

Participatory system dynamics: Empowering teams to increase access to timely, high-quality mental health care



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David Lounsbury, PhD, Craig Rosen, PhD
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Steve Lindley MD, PhD and Tom Rust, PhD

Three Goals for Today our PSD introduction today:

Why problems persist

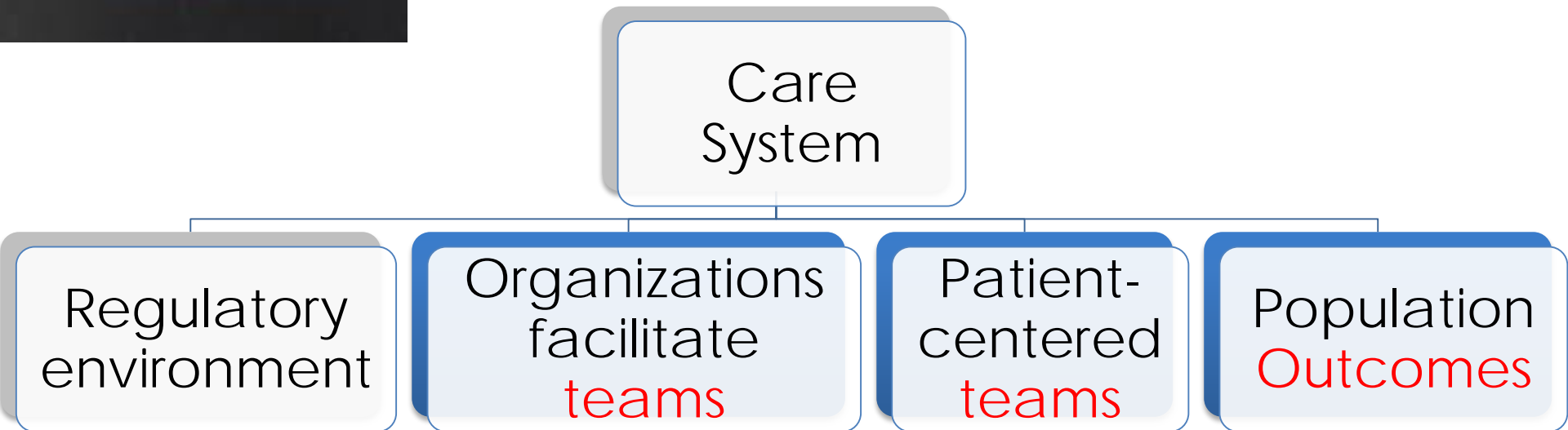
PSD MODELING TO LEARN

PSD effectiveness

Partnerships/
Next Steps



Context 1: PSD for quality improvement



PSD for balancing priorities.

Safe

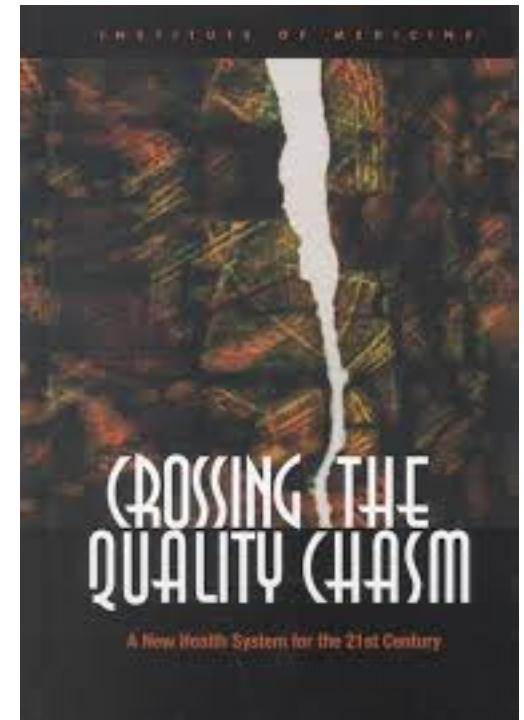
Effective

Efficient

Personalized

Timely

Equitable



Institute of Medicine,
2001

Context 2: PSD as implementation science.

Evidence-based - healthcare
practices with proven efficacy
& effectiveness.

There is strong evidence for the best practices to meet patient needs in VA.

- Evidence-based Psychotherapy (EBPsy)
- Evidence-based Pharmacotherapy (EBPharm)
 - reduce PTSD and depression symptoms, reduce alcohol or opiate use
 - reduce risk of chronic impairment, relapse, suicide and overdose.
- **Model(s) Problem: “Limited EBP reach”**
 - ~5-30% of eligible patient populations

Veterans Health Administration

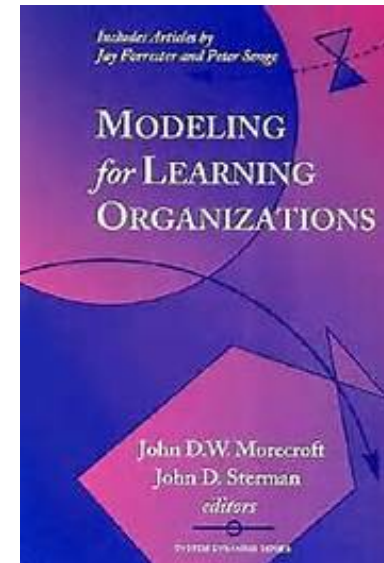
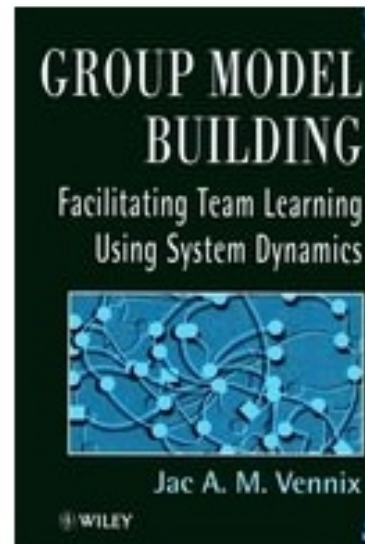
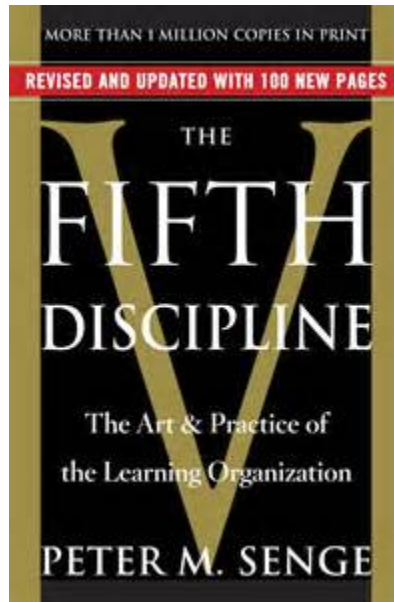
Model of a US National Health Care System

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



PSD in the era of the learning health system



Healthcare Learning Organization (Akhnif, et al., 2017)

- Senge, 1990
 - Personal mastery
 - Mental models
 - Shared vision
 - Team learning
 - Systems thinking
- Garvin, 2008
 - Leadership that reinforces learning
 - Learning processes and practices
 - Supportive learning environment

