter?
- **We predicted the likelihood of hospitalization and the cause of hospitalization**



Prediction
accuracy
80%

Predicting outcomes : Example 2

- **We analyzed VA EHR records of 20,000 bipolar patients to identify risk factors for hospitalizations, length of stay, mortality**

- The data set timeframe was the year prior to the diagnosis of bipolar disorder

- We divided the patients into 8 distinct clusters based on similarities of EHR data, including

- Lab work, vital signs, medical notes, and CPT codes

- **The documentation by clinicians of anxiety, depression, and SUD symptoms prior to diagnosis was highly predictive of the outcomes of interest**

Yijun Shao, et.al., Phenotype Fingerprinting of Bipolar Disorder Prodrome, CNS Summit 2018

Impact of research

- Why does this matter?
- **We identified the patient types who were most likely to die or be hospitalized.**

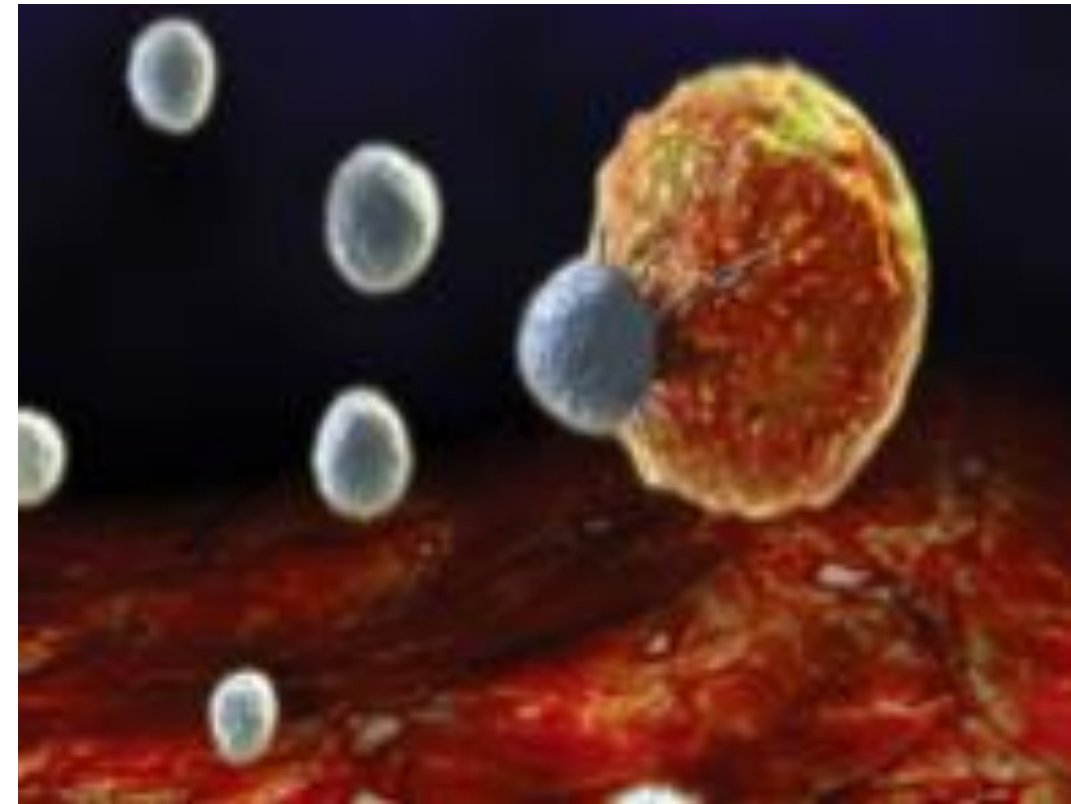
	Cluster 1 N=4077	Cluster 2 N=1386	Cluster 3 N=1906	Cluster 4 N=2105	Cluster 5 N=3874	Cluster 6 N=1617	Cluster 7 N=3634	Cluster 8 N=1401	p-value
Death%	1.3%	2.1%	0.8%	1.4%	1.0%	4.6%	1.4%	2.6%	<0.0001
Hospitalization %	27.9%	36.1%	27.3%	27.6%	13.5%	35.1%	35.1%	51.1%	<0.0001
#Hospitalizations, Mean (SD)	0.5 (1.1)	0.8 (1.4)	0.5 (1.1)	0.6 (1.3)	0.2 (0.7)	0.7 (1.4)	0.7 (1.4)	1.4 (2.2)	<0.0001
Length of Stay, Mean (SD)	11.1 (35.1)	14.5 (39.3)	9.3 (30.4)	10.2 (34.0)	4.0 (21.3)	9.4 (32.2)	9.4 (32.2)	22.8 (52.9)	<0.0001

