Modeling to Learn

Test. Don't guess.

LZPhD

Northwestern Prevention Science Methodology Group

10/12/2021

Lindsey Zimmerman, PhD

Office of Mental Health and Suicide Prevention

National Center for PTSD, Dissemination & Training Division

Created by

VA Team PSD

I will tell three implementation stories:

Story 1: VA Wait Times

Story 2: Platypus

Story 3: Physics

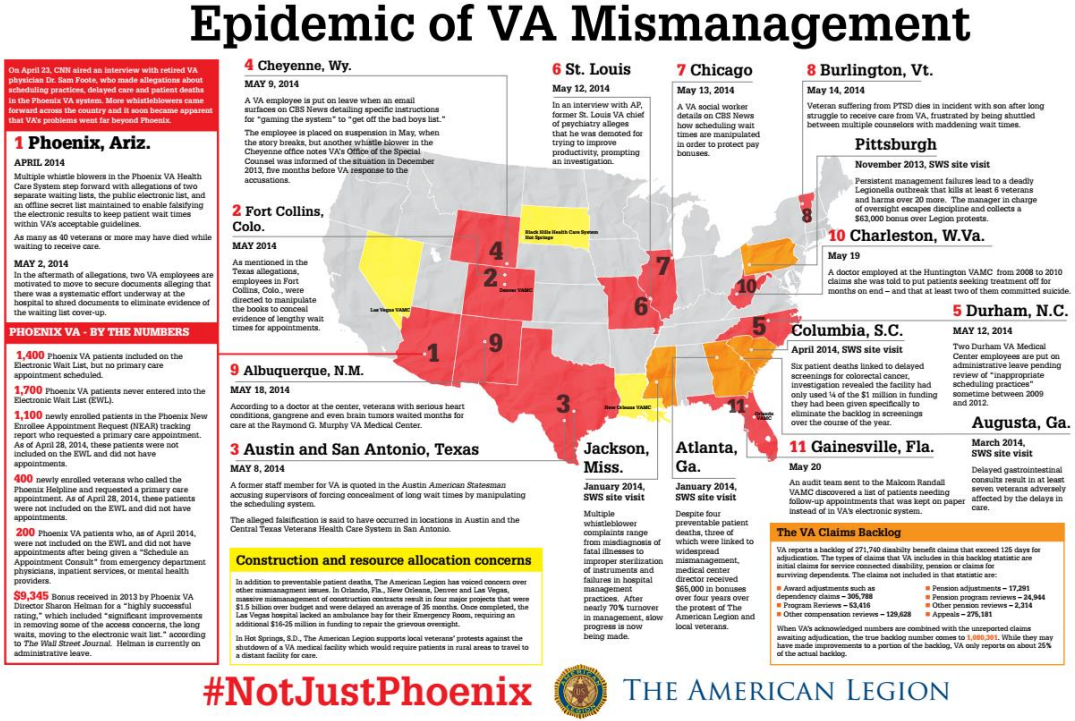
Story 1:
The VA Wait Time story cautions us that we can do more harm than good.

Our implementation climate is intense public scrutiny with the biggest headline about time.

Despite the press, many Veterans describe profound benefits from their VA care.

https://mtl.how/sketches_of_recovery

What would motivate keeping separate books?



http://www.legion.org/documents/legion/pdf/va_epidemic.pdf

“…do no harm.”

“The physician must be able to tell the antecedents, know the present, and foretell the future – must mediate these things, and have two special objects in view with regard to disease, namely, to do good or to do no harm.”

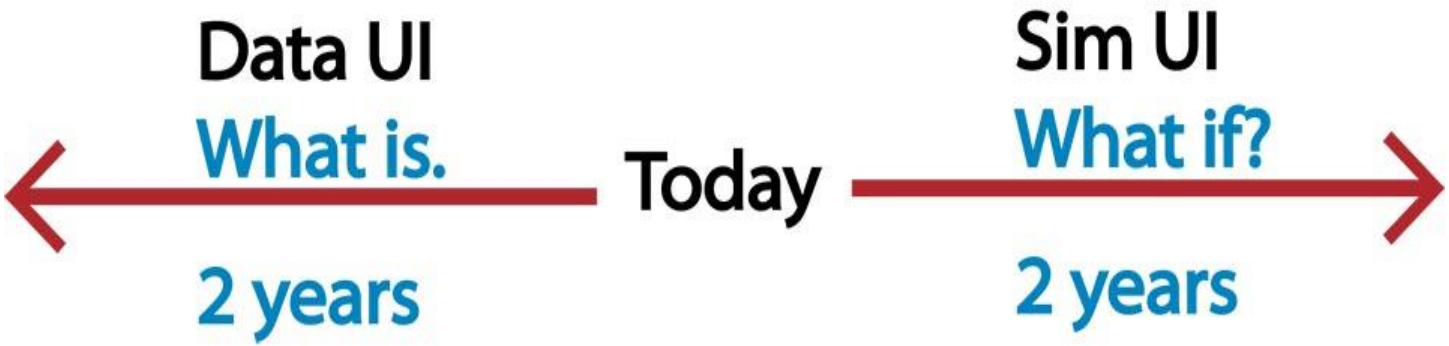
- Hippocrates, *Of the Epidemics*

Modeling to Learn

Test. Don't guess.

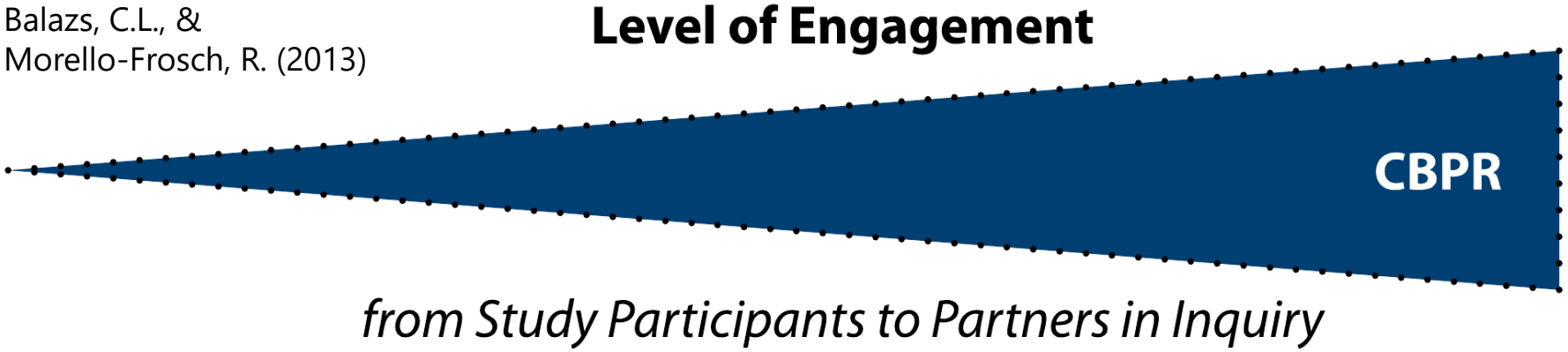
Modeling to Learn provides participatory infrastructure for frontline healthcare teams to interact with data and system dynamics simulation modeling to improve local care decision-making.

Modeling to Learn helps teams look backward and forward to improve care.



We strive for more just, inclusive, equitable processes to co-produce more valid, useful knowledge.

Balazs, C.L., &
Morello-Frosch, R. (2013)



Investigator Driven
Research Participants
Risk: Extractive
unequal benefit

Community Driven
Research Partners
Benefit: Rigor, Relevance
& Reach

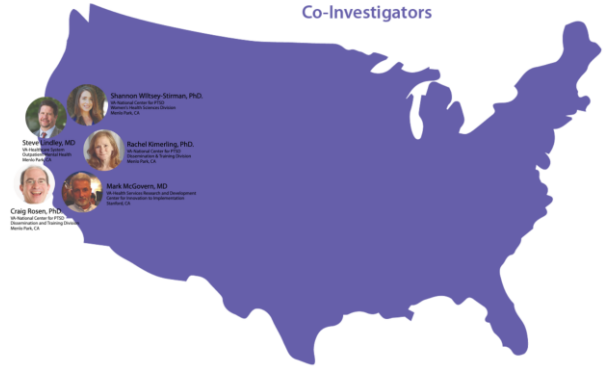
We are a nationally distributed, multidisciplinary team of scientists and partners. (PI: Zimmerman)

Team
Participatory System Dynamics

6 Research Employees &
5 Mentees at
National Center for PTSD
~500 sq ft; 12 workstations

Nationally Distributed Workgroups
- Facilitators
- Qualitative Methods
- Quantitative Methods
- Simulation User Interface
- System Dynamics Models

Key VA Partners
- Office of Mental Health and Suicide Prevention (OMHSP)
- Veterans Affairs Partnership for Operations & Research (VAPOR)
- Employee Education Services (EES)
- Office of Information Technology (OIT)
- National Pain Management, Opioid Safety and Specialty Care
- Office of Health Equity



Find out more about who we are and what we do at mtl.how/team.

We needed feasible local strategies at national scale.

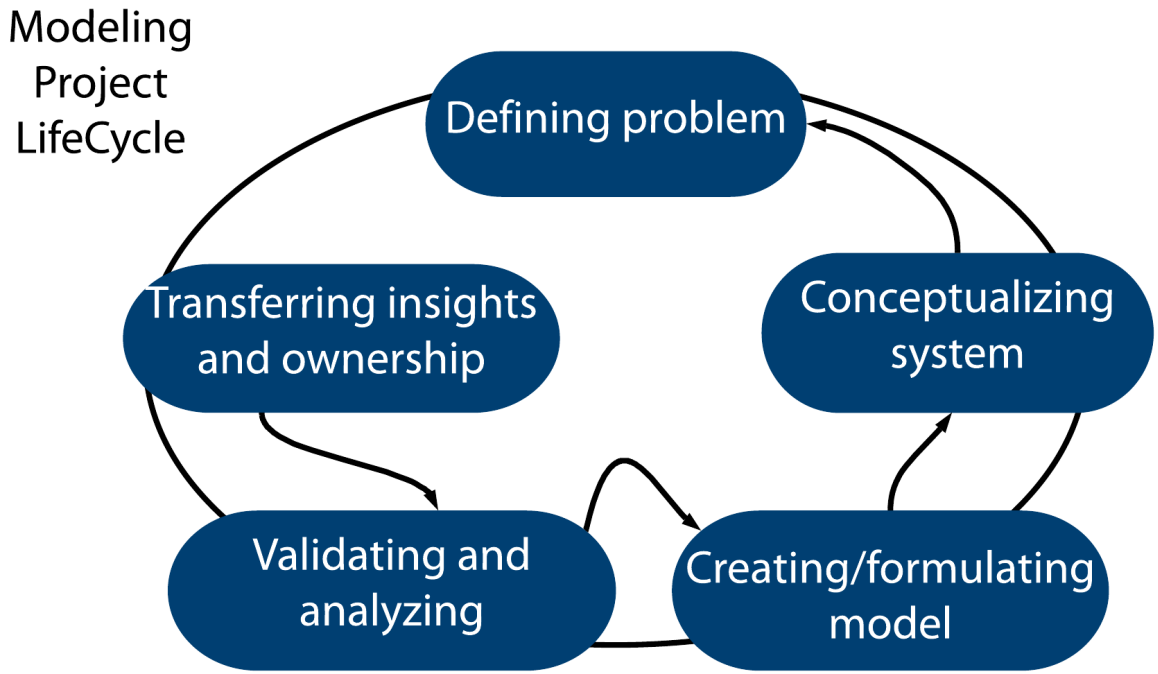
Target State: Lean SMART Goal

By April 2015, 40% of patients newly seen in outpatient mental health at Menlo Park for depression, PTSD, or anxiety disorders will have two psychotherapy visits completed within 28 days from time of intake assessment.

Specific.
Measurable.
***Actionable*:** if never achieved morale may suffer.
***Realistic*:** with the available resources.
***Time frame*:** A due date.

Story 2:
The platypus encourages a more inclusive, equitable scientific processes to transcend our current understandings.

Our paradigm is not a single model or project.



Sterman, J.D. (2000). *Business Dynamics.*

This initial project is too static to be useful.

Adm Policy Ment Health
DOI 10.1007/s10488-016-0754-1

CrossMark

ORIGINAL PAPER

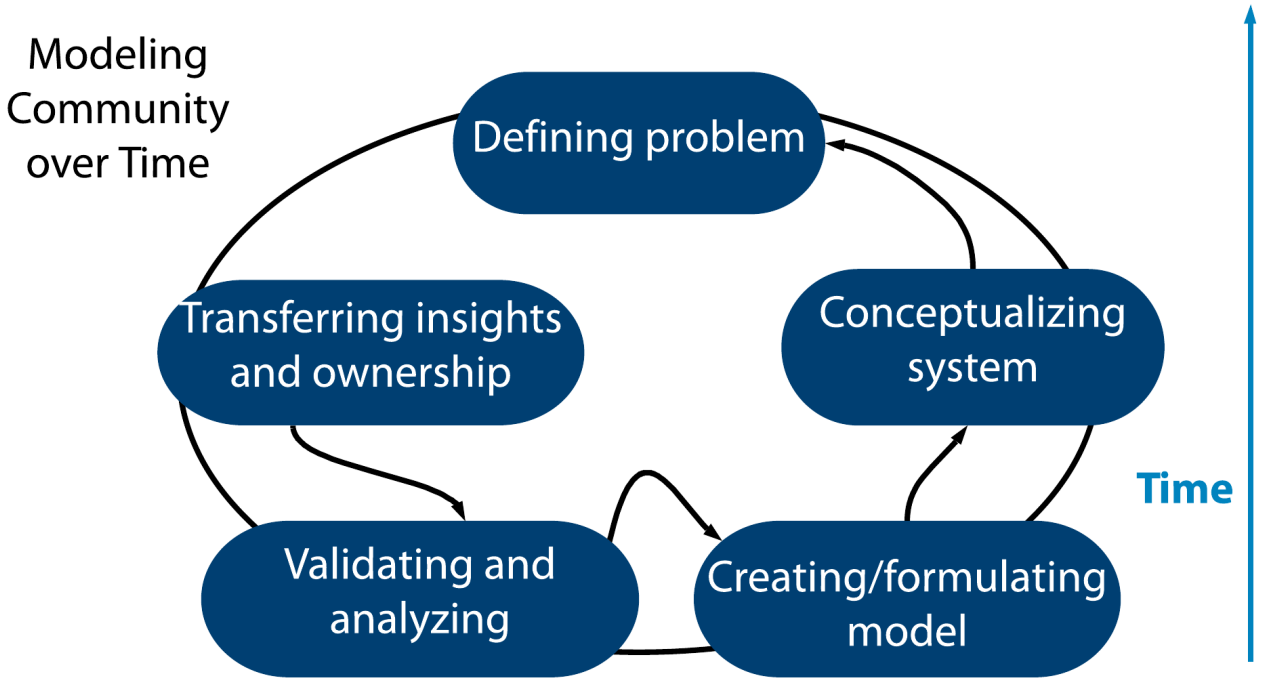
Participatory System Dynamics Modeling: Increasing Stakeholder Engagement and Precision to Improve Implementation Planning in Systems

Lindsey Zimmerman[1,2] · David W. Lounsbury[3] · Craig S. Rosen[1,4] · Rachel Kimerling[1] · Jodie A. Trafton[4,5] · Steven E. Lindley[4,6]

Administration and Policy in Mental Health AND Mental Health Services Research
Volume 43 • Number 5 • September 2016

Staff Priority Experiments
• Patients' needs/preferences
• Reduce extra stops for Veterans
• Initiating a specific treatment
• Allocations of time (not enough time)
• Actual time (what we really do)
• Misunderstanding provider functions
• Morale & burnout
• Staff turnover

We are modeling to learn over time.