PSD theory: Understanding how common dynamics emerge from team capacities/constraints

KEY IDEA: Systems Theory + Simulation Learning increases team psychological safety and thereby MH quality (EBP reach)

Teams

- General
- Specialty

Patients

- MH
- Addiction

Providers

- Prescribe
- Therapy

Pilot

- Preliminary pilot

NIH R21

- Increase reach of EBP initiation
- Increase reach of full EBP dose
- Increase EBP timeliness

Modeling to Learn

- QI training continuing education credit
- Accessible simulation user-interface
- Data/training tailored to local care teams

IIR

- PSD vs QI as usual for increasing EBP reach
- Determine Budget impact of PSD
- Calculate PSD Incremental Cost-effectiveness Ratio

R01

- PSD vs Audit-&-Feedback for increasing EBP reach
- Measure hypothesized mechanisms of change
- Exploratory mediational analyses

Suicide Prevention

- Address new priority in team “Modeling to Learn” training
- Guide facility Suicide Prevention Coordinators
- Train OMSHP Tech. Assistants; Network Performance Plan

The aim of our research:

- ...is to develop a systems understanding of mental health service delays and how they contribute to limited reach of evidence-based mental health care.
- ...and empower mental health stakeholders to make optimized quality improvement decisions with ex ante assessments of their proposed redesign solutions.

We define EBP reach as the proportion of patients with a PTSD, depression or SUD diagnosis who

a) initiate

b) timely EBP session

c) complete an adequate, therapeutic EBP dose

EBP Reach: Starts and Completes

Population Coverage - Denominator (<i>diagnostic cohorts</i>)	Continuity of Care - Denominator (<i>diagnosis + active treatment</i>)
SAIL MH Domains	
PTSD	EBPsy
Depression	EBPsy and EBPharm
ODD	EBPharm
AUD	EBPharm

Complex interventions delivered by multidisciplinary teams

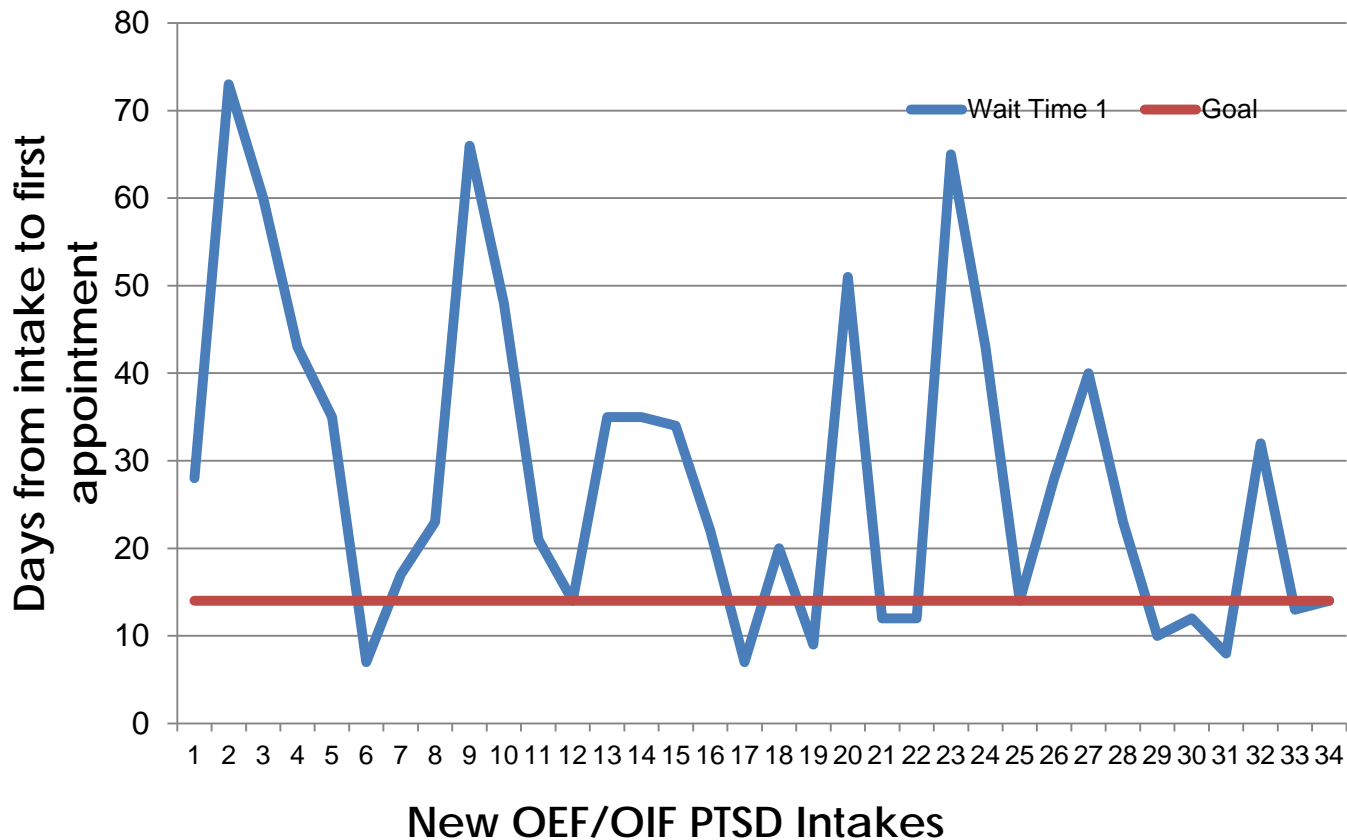
Reach as a system behavior:
the whole set of *mechanisms* by which the needs of the patient population are or are not addressed by their health care system.

Palo Alto VA Health Care System



- Main facility and nine outpatient clinics
- +85K patients served
- >17,000 patients receive MH care each year