Precision medicine

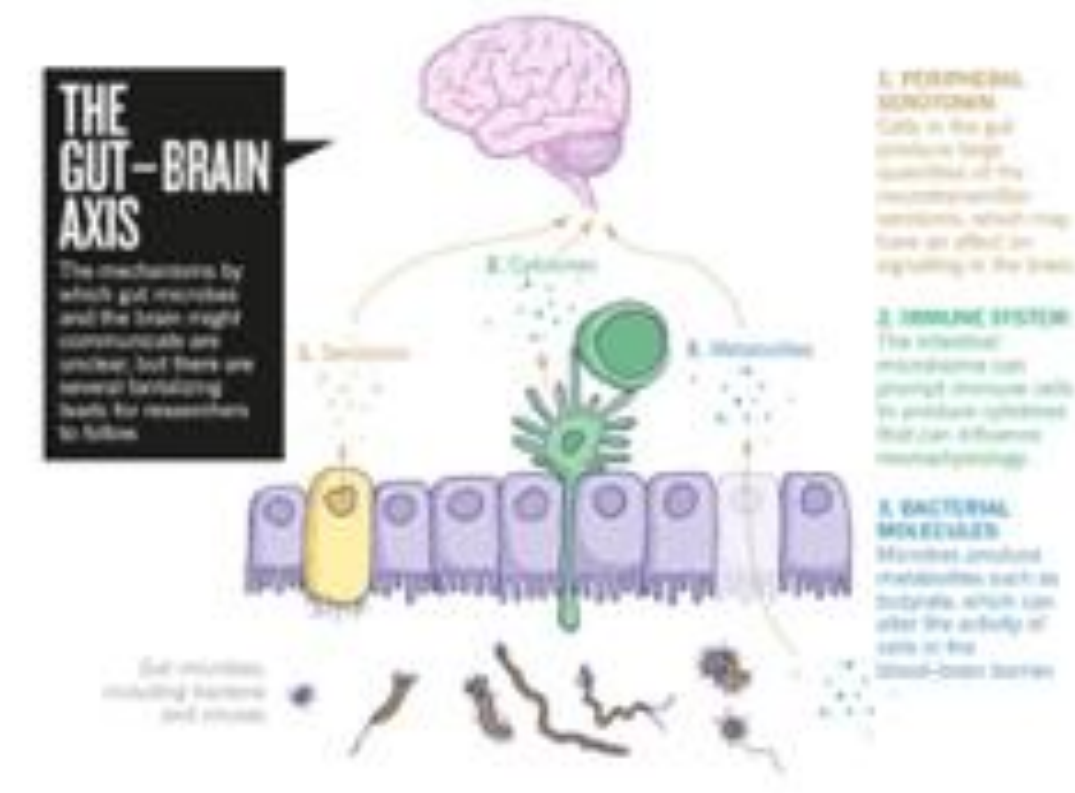
Road to precision medicine



Genomics



Biomarker panels



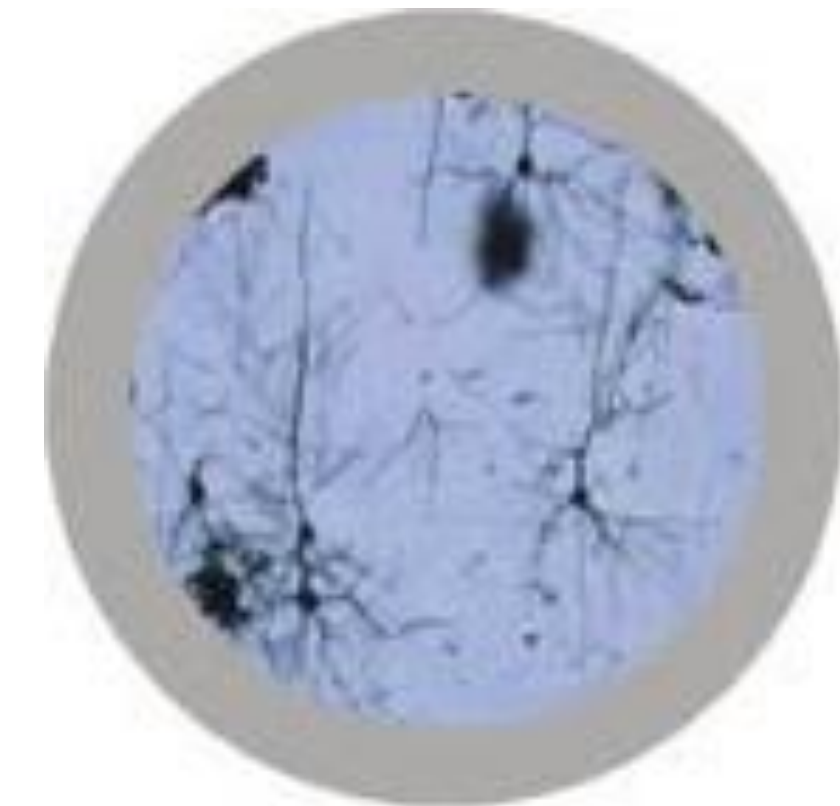
Microbiome



Digital phenotypes



**Socio-economic and
Environmental factors**



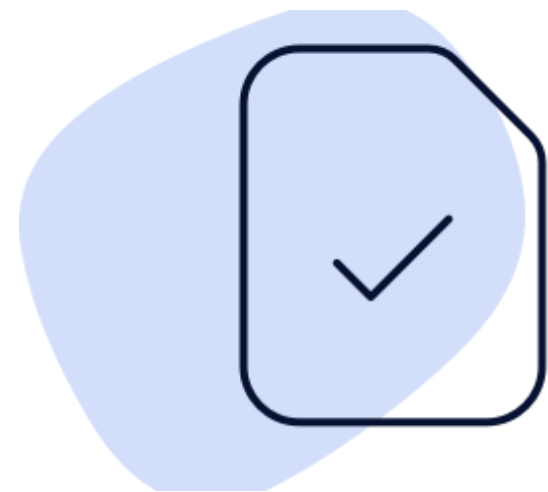
**Patient specific
neurons in a dish**

Through our collaborations, we seek to understand how we can



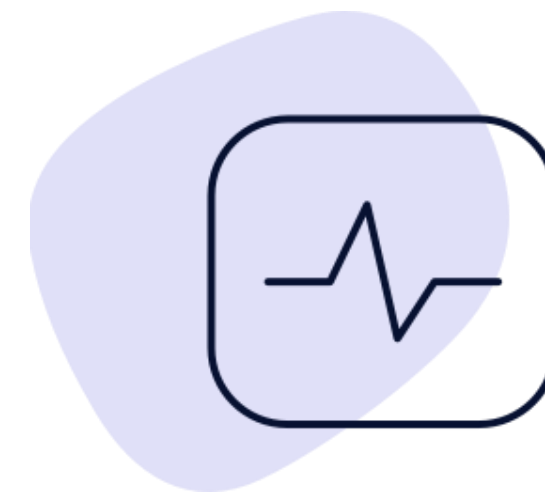
Measure Progress

Smart phone-based app on which individuals with psychiatric disorders complete scientifically validated scales



Provide Value

Enhanced collaboration and high quality data inputs increase likelihood of improved efficiencies and outcomes



Improve Communication

Scale results are connected to digital dashboards which allow clinicians and administrators to monitor treatment progress over time



Innovate Psychiatry

An integrated, customized digital platform ensures that the needs of the clinicians and organization are met.

Collaboration

Let's create the future of psychiatric treatment, together

Through collaboration, we will attempt to improve clinical outcomes and optimize healthcare utilization.

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For Further Inquiry

Booth# 504

mitram@otsuka-us.com

www.mitram.com