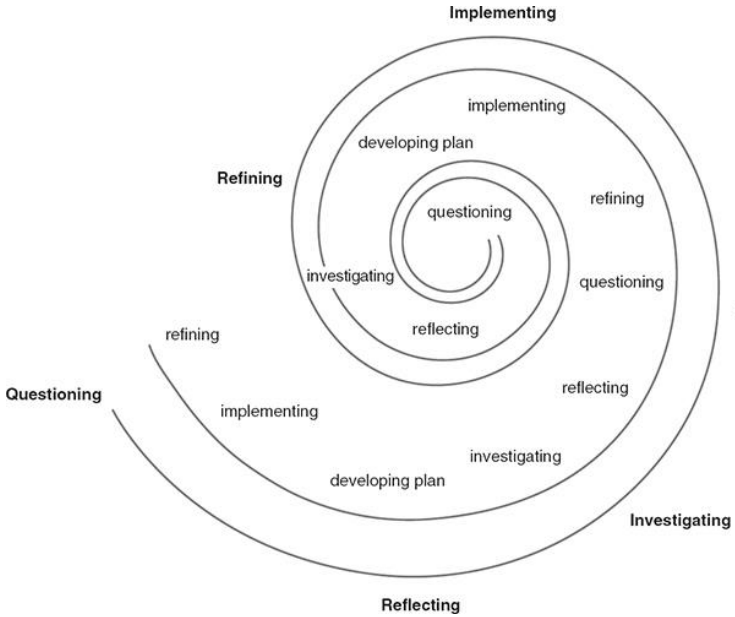


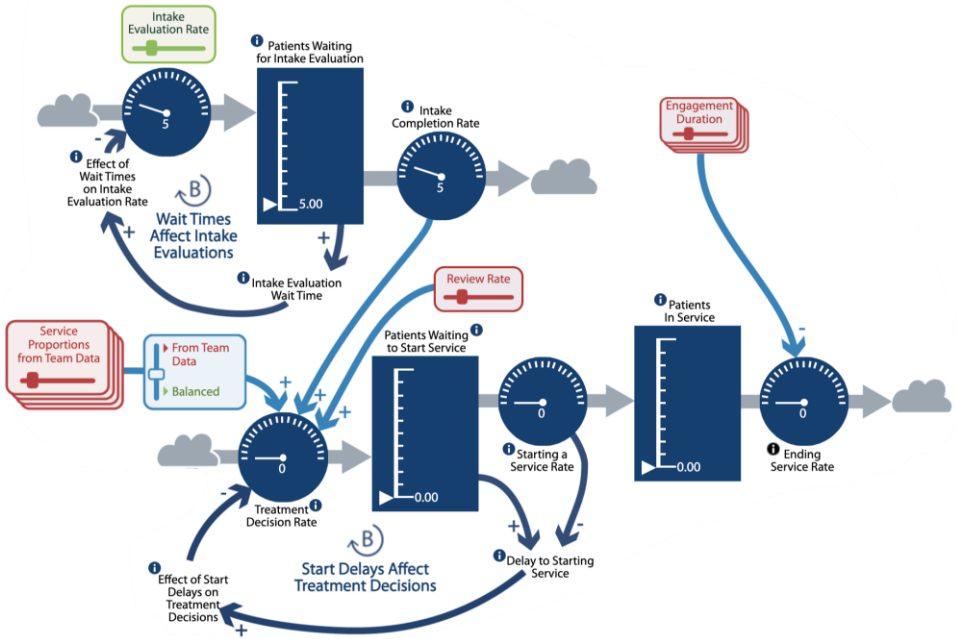
Hovmand, P. (2014). *Community Based System Dynamics.*

Close your eyes and picture a platypus.

Not ‘beaver’ or ’duck’ but platypus.

Now picture a participatory system dynamics

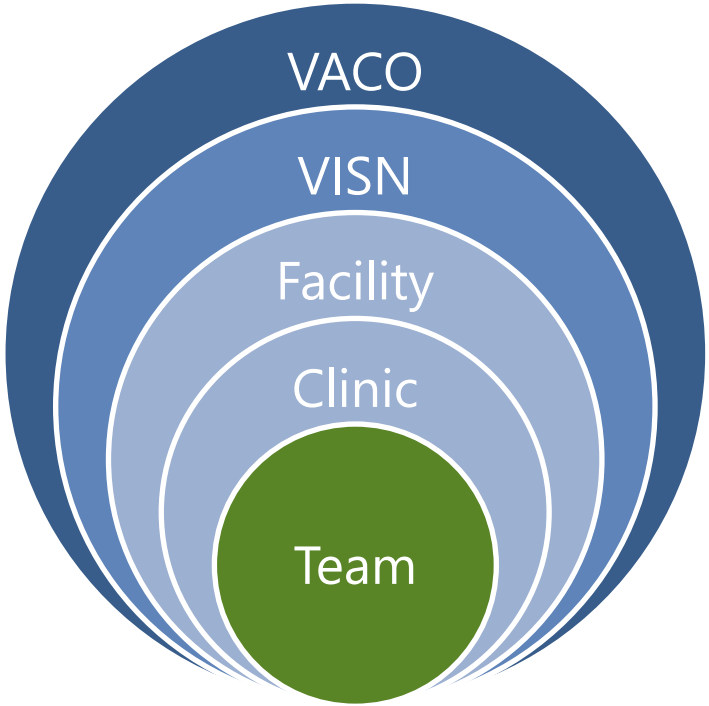


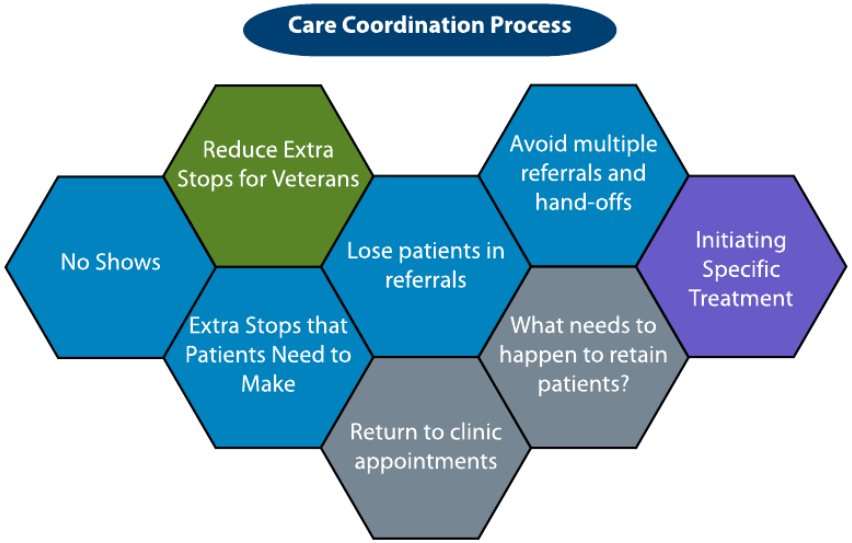


Is your mental model keying in on 'participatory' or with 'system dynamics?'

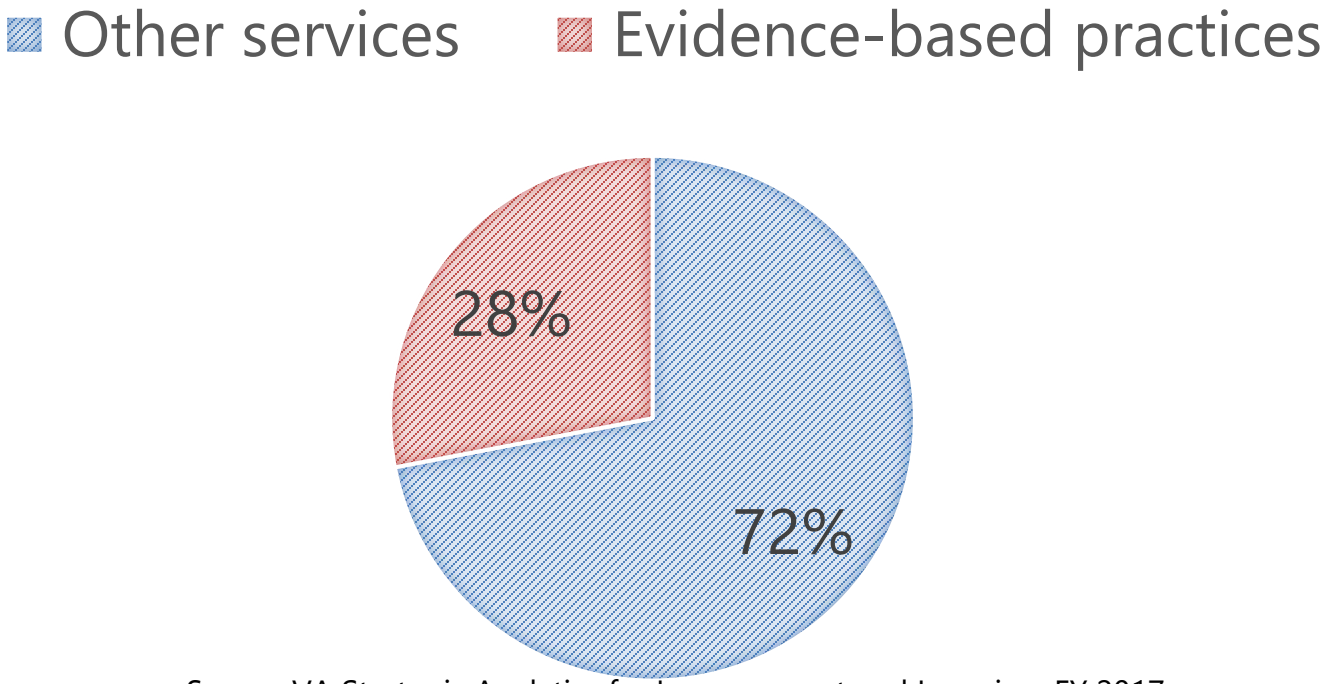
McIntyre, A. (2008). *Participatory Action Research*

We are embedded in the VA community and have established infrastructure for participatory learning from modeling.





We focus on teams to address policy resistance: How can we reach more patients with our highest quality care?



Source: VA Strategic Analytics for Improvement and Learning, FY 2017

Veterans Health Administration

Model of a US National Health Care System

American J. Public Health 97, 2007

1. VA innovates with national dissemination efforts to train providers in evidence-based mental health practices.
2. Enterprise-wide quality measures.
3. Clinical practice guidelines and mandates for evidence-based care.
4. National electronic health information system.
5. Mental health care coordinated in multidisciplinary teams.

We focus on improving implementation of evidence-based psychotherapy for depression and PTSD.

Depression	Posttraumatic Stress Disorder
Cognitive Behavioral Therapy (CBT)	Prolonged Exposure (PE)
Acceptance and Commitment Therapy (ACT)	Cognitive Processing Therapy (CPT)
Interpersonal Processing Therapy (IPT)	

And, evidence-based pharmacotherapy for alcohol use disorder (AUD), depression, and OUD.

Alcohol Use Disorder	Depression	Opioid Use Disorder
Acamprosate	Anti-depressant medications	Buprenorphine
Disulfiram		Methadone
Naltrexone		Naltrexone
Topiramate		

VAPOR
Veterans Affairs Partnership

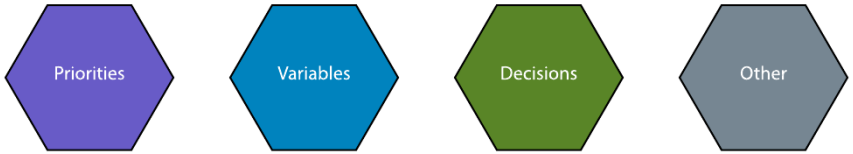
Our first step was to co-establish an ongoing Veteran advisory board comprised of certified peer support specialists.

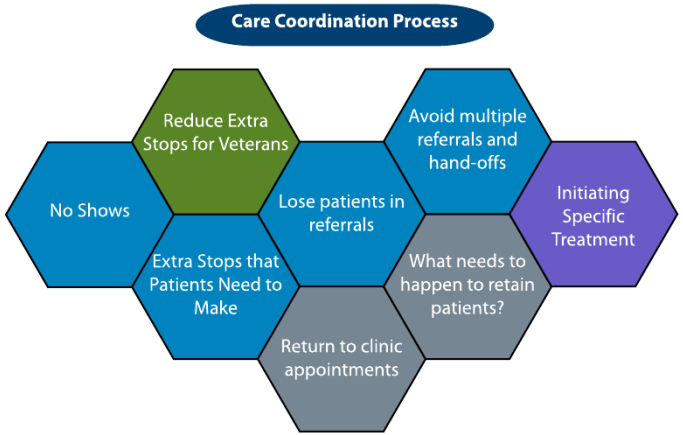
"So, when I meet veterans in crisis, veterans in need, I'm always offering some information to them and I love to provide resources, I love because again that disconnect is something I experienced. After 26 years, things didn't fit right, so I find myself instead of isolating, I would look for other alternatives that would fill those voids until I got what I needed."