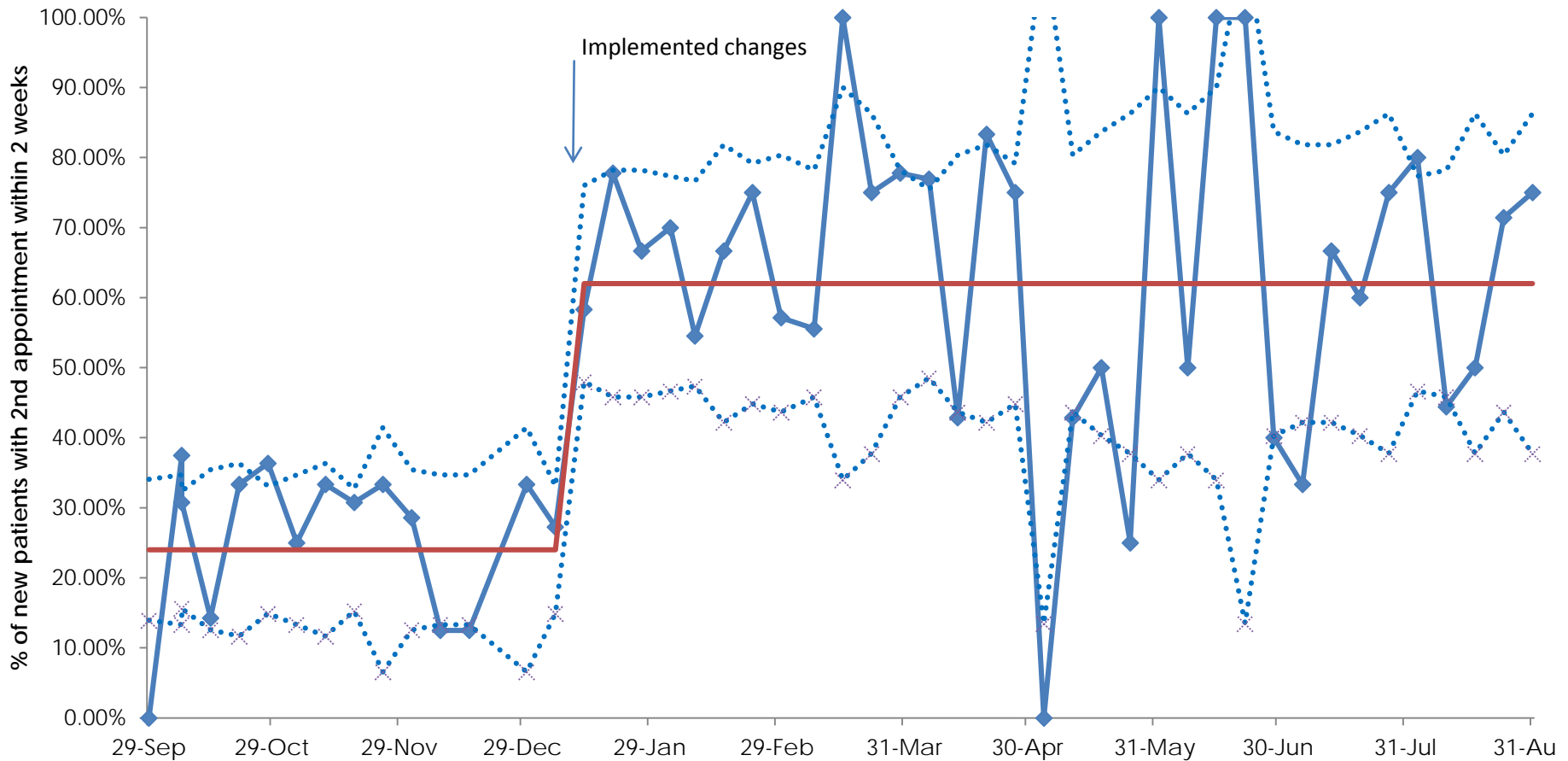
Existing State: Inadequate proportion of patients getting timely, high-quality care



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.

Local improvement, but wide variability & goal not achieved.



Gap between scheduling and completing psychotherapy remained.



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.

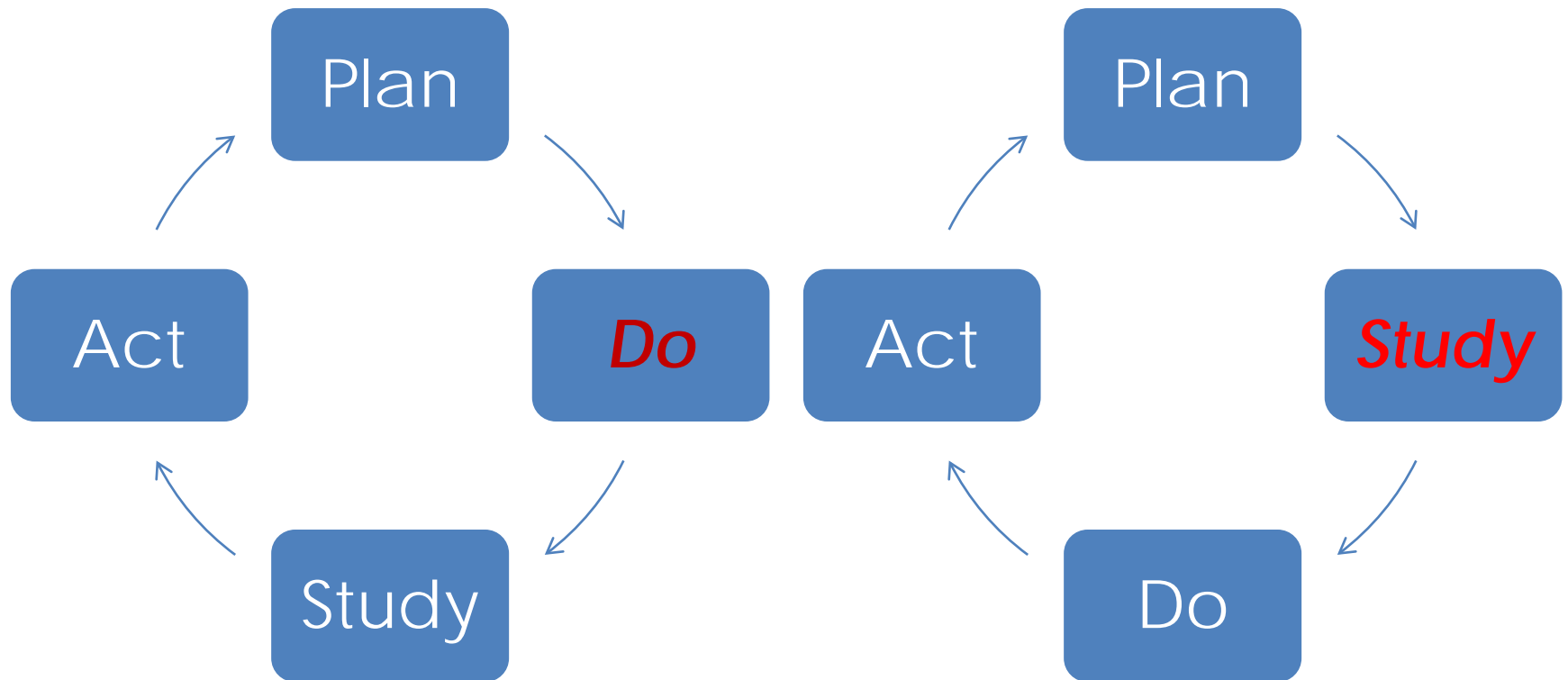
Specific.
Measurable.

Attainable: if never achieved morale may suffer.


Realistic: with the available resources.

Time frame: A due date.

Systems have properties of self-organization, emergence & adaptation.



Why do problems persist?



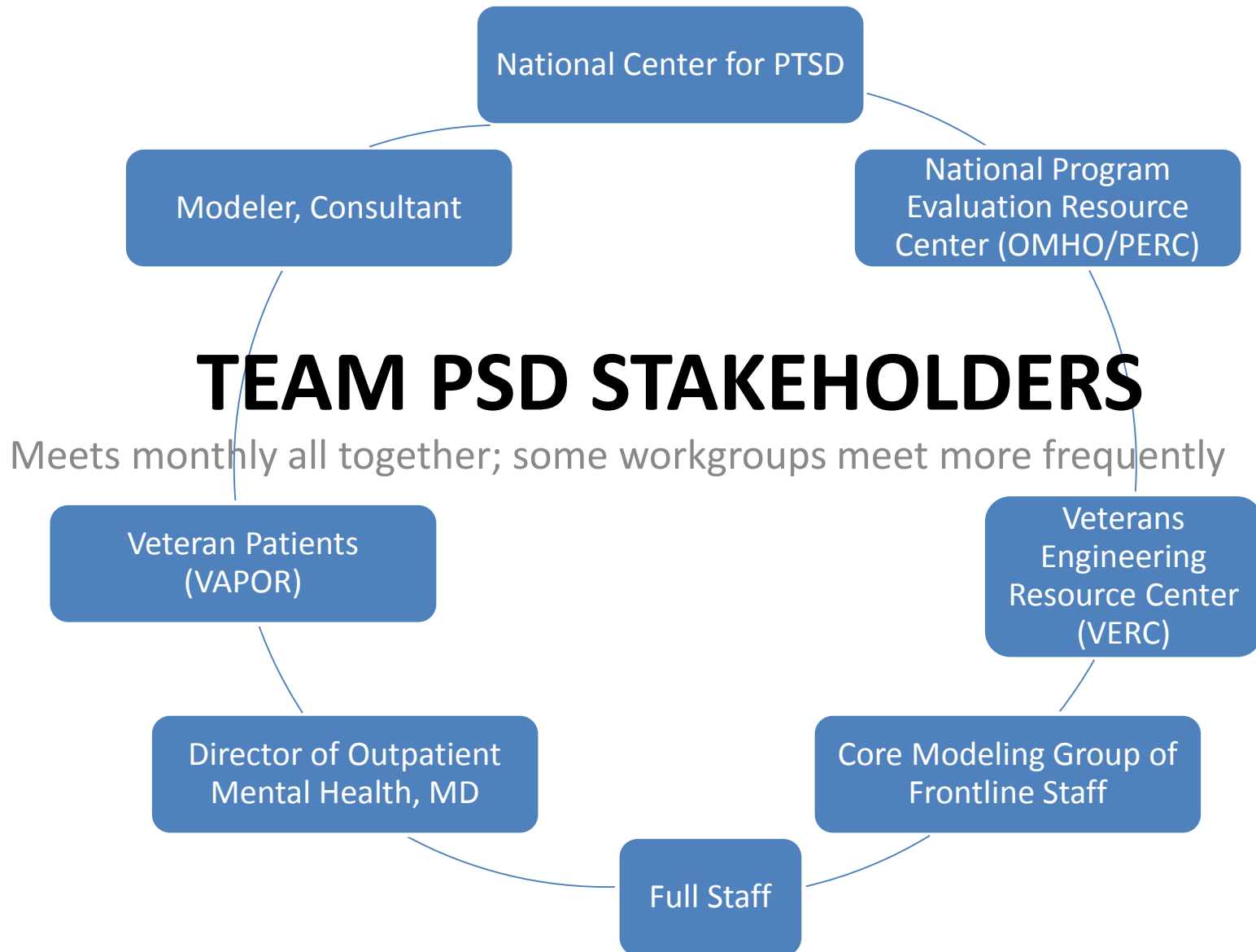
Scientific Model	Problem	Description of why quality problems persist.
General QI Teams	Learning	Stakeholders cannot or do not learn and adapt to their situation.
	Coordination	Conflict or lack of stakeholder consensus.
EBP Specific Systems Theory	Analysis	Policies are inconsistent with the real system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

Hovmand, 2013; Scaccia et al., 2015

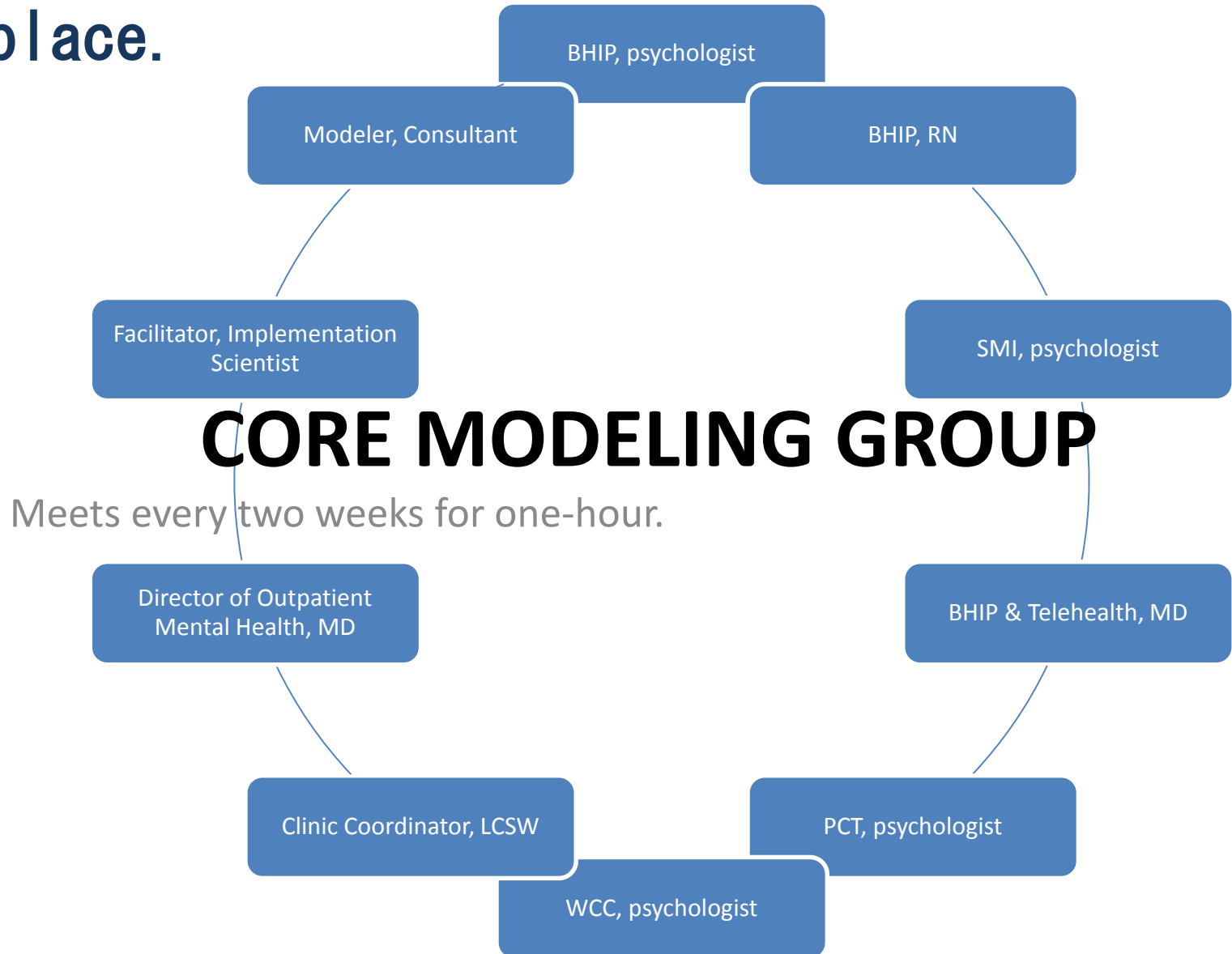
Community-based Participatory Research: A partnership approach to research that equitably involves stakeholders in all aspects of the research process and in which all partners contribute expertise and share decision-making and ownership.