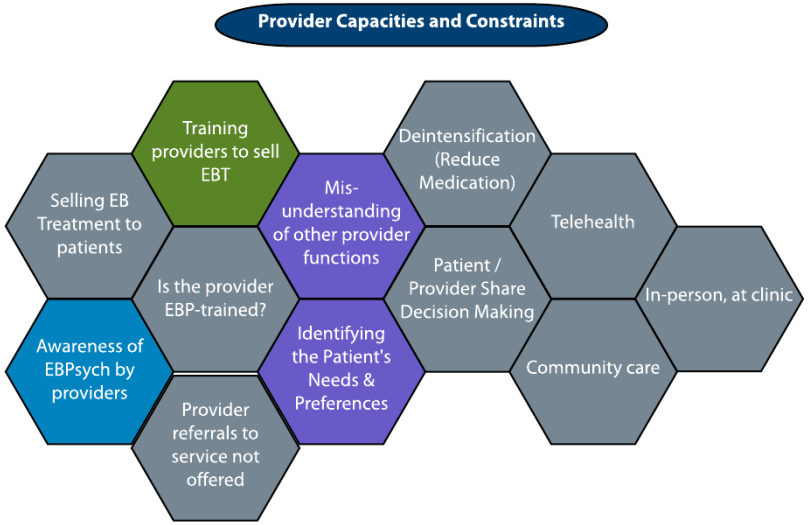
https://mtl.how/videos

National Center for PTSD
VA Employee Education Services
Office of Mental Health & Suicide Prevention
OUR STAKEHOLDERS
VA policy-makers, patients, and providers from psychiatry, psychology, social work, nursing & certified peer support specialists
Veteran Patients (VAPOR)
Office of Healthcare Transformation
Directors of Outpatient Mental Health & VISN MH Leads
Core Modeling Group of Frontline Staff
Frontline Teams

We used the hexagons exercise to explore stakeholder convergence & divergence.







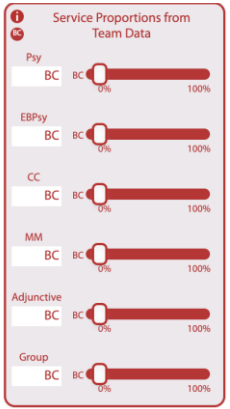
Participatory infrastructure supports the decision-makers least supported before this work.

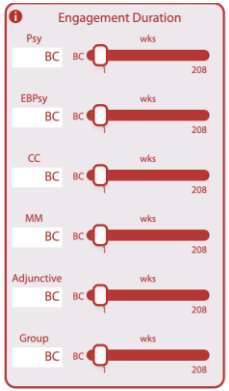
Team

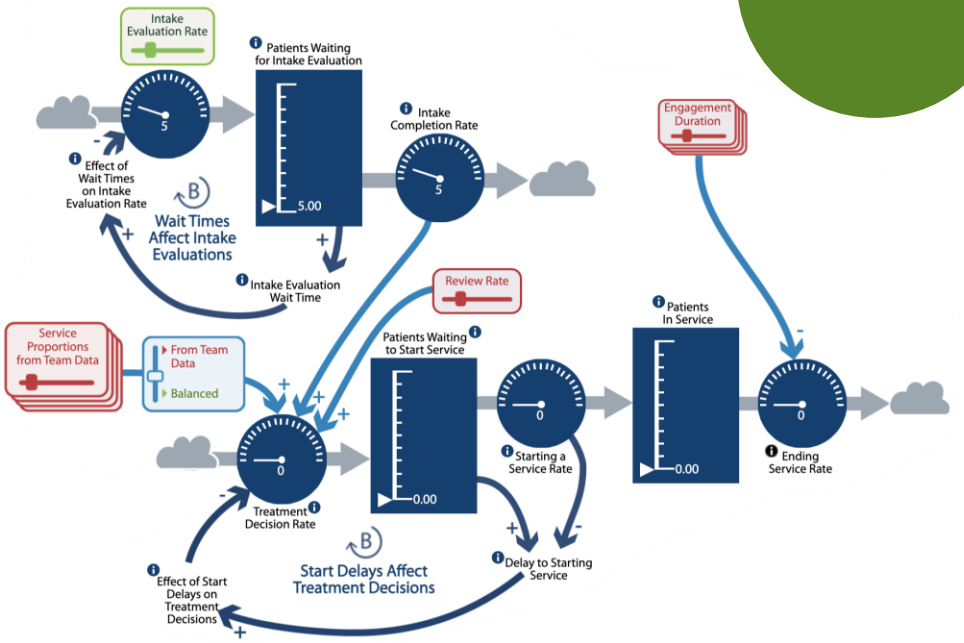
Team Data

New Patient Start Rate (mean)	24.27 (pt/wk)
Appointment Supply (median) (Psy)	41 (hrs/wk)
Appointment Supply (median) (EBPsy)	16 (hrs/wk)
Appointment Supply (median) (CC)	2 (hrs/wk)
Appointment Supply (median) (MM)	12 (hrs/wk)
Appointment Supply (median) (Adjunctive)	13 (hrs/wk)
Appointment Supply (median) (Group)	1 (hrs/wk)
Appointment Supply (median) (Intake)	5 (hrs/wk)
Appointment Supply (Total)	90 (hrs/wk)

	True Missed Appointment %	Return Visit Interval (median) (wks)	Engagement Duration (median)(wks)	Service Proportions from Team Data %
Psy	16	16	107	43
EBPsy	18	1	15	13
CC	17	11	44	13
MM	16	20	119	35
Adjunctive	16	14	38	40
Group	18	2	14	8







Local clinic strategies are needed to address local differences.

Clinic 1	Clinic 2
3548 unique patients/year	**2043 unique patients/year**
Lower caseload per provider	Higher caseload per provider
Rare wait for initial appointment	Occasional waitlist to get into clinic
5.2 psychiatrists per 9 EBPsy providers	**3.0 psychiatrists per 4 EBPsy providers**
Higher EBPsy providers/MD ratio	Lower EBPsy provider/MD ratio
Higher EBPsy base rate	Higher EBPharm base rate
Providers often self refer for EBPs	**Referrals to other providers by necessity**
Multiple on-site specialty programs	**Only telehealth specialty care**
Training program site multiple disciplines	**No trainees providing care**
Most groups "open" (ongoing enrollment)	**Most groups "closed" (infrequent opening)**
Shorter time to next available appointment	Longer time to next available appointment

“What data sources are standard across settings?”

Team Data

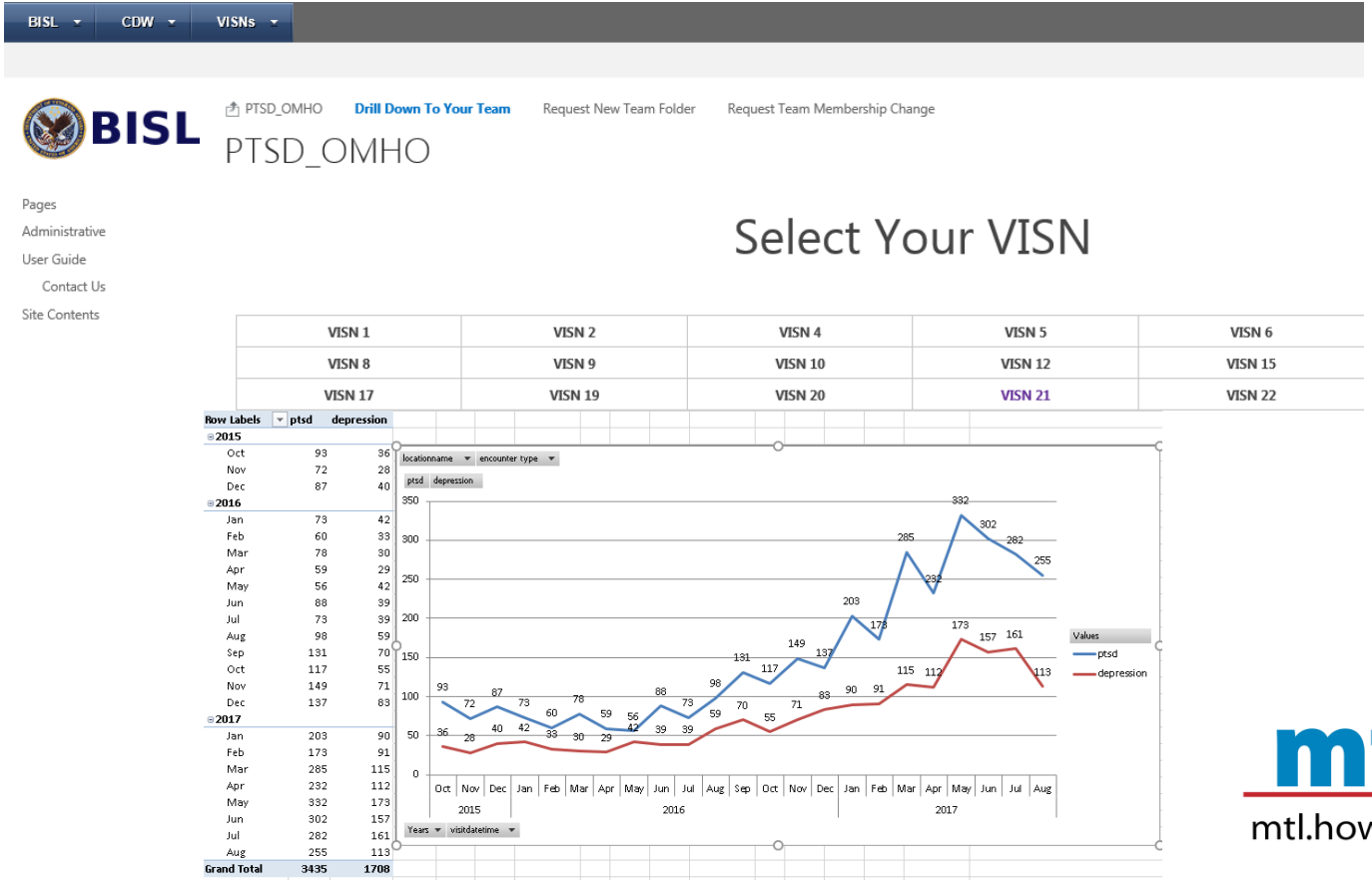
Appointment Supply (75th percentile) (appt/wk)	49		
New Patient Start Rate (pts/wk)	2.96		
AUD within 3 Months %	0	PTSD within 3 Months %	93
DEP within 3 Months %	3	OUD within 3 Months %	0

First 3 Months

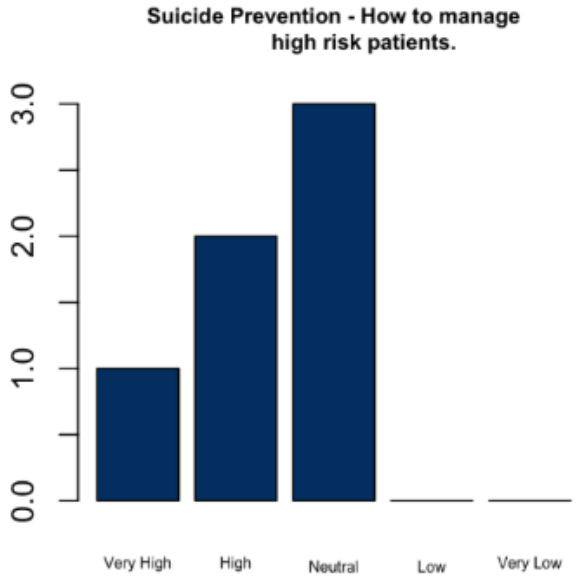
Patient Flow		Engagement Duration (wks)	Return-To-Clinic Visit Interval (wks)
Starters who Initiate %	79	Always 1 week	N/A
Starters who Return Later %	11	See table below	See table below
Starters who Quit %	10	Always 1 week	N/A
Initiators who Complete %	40	9	1
Initiators who Return Later %	44	See table below	See table below
Initiators who Quit Early %	16	2	2
Completers who Graduate %	4	2	1
Completers who Return %	96	See table below	See table below

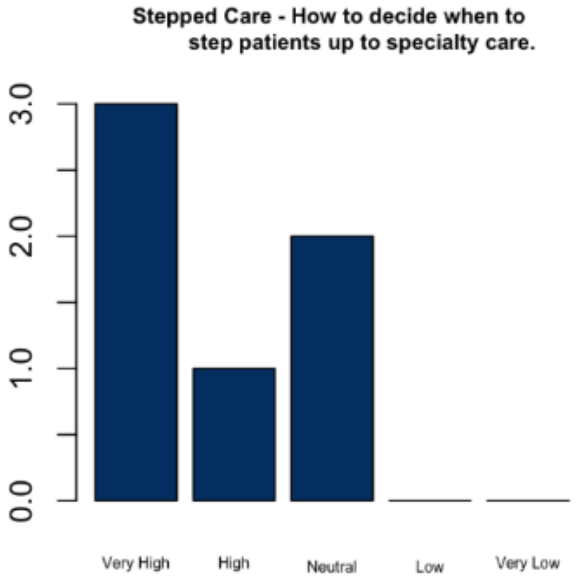
Red =
- Read in from existing team data
- Standardized

We developed a secure website for reviewing team trends over time.

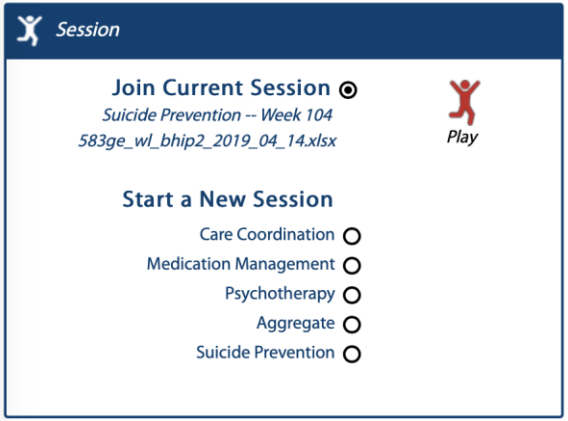


mtl.how/data


Suicide Prevention - How to manage high risk patients.
3.0
2.0
1.0
0.0
Very High
High
Neutral
Low
Very Low


Stepped Care - How to decide when to step patients up to specialty care.
3.0
2.0
1.0
0.0
Very High
High
Neutral
Low
Very Low

mtl.how/menu


Session
Join Current Session
Suicide Prevention -- Week 104
583ge_wl_bhip2_2019_04_14.xlsx
Play
Start a New Session
Care Coordination
Medication Management
Psychotherapy
Aggregate
Suicide Prevention

Stakeholders typically converge and diverge in their understandings of the implementation problem.