We partner with national stakeholder.



We put a local stakeholder engagement process in place.



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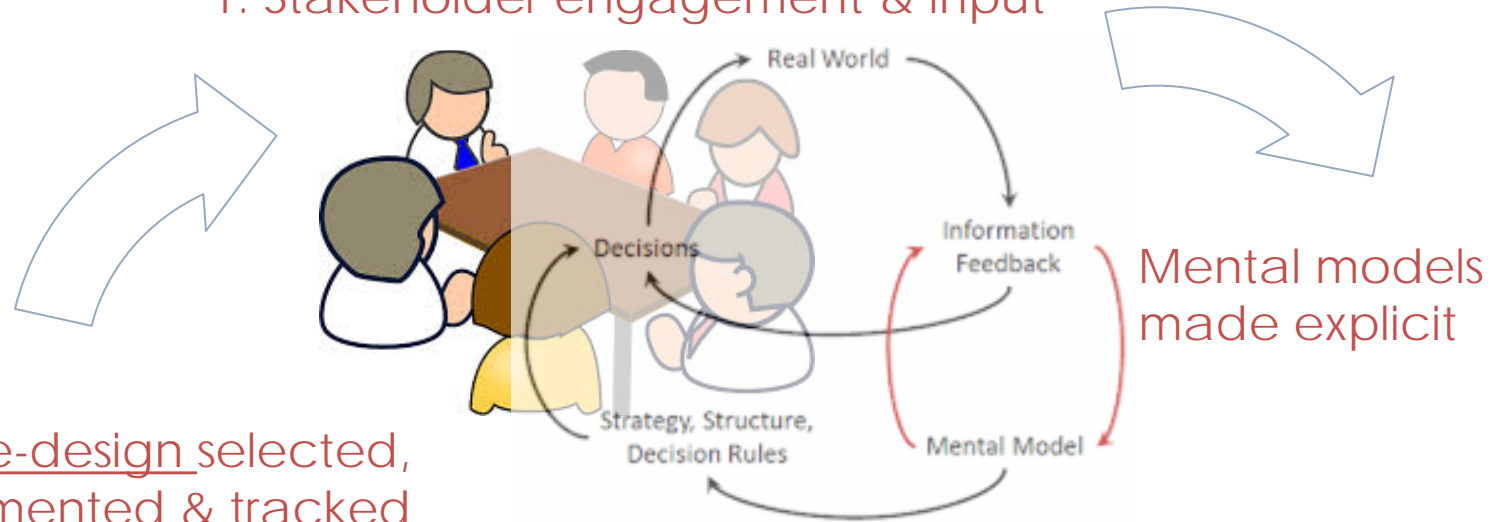
System - A set of elements interconnected in such a way that they produce their own internal dynamics. The system, to a large extent, *causes* its own behavior.

Reach as a system behavior:

the purposes of subunits in a system may add up to an overall behavior no one wants; changing elements usually has the *least* effect on the system.

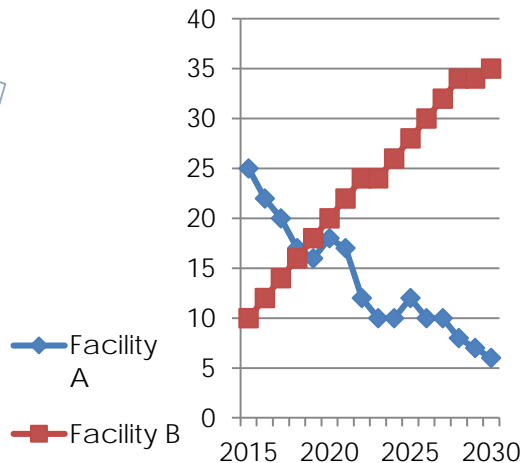
Participatory System Dynamics

1. Stakeholder engagement & input

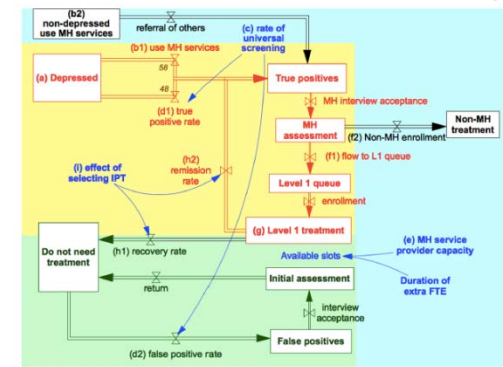


4 & 5. Re-design selected, implemented & tracked

3. Implementation impacts tested via simulation



2. System 'behavior' observed holistically



Administrative data, stakeholder estimates & research evidence

Participatory system dynamics for implementation planning.

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



ORIGINAL PAPER

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

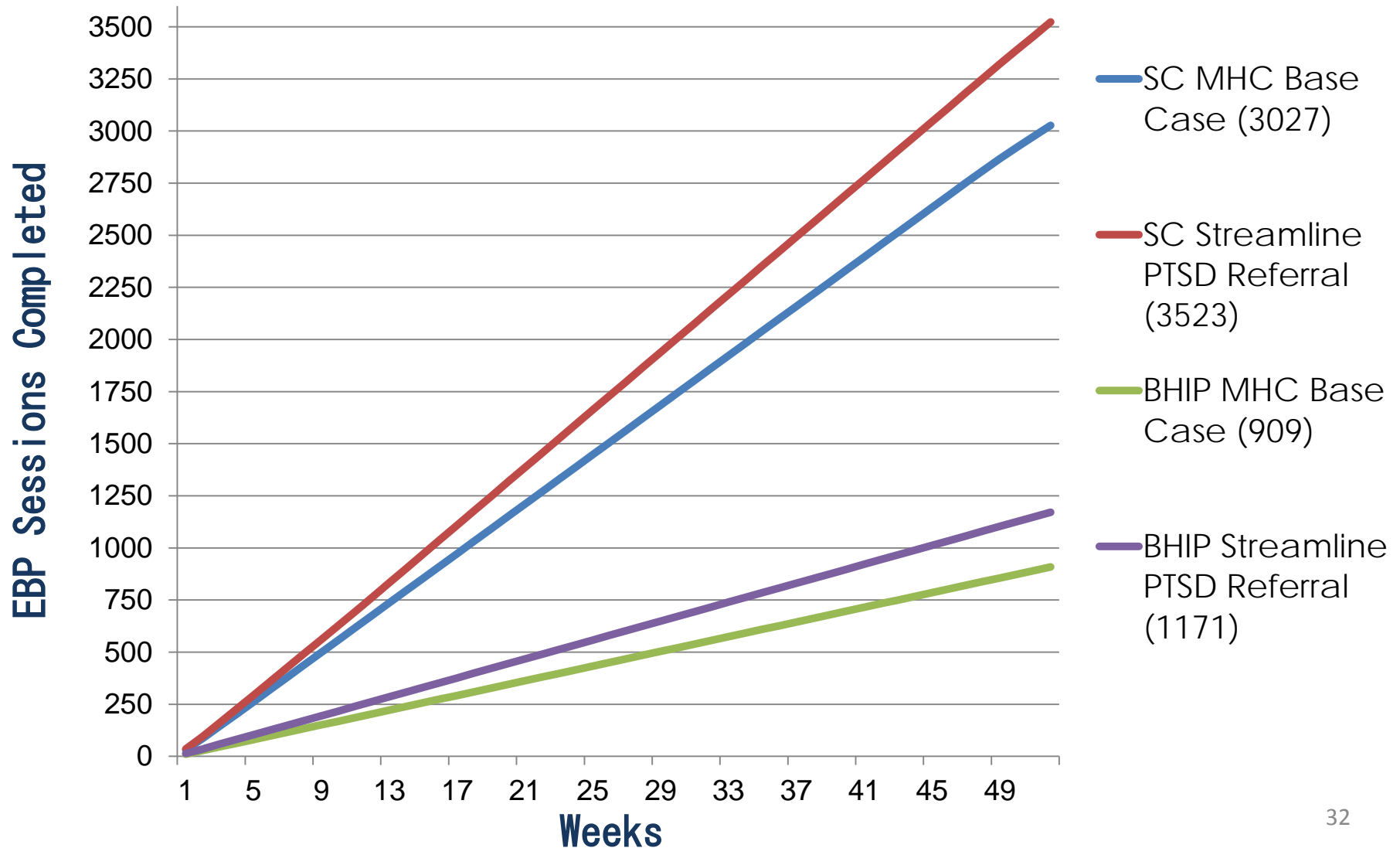
Lindsey Zimmerman^{1,2} · David W. Lounsbury³ · Craig S. Rosen^{1,4} ·
Rachel Kimerling¹ · Jodie A. Trafton^{4,5} · Steven E. Lindley^{4,6}