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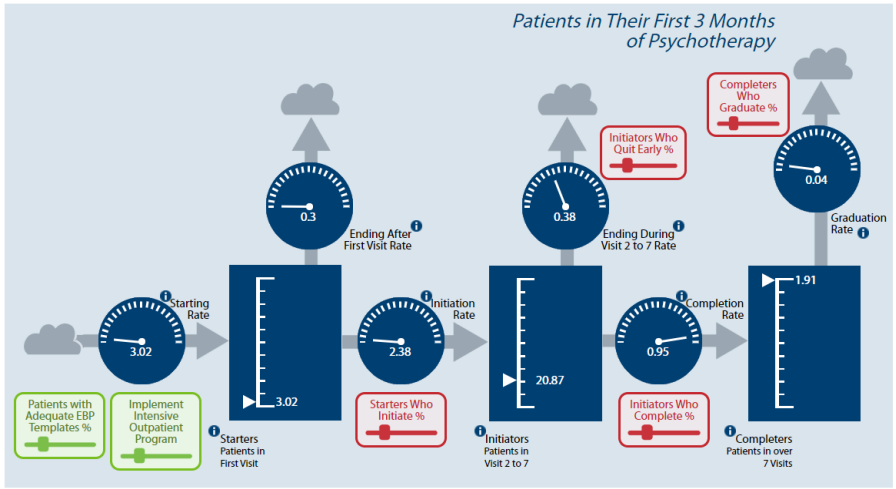

Team Question: How can we get more patients through a full course of high-quality psychotherapy *when they start*?

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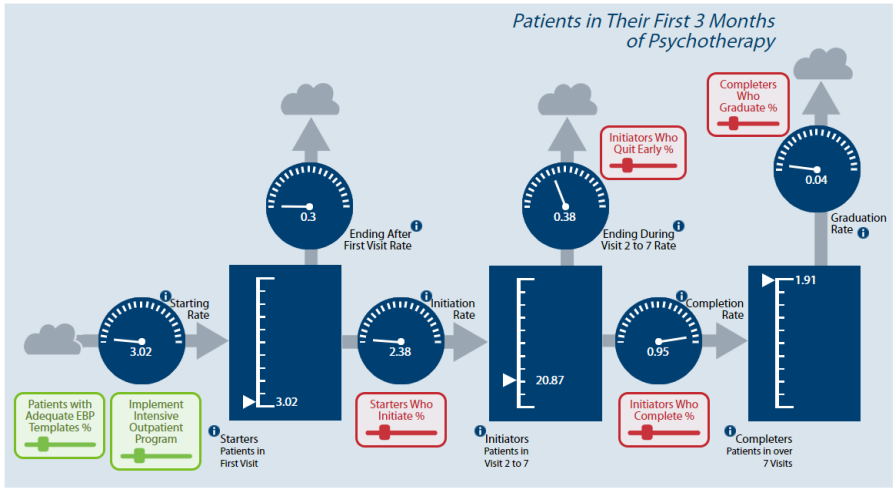
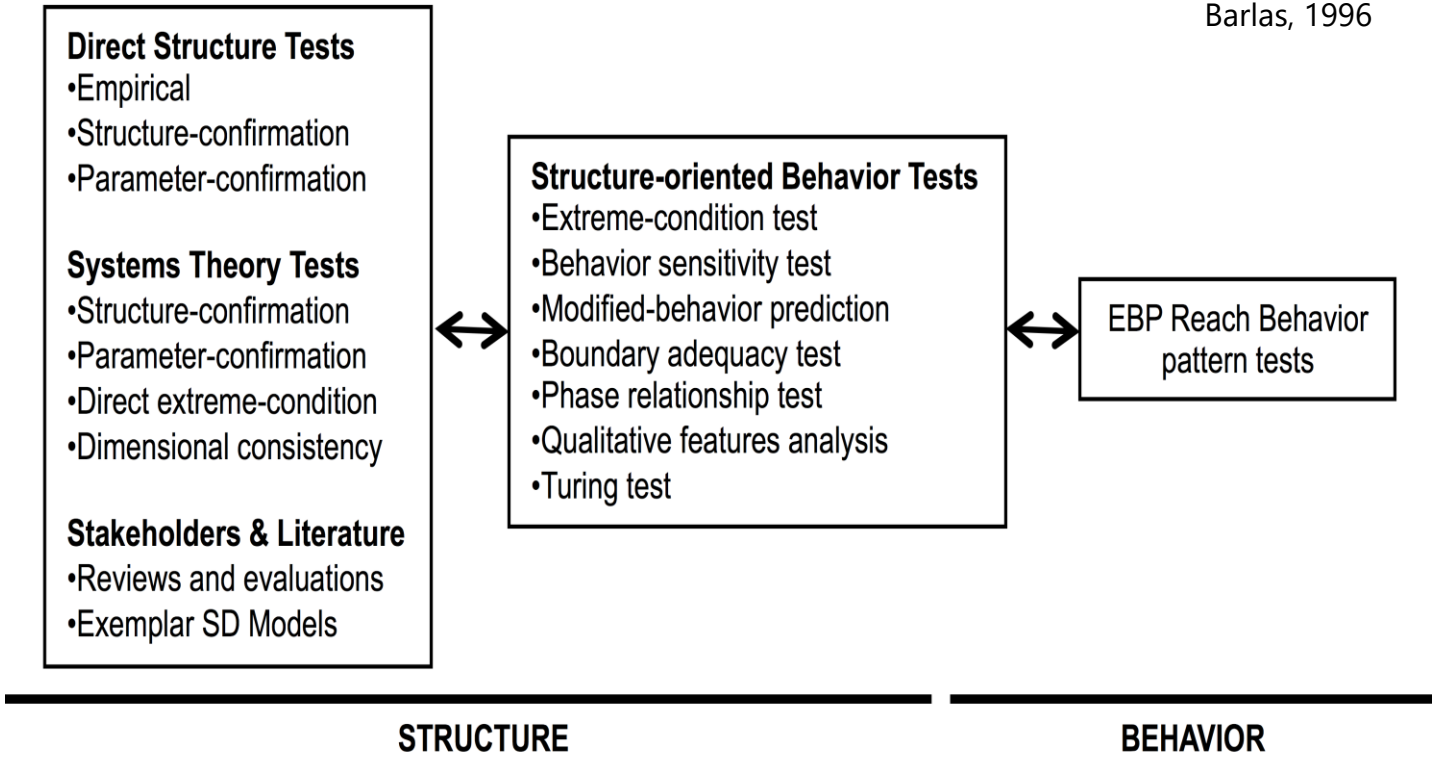


We achieved saturation during structural behavioral validity testing.

Barlas, 1996

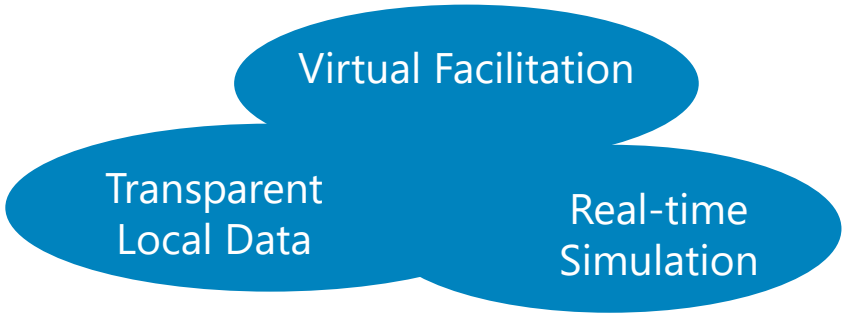


We co-developed a national quality improvement initiative that enlists point of care participatory learning from system dynamics simulations.

NIH R21 DA042198
(PI Zimmerman)

Modeling to Learn

Test. Don't guess.



1. Equitable access to resources.
2. Mutual learning.
3. Shared decision-making.

***Modeling to Learn* offers FREE licensure credit** for psychiatry, psychology, social work and nursing & certified peer support specialists.

For papers, slide decks, videos and a demonstration simulation go to mtl.how/demo.

Free and open science guides to the *Modeling to Learn* program are available at mtl.how.

Participatory Learning to develop *Systems Thinking.*

mtl Facilitate

[mtl.how](mtl.how)

Partner

Build

Apply

MTL Fidelity Checklist for 12-session Plan

Sesson Summaries across *MTL* Modules

session 01. Today we're *modeling to learn* how to align our **team vision**.

session 02. Today we're *modeling to learn* how to check our **patient data** and **team trends.**

session 03. Today we're *modeling to learn* how to produce **team data** for simulation.

session 04. Today we're *modeling to learn* how to prioritize **team needs**.

session 05. Today we're *modeling to learn* how to log-in to our **team world**.

session 06. Today we're *modeling to learn* how to tell a **systems story**.

session 07. Today we're *modeling to learn* how to evaluate our **base case** of no new decisions.

session 08. Today we're *modeling to learn* how to test a **dynamic hypothesis**.

session 09. Today we're *modeling to learn* how to **compare alternatives**.

session 10. Today we're *modeling to learn* how to use **systems thinking**.

session 11. Today we're *modeling to learn* how to make future **team decisions**.

session 12. Today we're *modeling to learn* how to turn **team learning** into a **team plan**.

Accredited session videos are available at mtl.how.

mtl.how

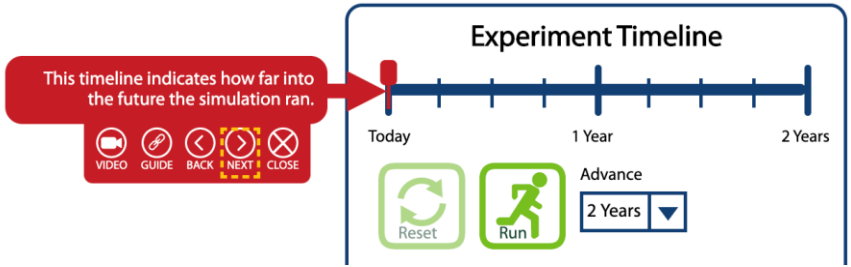
Partner

Build

Apply

Modeling to Learn 2.0 – Scaling community resources.

MTL Tutor



MTL Community of Practice

Innovative wisdom with a copyleft, free and open license.
Modeling to Learn (VHA OGC Invention #2020-130)

Look before you leap.

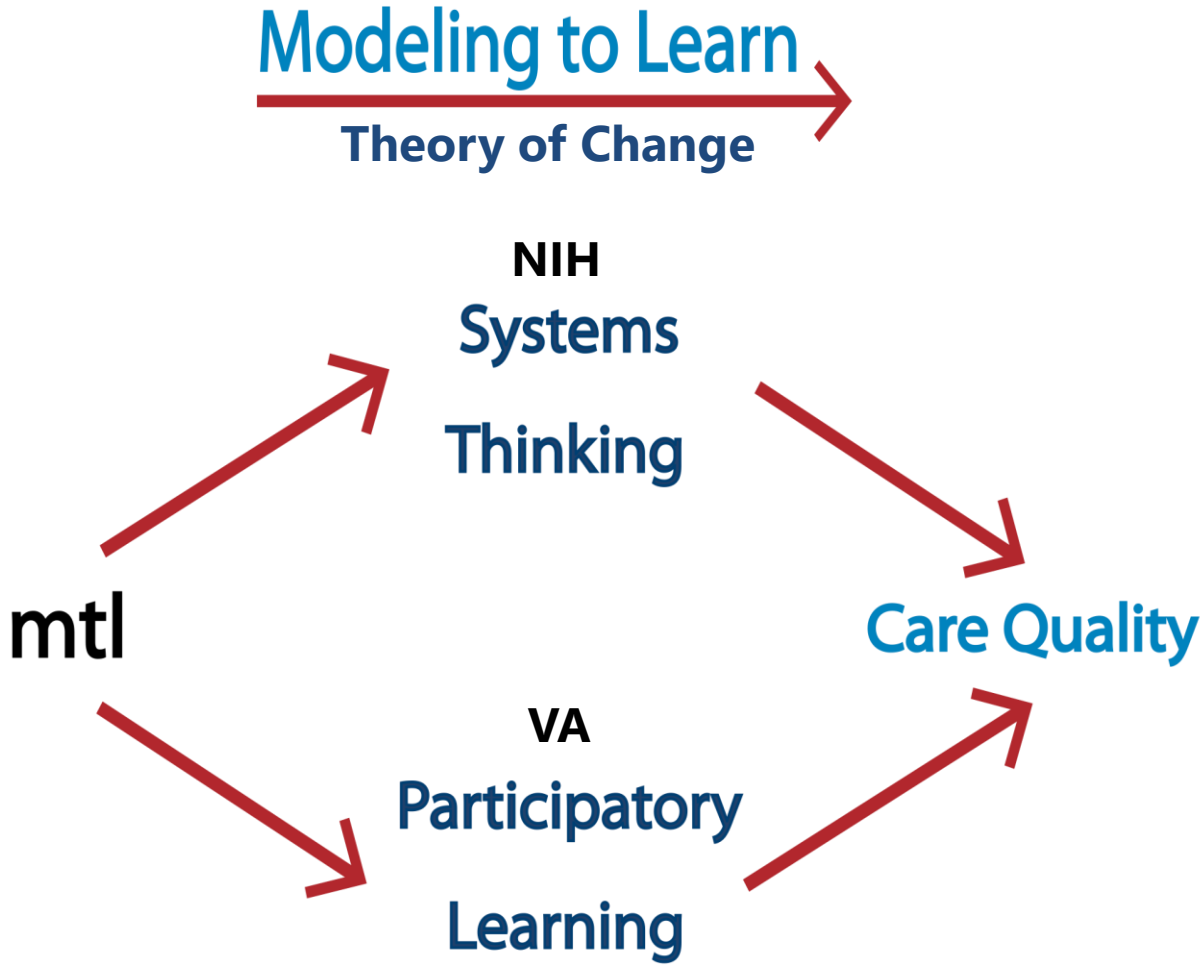
Measure twice cut once.