Springer

Please email me for even more “tech specs”

PCT Streamline Scenario



Pilot

- Preliminary pilot

NIH R21

- Increase reach of EBP initiation
- Increase reach of full EBP dose
- Increase EBP timeliness

Modeling to Learn

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Suicide Prevention

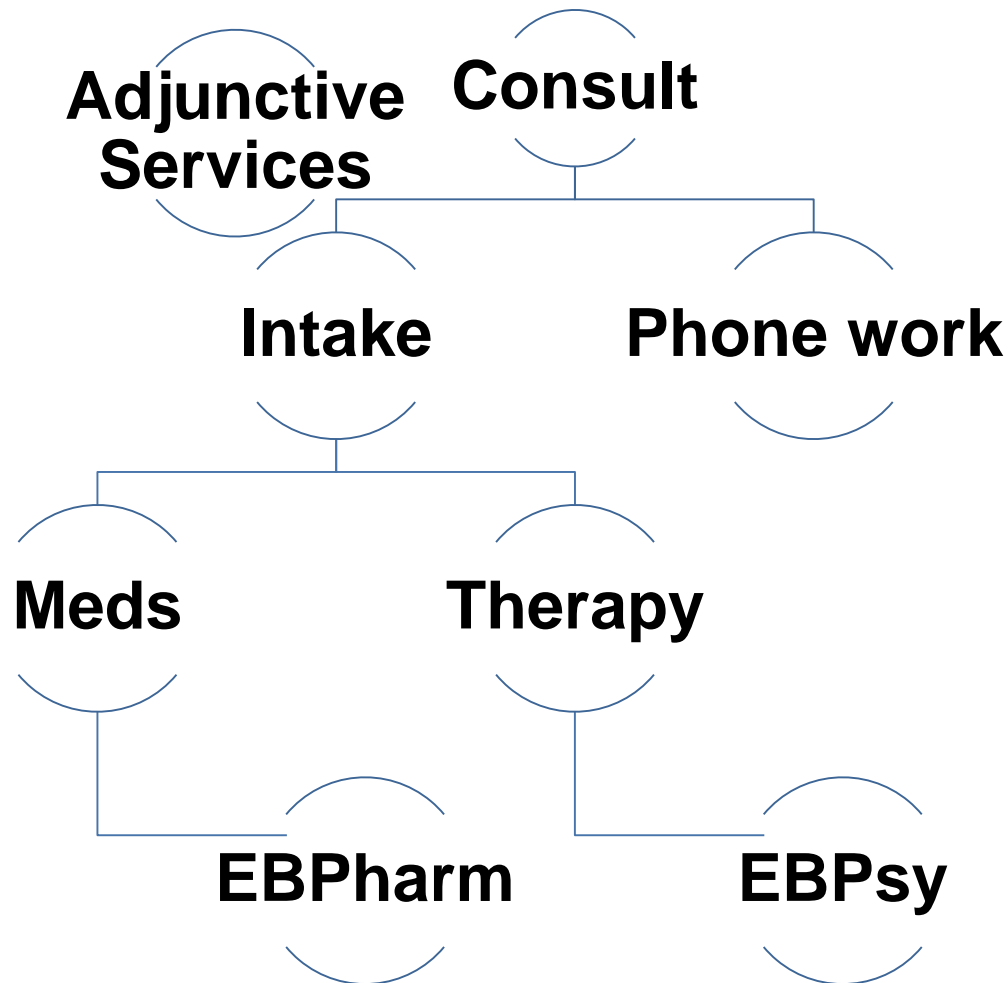
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The research question in our current effort:

Using simulation tests of stakeholder hypotheses about what procedural and policies changes would increase timely access to EBPs:

- Which proposals are most likely to align *existing* mental health resources to maximally increase reach of EBPs?

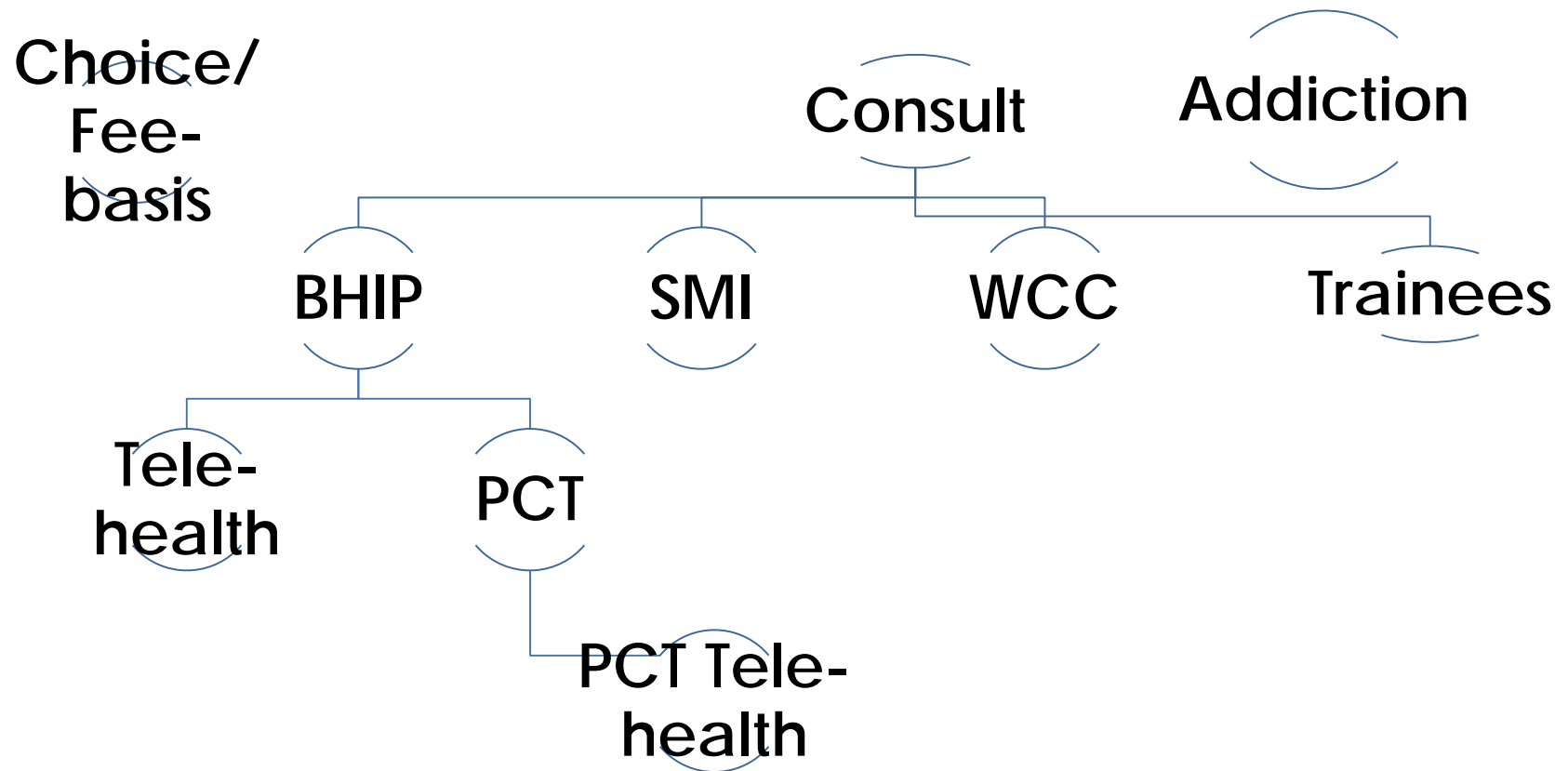
Each team has capacities for particular services.



Teams Coordinate Care

Menlo Park Teams	Stockton Team
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

The team as the fundamental molecule of the model.



Teams in the VA learning health system

- PACTs (2009) created in primary care due to
 - lagging patient access
 - increasing rates of clinician burnout and turnover
 - inefficient use of staff
- PACTs effectiveness variable, depends on implementation
 - use of clinical information
 - care coordination
 - provider turnover and burnout, still an issue

PSD Uses Existing VA Data

VA Corporate Data Warehouse (CDW) Data Source

Patient cohorts

ICD diagnostic information from visits and clinic usage (below)

Clinic capacity

Clinic/Scheduling hours VISTA/BISL clinic availability

Provider capabilities

Provider disciplines with user input to map to encounter types

Clinic utilization

Visit (workload) schema. CPT encounters.

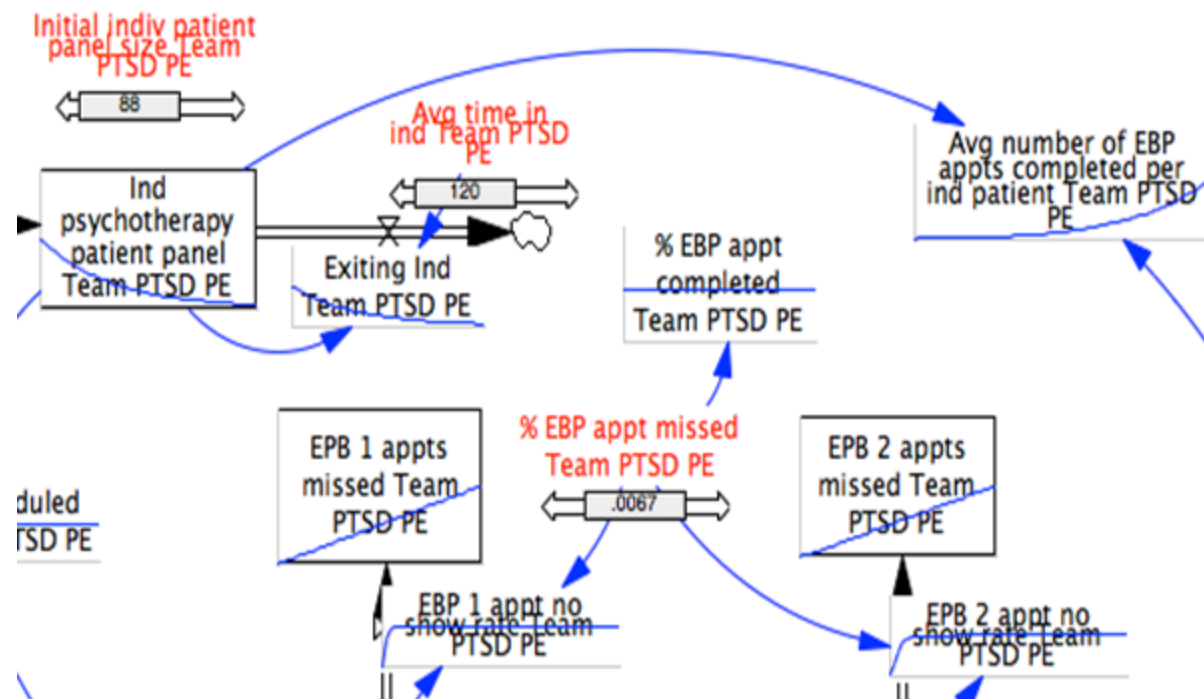
Appointment data = 'no shows'

EBP reach

Template usage from health factor schema

Stakeholder Hypotheses: Testing policy/procedure changes.