OFFICE OF TECHNOLOGY LICENSING

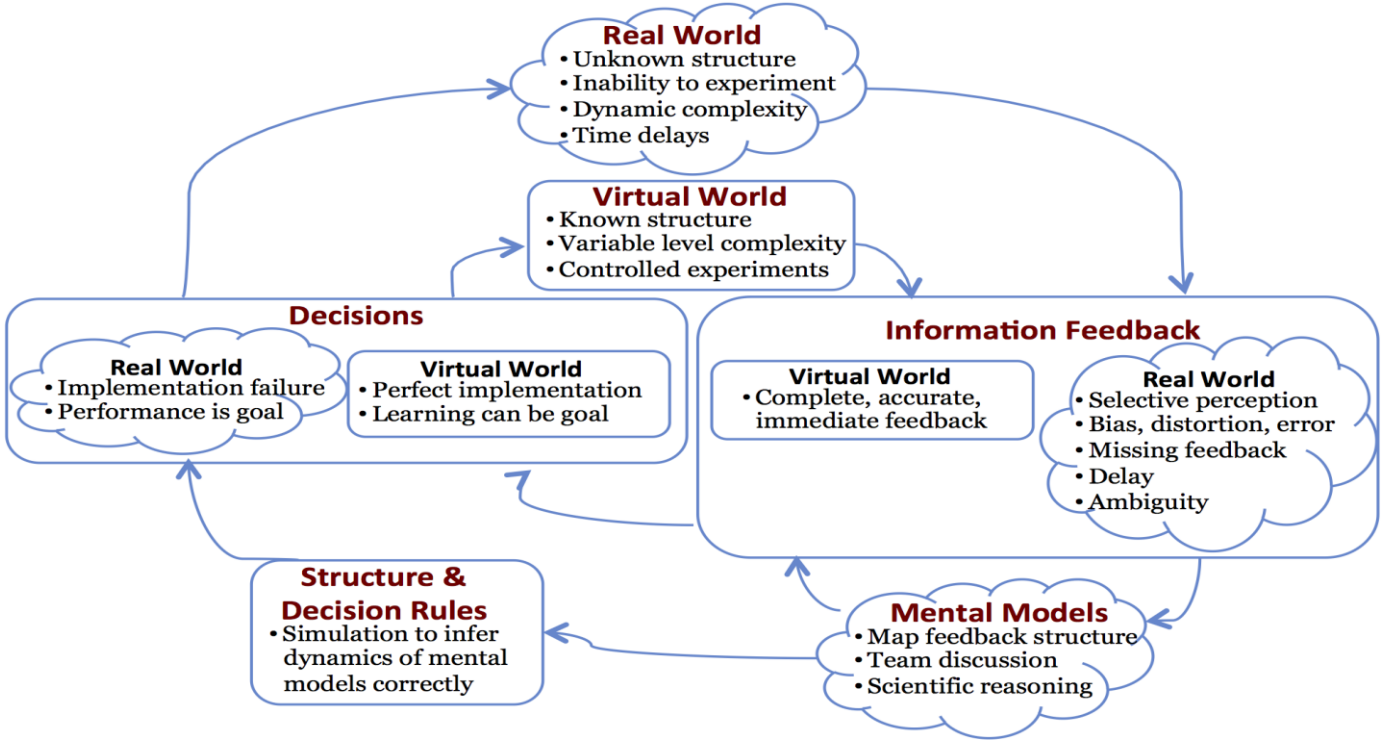
Story 3:
The physics problem: Upgrading our mental models is hard, because our problems change over time.

"The task…in an interdisciplinary team working on the thematic universe reveald by their investigation is to "re-present" that universe to the people from whom [they] first received it – and "re-present" it not as a lecture, but as a problem."

- Paulo Freire, *Pedagogy of the Oppressed*


Modeling to Learn
Theory of Change
NIH
Systems
Thinking
mtl
Care Quality
VA
Participatory
Learning

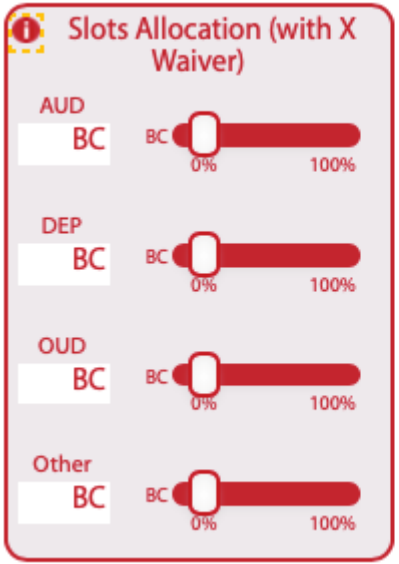
Why is *Modeling to Learn* effective?
Two Causal Theories: Systems and Decision Science

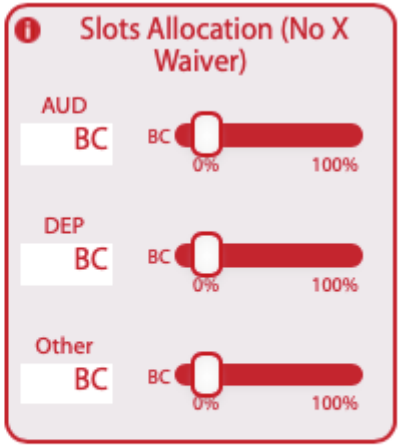


Sterman, 2000; Sterman 2006

Modeling to Learn facilitates participatory learning and improves systems thinking about complexity, feedback, and change over time.

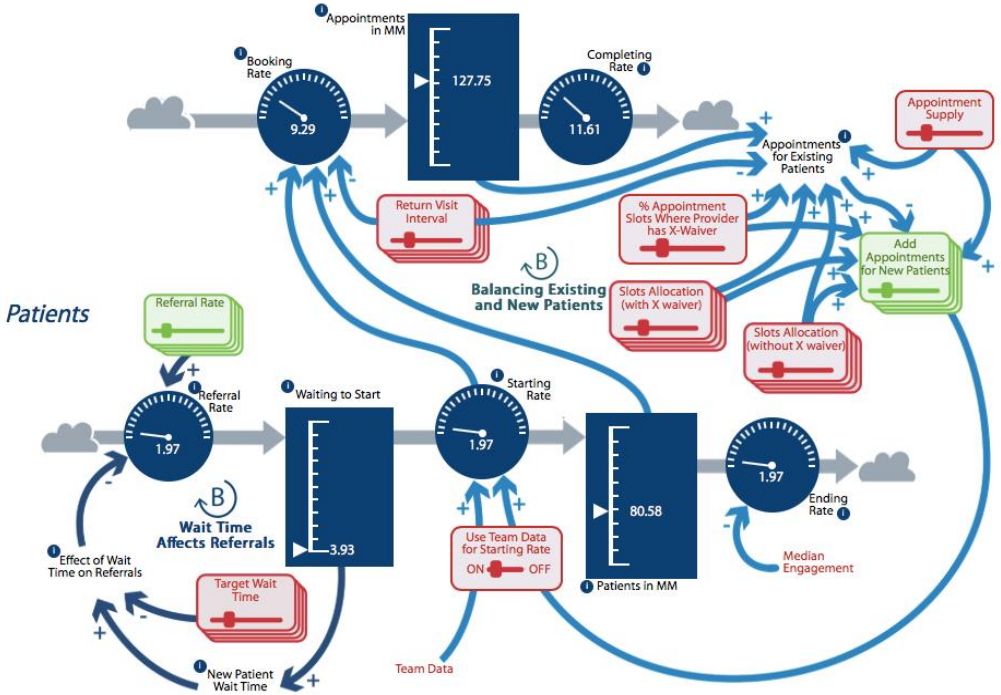
Not all medication management staff resources are the same.





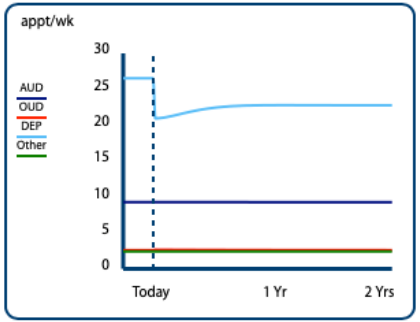
Hypothesis about Re-allocating X-waiver slots:

- we could start more patients with OUD on EBPharm
- but we expect more patients with depression and AUD will be waiting to start than in the base case.

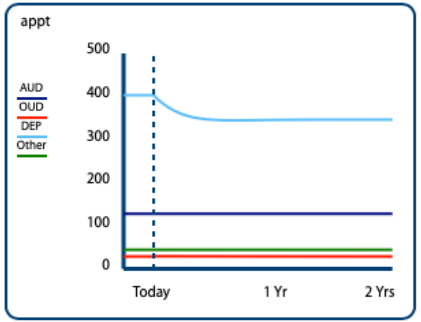


Red =
- Read in from existing team data
- Standardized

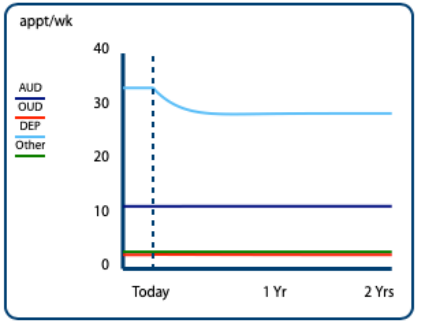
Re-allocating 20% of x-waivered slots from patients w/depression to patients w/OUD levels out over time.



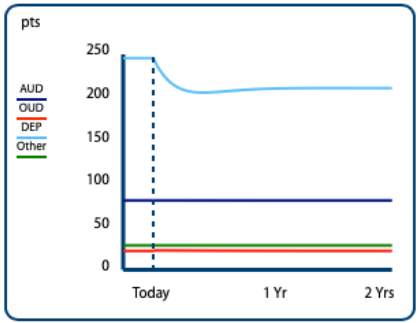
Booking Rate



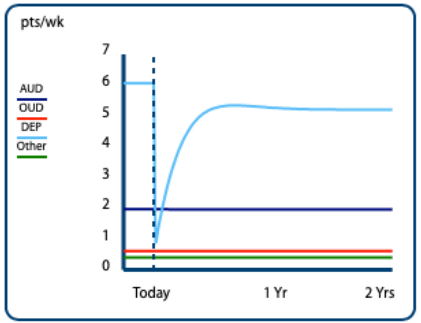
Appointments in MM



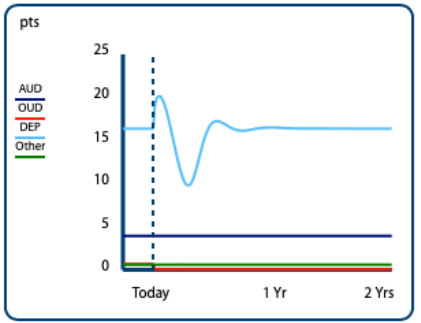
Completing Rate



Patients in MM

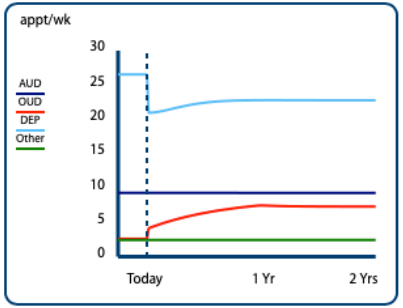


Start Rate

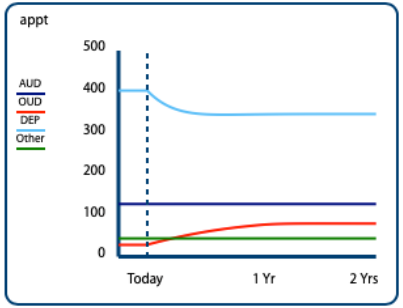


Waiting to Start

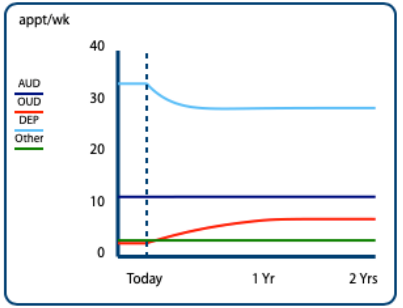
With two new referrals each week we can triple the number of patients with OUD in our team who receive EBPharm over the next two years.



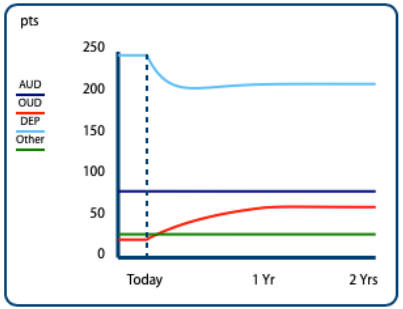
Booking Rate



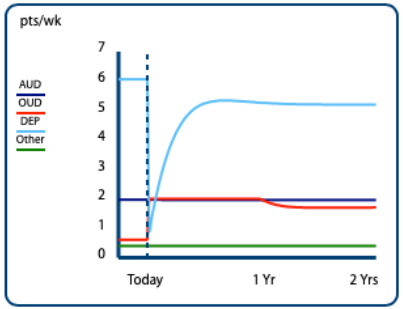
Appointments in MM



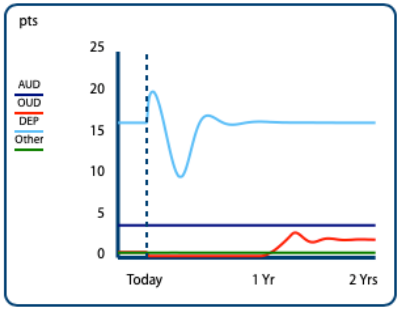
Completing Rate



Patients in MM



Start Rate



Waiting to Start

MTL focuses on learning among frontline teams making EBP-related care decisions.

Drawn from Hovmand 2014 & Scaccia et al., 2015

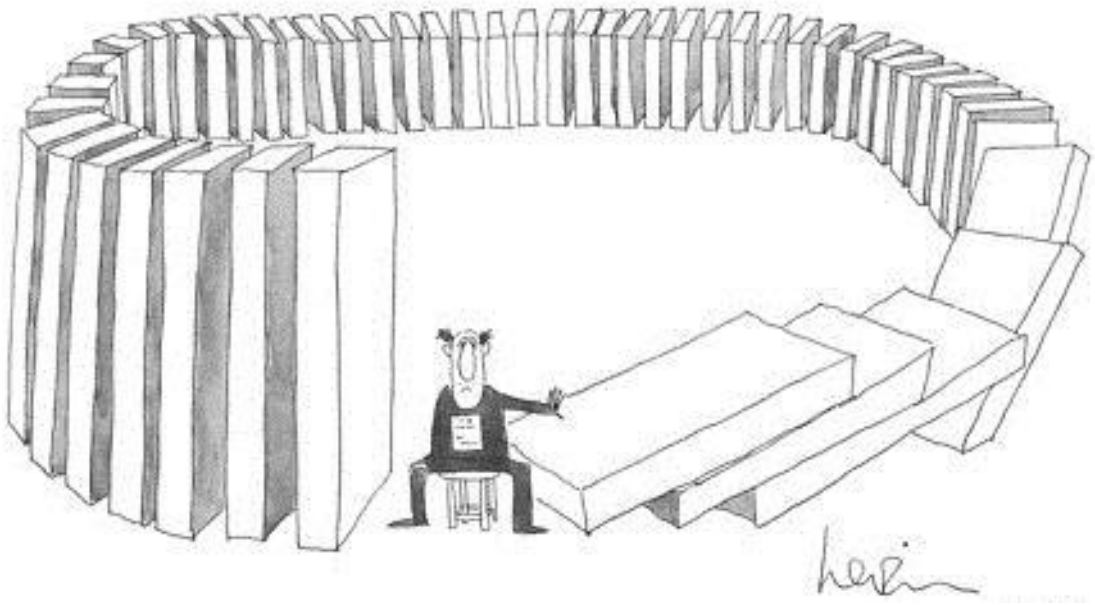
Scientific Model	Problem	Why problems persist
General Capacity	Learning	Stakeholders cannot or do not learn and adapt to their situation.
	Coordination	Conflict or lack of stakeholder consensus.
EBP Specific Capacity	Analysis	Policies are inconsistent with the real system constraints.
	Restructuring	The underlying structure of the system prevents workable solutions.

Consider the physics of your problem:

Our models conserve staff time a common constraint that changes locally over time.

Decisions based on *Modeling to Learn* experiments:

Something that we think is outside of our control may actually be the accumulated result of our own decisions.

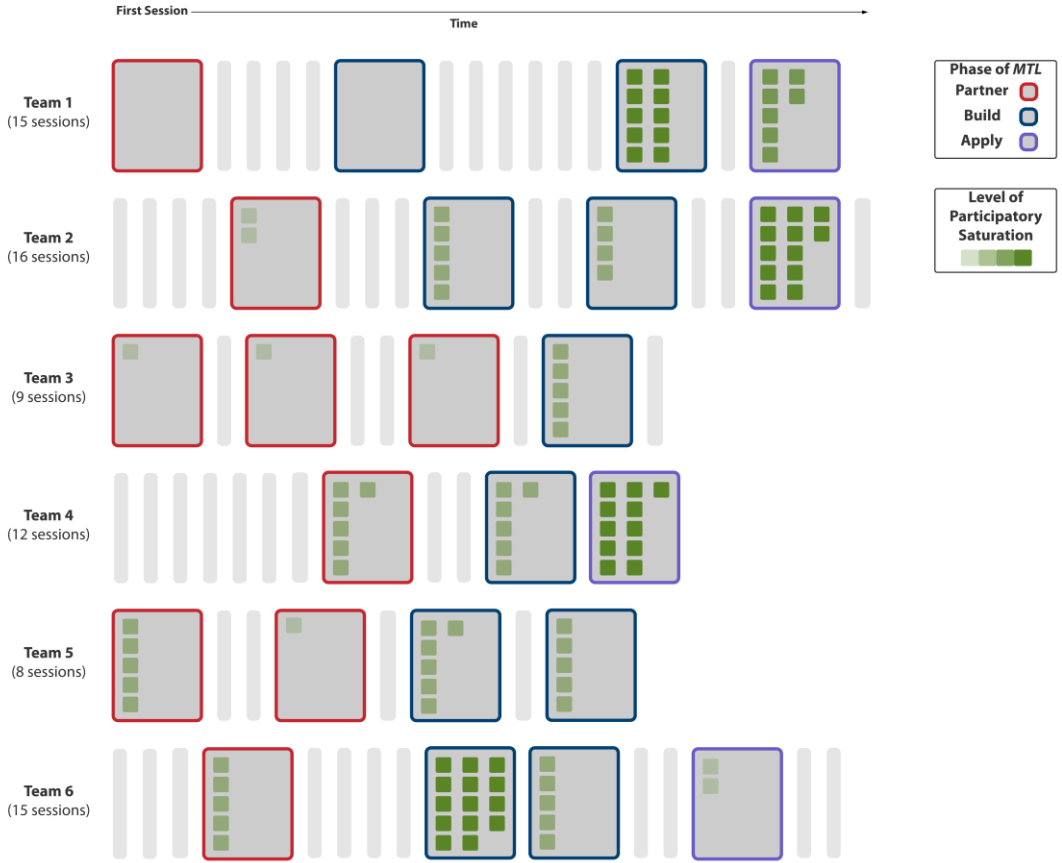


MTL fidelity to increasing participatory learning among frontline teams making care decisions.

Clear Engagement	Establish relationships, build trust, and create processes for action.
Partner for Change	Recognize the need to partner to create change and improvement.
Transparency	Be clear about the purposes or goals of this improvement effort.
Local Control	Make VHA data resources in this effort transparent. Support greater understanding and local team control over use of VHA data.
Build Capacities Strengths	Seek to support the team's existing capabilities to best use local team resources and make local decisions.
Shared Decision Making	Support shared team decisions in this project.
Local Synergy	Recognize local challenges for this team and identify good solutions.
Shared Understanding	Are clear and share understanding of the problems they are trying to address.
Team Priority	Project is emphasizing what is important to this team.
Consensus Building	Even though the team did not have total agreement, they did reach a kind of consensus that they all accept.
Workable Solutions	Co-develop strategies likely to work for this team.

Oetzel et al., 2018

R21 team notes: Participatory constructs per team meeting over the partner, build, and apply phases.



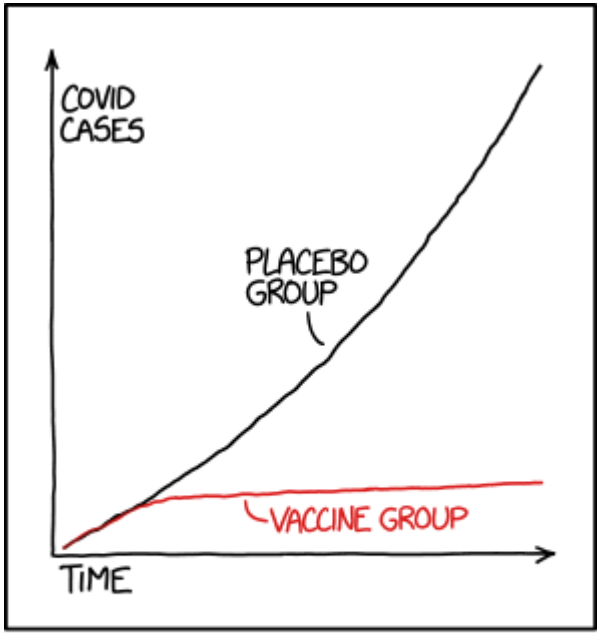
MTL fidelity to increasing systems thinking among frontline teams making care decisions.

Systems Thinking	Definition
Complex	**Forest not trees.** Relationships among two or more variables (wait times, improvement rate), or two or more settings (primary care, general mental health).
Feedback	**Loop not line.** Not simple cause and effect. The end of the story often influences the beginning, and is strengthened (reinforcing) or reduced (balancing) around the loop.
System Behavior	**Movie not snapshot.** Trends over time. Systems cause their own behavior through feedback.
Time	**Short *and* long term**. Better understanding of change over time (e.g., worse before better, better before worse).

R21 team notes: Level of systems thinking observed among frontline teams while modeling.

Why Participatory System Dynamics?
Story 1: We can do more harm than good.
Story 2: We must transcend our current minds through participatory learning.
Story 3: Under constant change mental upgrades may be facilitated by participatory modeling

What works to improve evidence-based practice reach?



STATISTICS TIP: ALWAYS TRY TO GET DATA THAT'S GOOD ENOUGH THAT YOU DON'T NEED TO DO STATISTICS ON IT

xkcd.com

Figure 1. VA Palo Alto Health Care System quality improvement p-charts (2015-2019): Evidence-based psychotherapy templates (%) among unique patients who had a clinic outpatient mental health visit each month.

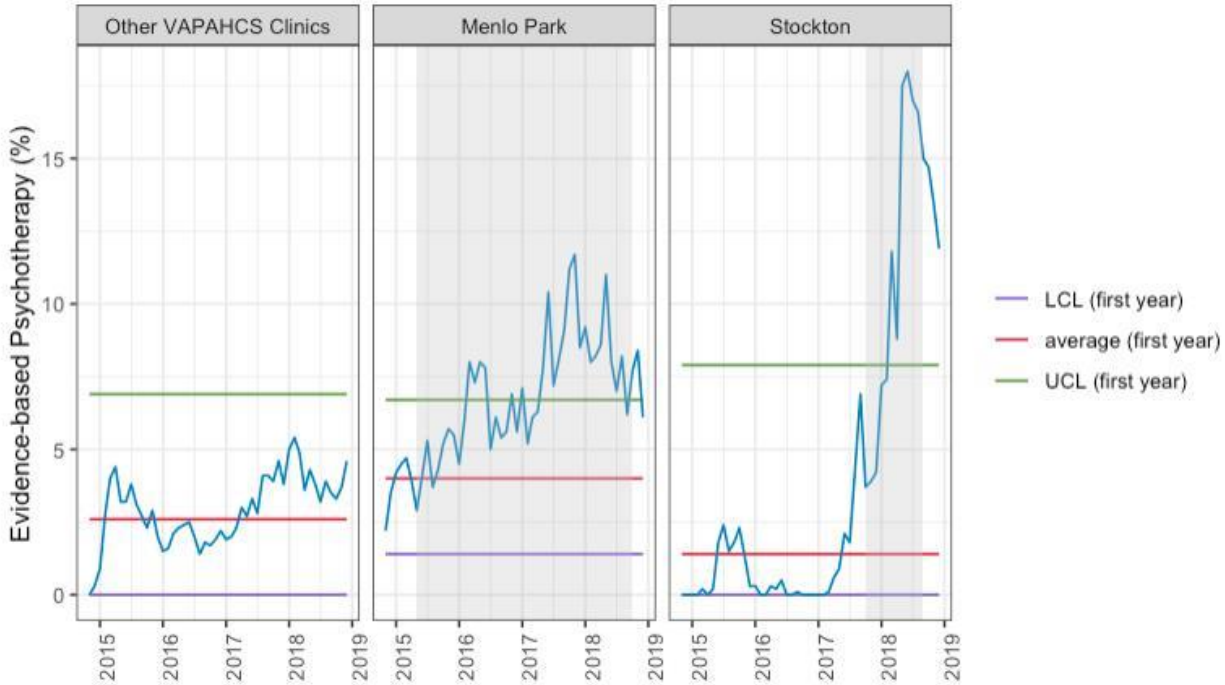
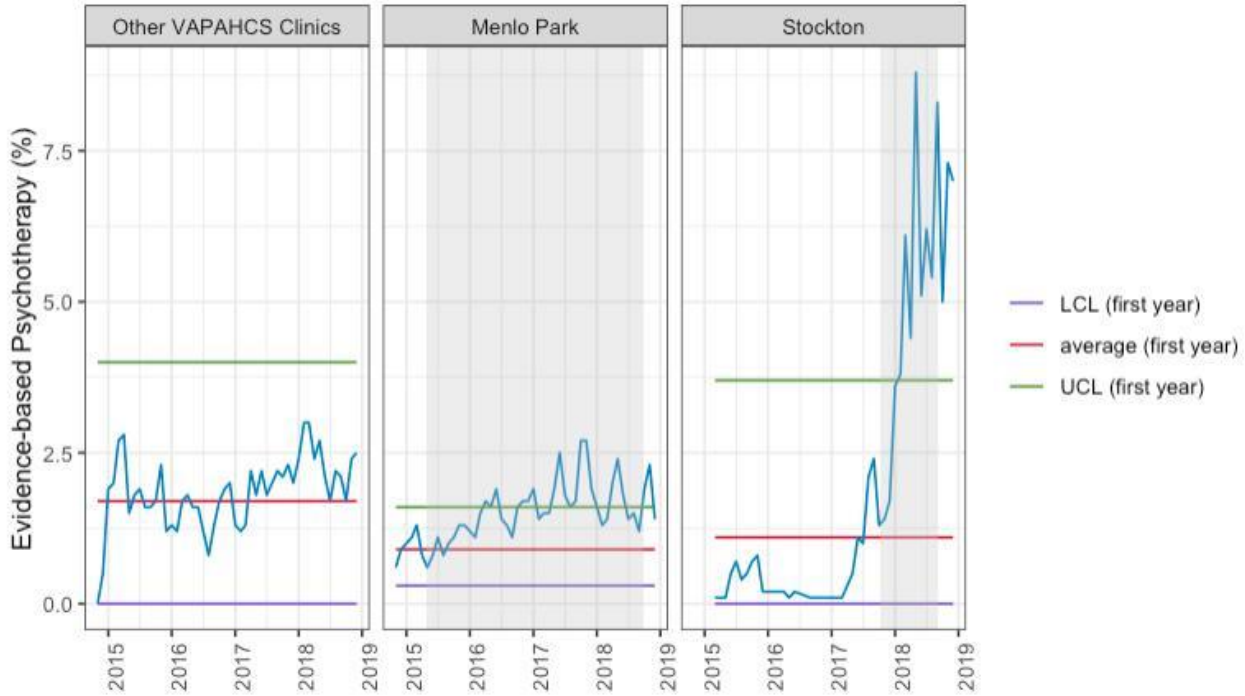
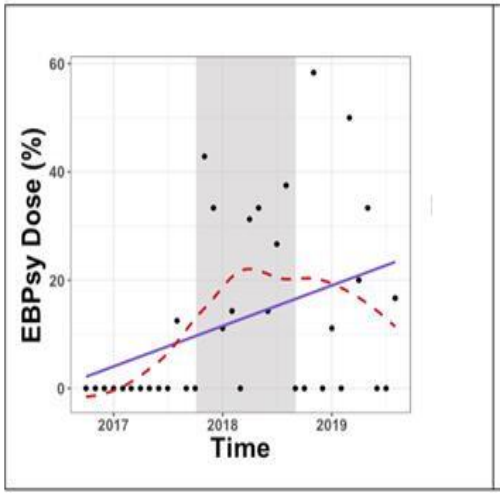


Figure 2. VA Palo Alto Health Care System quality improvement p-charts (2015-2019): Evidence-based psychotherapy templates (%) out of the total clinic mental health visits each month.

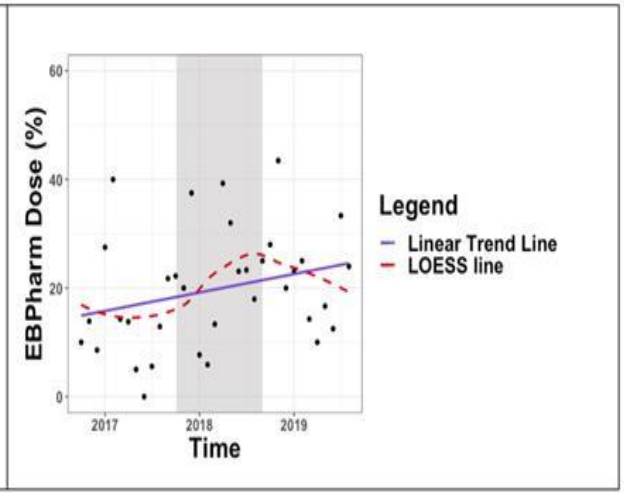


EBP Reach: *MTL* improved the therapeutic course/dose of both EBPsy and EBPharm over time.

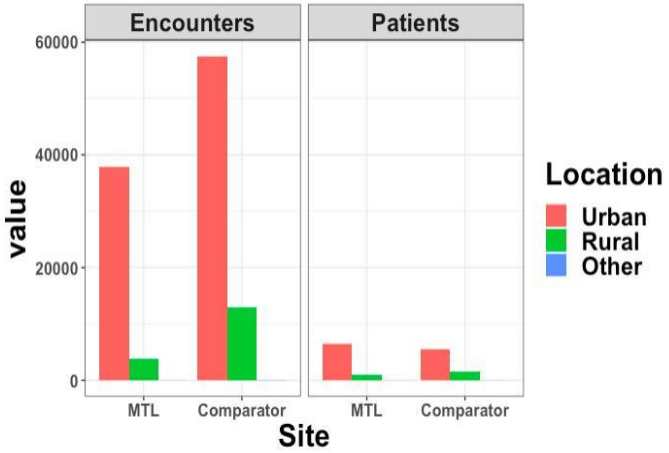
EBPsy



EBPharm



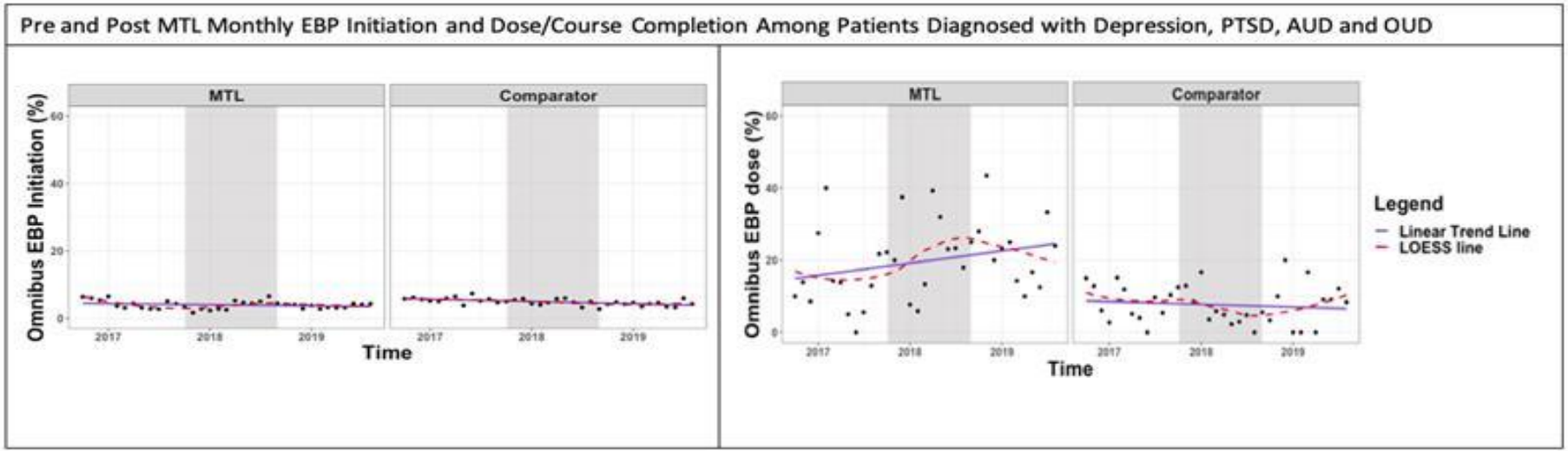
Urban/Rural



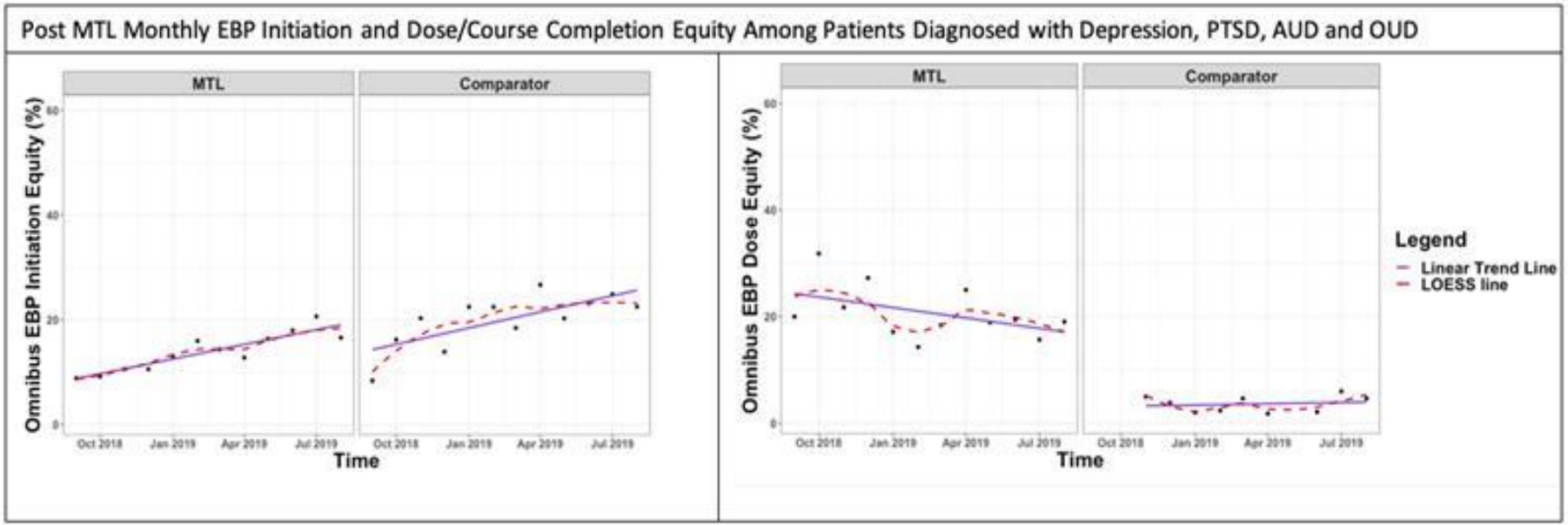
EBP Tradeoffs: Omnibus EBP Dose (EBPsy and EBPharm) improved with *Modeling to Learn* without compromising EBP initiation.

EBP Initiation

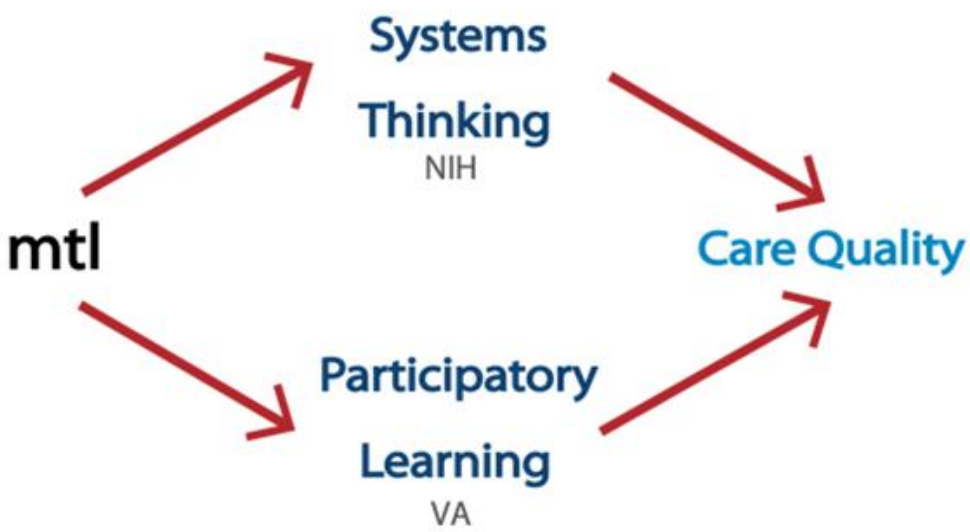
EBP Dose



EBP Equity: Omnibus EBP Dose was significantly higher among women Veterans, and Veterans of Color (EBP Equity) in our *Modeling to Learn* clinic as compared to our statistically matched comparator clinic.



We lead large national multi-site cluster randomized trials of addiction and mental health care quality improvement.



R01 Aims - *MTL* vs audit & feedback

1. Effective
2. Systems Thinking Mechanism of Change
3. Generalizable

NIH R01 DA04665-03
(PI Zimmerman)

IIR Aims - *MTL* vs usual quality improvement

1. Effective
2. Participatory Mechanism of Change
3. Budget Impact

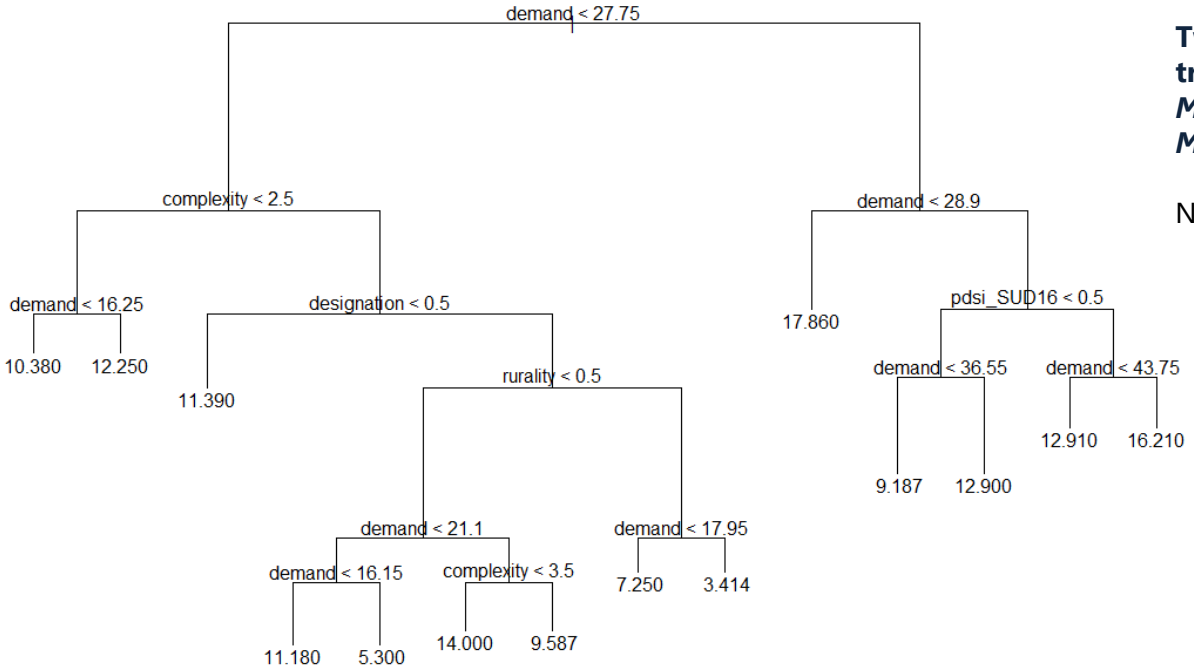
VA 1I01 HX002521-01
(PI Zimmerman)

We are replicating our *MTL* quality improvement approach with Hawaii Dept of Health.

SAMSHA 1H79 SM082961-01
(Consortium PI Zimmerman)

VA Team PSD

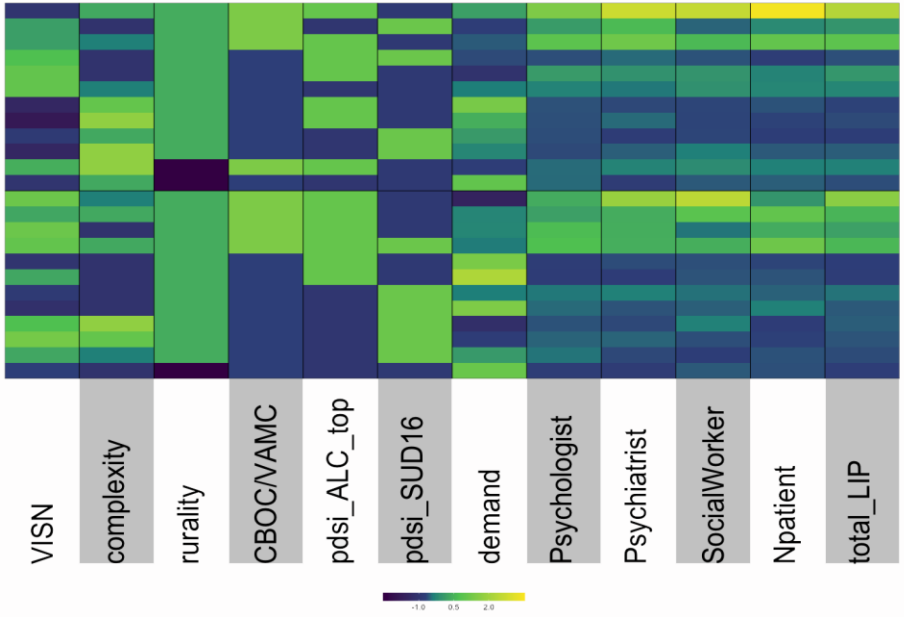
We used a random forest machine learning approach to evaluate baseline covariates and EBP reach. CBOC staff size and VAMC unique patient size to be the most important sampling and blocking.

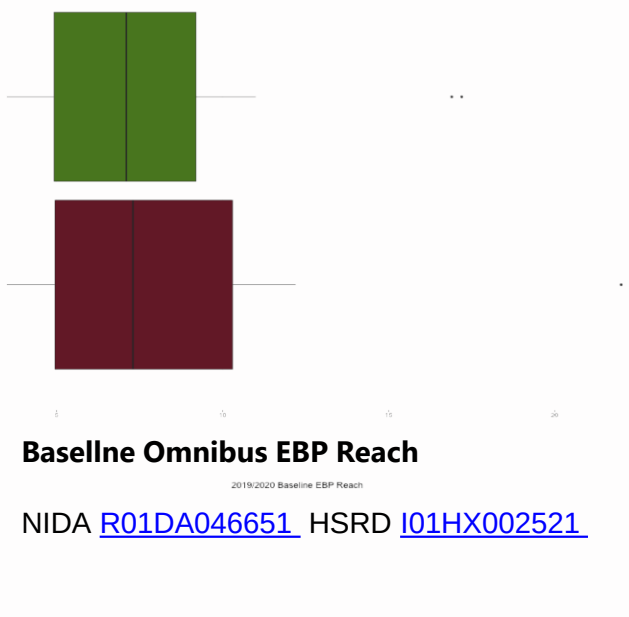


Two phase III superiority cluster randomized trials.
***MTL* vs. Autit and Feedback (24 VAs)**
***MTL* vs. Usual Quality Improvement (24 VAs).**

NIDA R01DA046651 HSRD I01HX002521

We used a modified stratified proportional sampling frame with a 2:1 Community Based Outpatient Clinic to VA Medical Center Ratio. We used stratified block randomization to parallel arms.





NIDA R01DA046651 HSRD I01HX002521

How we do participatory system dynamics?

How do my roles inform one another?

Lindsey Zimmerman, PhD, leads the Veterans Health Administration (VA) national quality improvement initiative, *Modeling to Learn*.

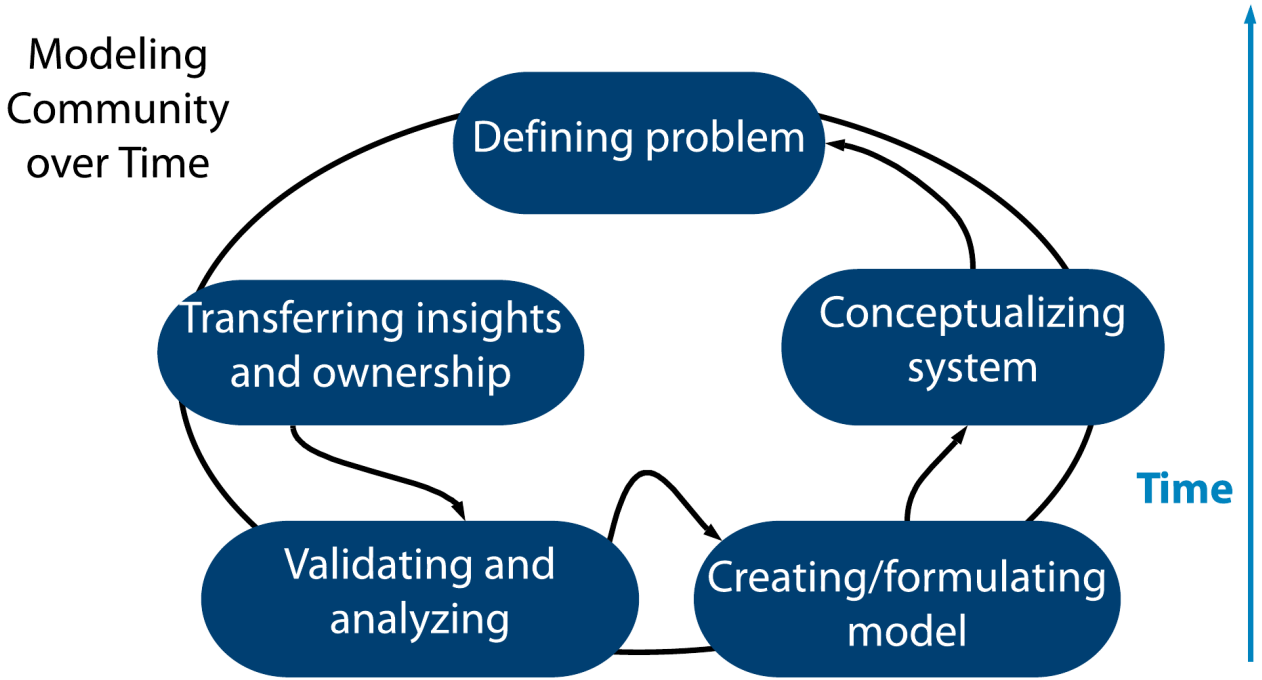
Lindsey Zimmerman, PhD, is Principal Investigator of NIH, VA and SAMSHA funded research that evaluates *Modeling to Learn* for increasing the reach of evidence-based health care among patient populations.

We strive to integrate Participatory Action and Research Cycles to avoid learning without action and innovation without inquiry.

Action	Research
1. Identify problems to solve and other opportunities, causal factors, environmental constraints and relevant practice.	1. Identify topic to study and review relevant knowledge.
2. Formulate proposed changes and the implementation plan.	2. Operationalize hypotheses.
3. Initiate changes in targeted areas.	3. Select sample to observe.
4. Assess changes and implementation.	4. Select other research methods, gather data, and generate findings.
5. Deepen, institutionalize and diffuse change.	5. Derive and disseminate implications for theory and practice.

Whyte, W.F. (1991). *Participatory Action Research*, p. 123, Figure 8.3

We are modeling to learn over time.



Hovmand, P. (2014). *Community Based System Dynamics.*

https://mtl.how/

We locate our VHA implementation efforts in the following Implementation Science Frameworks.

	Framework	Construct(s)
Phase	EPIS Aarons et al. 2011	Implementation & Sustainment
Determinants	CFIR Damschroder et al., 2009	Process & Inner Context
Strategy	ERIC Powell et al., 2015	Multicomponent: External Facilitation, Data Review, Participatory Learning from Simulation
Mechanism	TMF Nilsen, 2015	Basic Theory: Decision Science & Systems Science
Outcome	Proctor et al., 2011 & Glasgow et al., 1999	Penetration or Reach (tradeoffs & time)

We locate our philosophy of science in the following epistemologies & methods.

	Scientific Tradition	Process/Method/Design
Epistemology		
Process	PAR Lewin, 1934 CBPR Wallerstein et al. 2018	Praxis of learning and reflection from creating change with communities.
Design	Empiricism & Experimentation	Quasi-Experimental, Cluster Randomized Trial
Method		
Data Collection & Analysis	Mixed Methods Creswell & Plano-Clark, 2018	Core designs for integrating QUAL + QUAN data
Data Collection & Analysis	System Dynamics, Sterman 2000 Group Model Building, 1996 Vennix Community Based System Dynamics, 2014	Establish structural behavioral validity of models through iterative modeling with stakeholders.

Anyone can go review and use all of *Modeling to Learn* models, guides and videos.

mtl.how/demo

Course Code: northwestern_psmg_2021

@LZPhD

Lindsey Zimmerman, PhD

Office of Mental Health and Suicide Prevention

National Center for PTSD, Dissemination & Training Division

mtl.info@va.gov

We use monthly agile design sprints coordinated across workgroups via GitHub/ZenHub to manage the scale of our project.

Team PSD Manual at mtl.how/teampsd_manual.

Chapter 3 Standard Operations

3.1 Team PSD

Team
Participatory System Dynamics

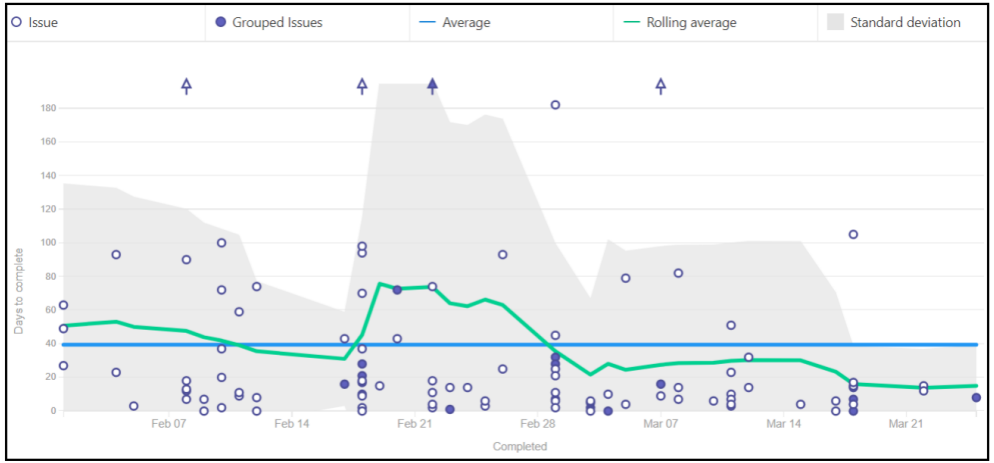
Meet the members and partners of Team Participatory Systems Dynamics at mtl.how/team.

3.2 Scientific Values

Team PSD Scientific Values guide additional **Participatory** and **Open Science** principles:

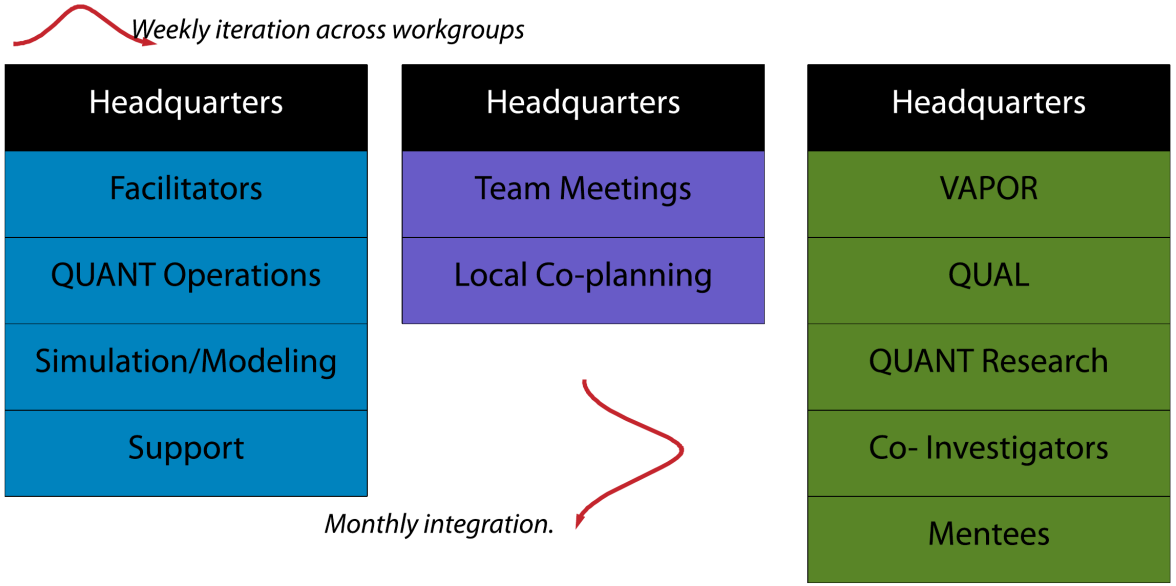
- **Participatory Research** encourages us to **co-create our scientific research**. Therefore…
- We **share decisions**, which requires a high level of **documentation.**
- We seek greater **equity** among partners in how collaborate, which requires **responsive pivots** with new stakeholder inputs.
- We strive use **transparent** and **accessible** processes and platforms, and develop **transparent, accessible resources**.

Team PSD Control Charts mtl.how/teampsd.



We use standard workgroup schedules with dedicated focus blocks. Many team members work flex or compressed schedules.

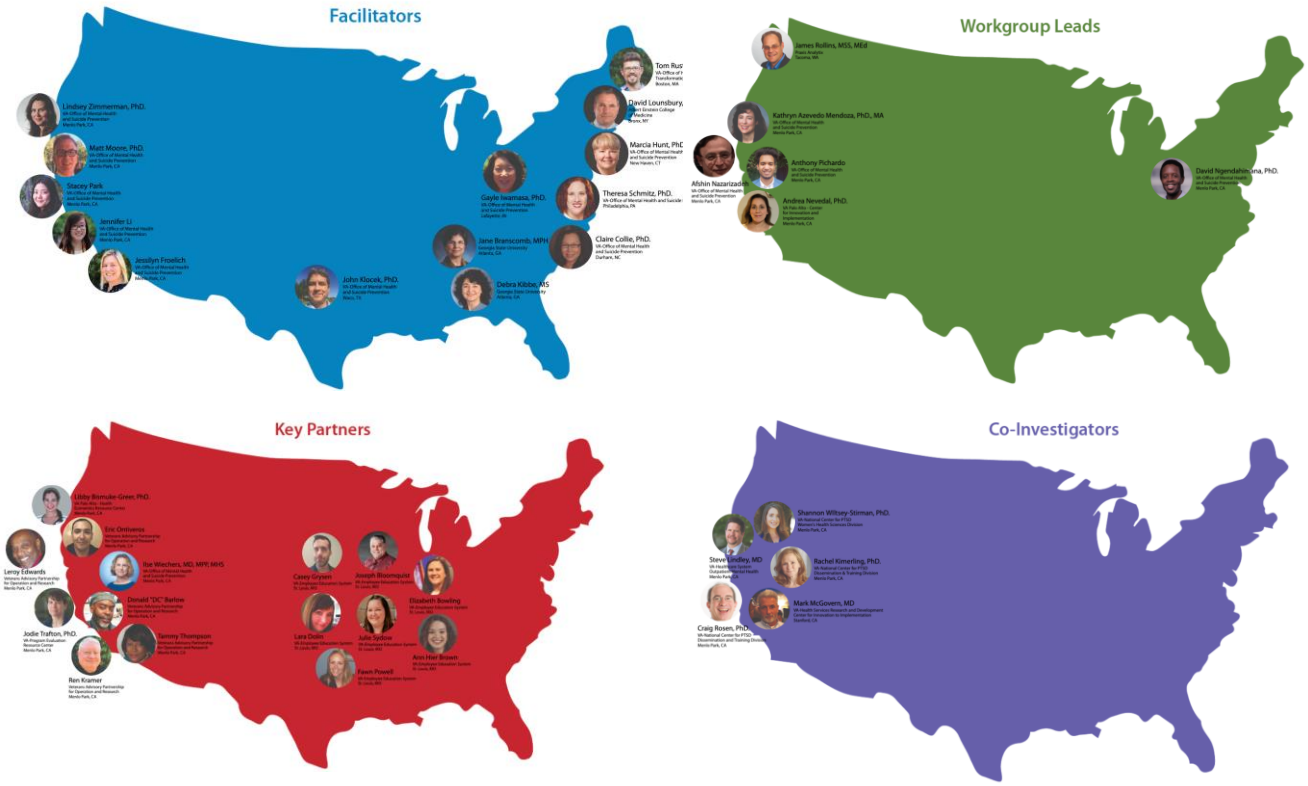
We iterate and integrate our work consistent with Scaled Agile Framework.



Team PSD 2.0	*Research and Operations Workflows*			
	Mon	**Tue**	**Wed**	**Thu**
Week 1 Hypotheses	*Weekly iteration across workgroups*			
Week 2 MVPs				
Week 3 Feedback				
Week 4 Integration		*Monthly integration.*		

https://mtl.how/teampsd_manual

We created an authorship app for co-authoring across our partners these last seven years.



Team
Participatory System Dynamics

NIDA R01DA046651 and R21DA042198
HSRD I01HX002521 PI: Zimmerman

Co-Investigators

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Project Support

Stacey Park, McKenzie Javorka, MS, Dan Wang, PhD, Savet Hong, PhD, Kathryn Azevedo, PhD, Savet Hong, PhD

Team PSD Mentees

Cora Bernard, PhD, Jessilyn Froelich, MS, Swap Mushiana, MS, Joyce Yang, PhD

VAPOR (Veteran VA Consumer) Board

DC Barlow, Ren Kramer & Erik Ontiveros

Georgia Health Policy Center

Jane Branscomb, MPH Debra Kibbe, MS Ursula Davis, MA, Amanda Martinez, MPH

Praxis Analytix

Col. (Ret.) James Rollins, MEd

Key Partners

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Office of Healthcare Transformation (10A5)
Tom Rust, PhD, Andrew Holbrook, BS, Liz May, BS

VA Employee Education Services (EES)
Elizabeth Bowling, MA, RD/LD, Correy Mathews, Ann Hier, MS, Fawn Powell, MHA, Justin Spears, MBA, Ed Caldwell MEd, Amy Jones, MSEd, Julie Sydow MA, Cate Wright, and Lara Dolin

References

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