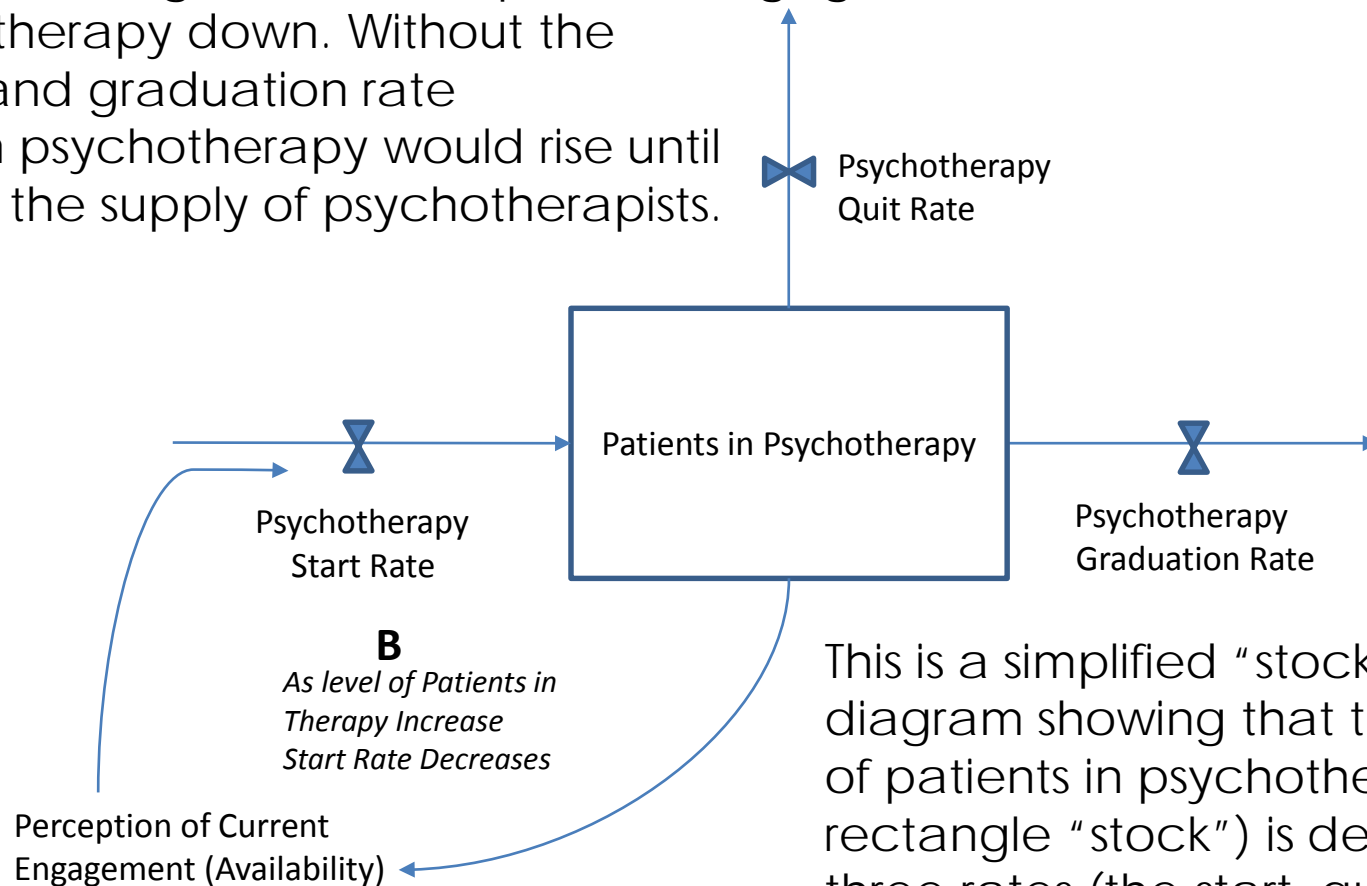
BHIP to PCT: What if intake was in BHIP and PCT started treatment without another intake?



Modeling to Learn: Example

- Flow of Psychotherapy Patients in Multi-Disciplinary Teams Over Time
- Data Review Tools for Simulation Modeling in Teams

We know identification of psychotherapy need far exceeds graduate rate.
The quit rate brings the level of patients engaged in psychotherapy down. Without the quit rate and graduation rate
Patients in psychotherapy would rise until limited by the supply of psychotherapists.



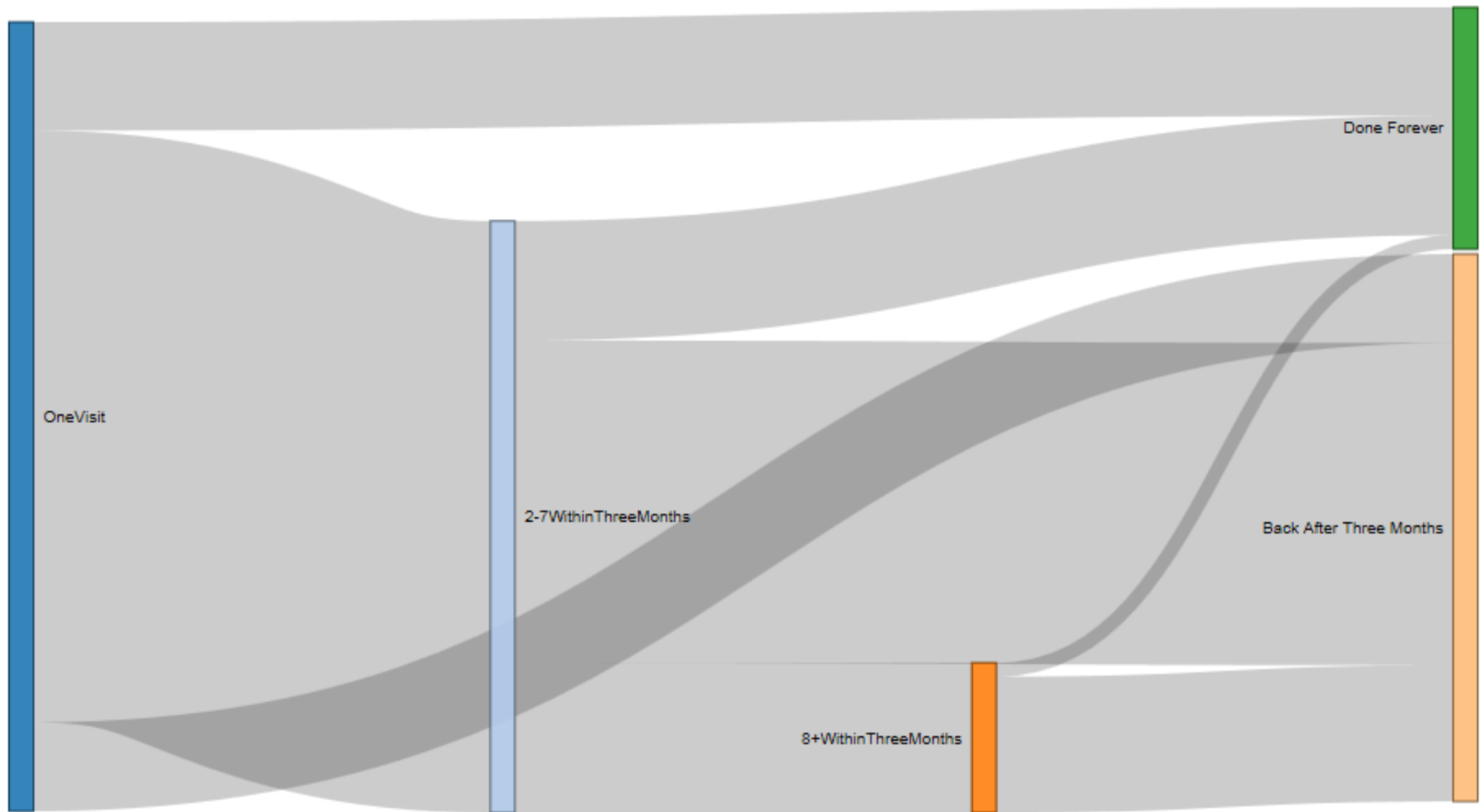
This is a simplified "stock-and-flow" diagram showing that the number of patients in psychotherapy (the rectangle "stock") is determined by three rates (the start, quite and graduate "flows") and it also determines the start rate through a feedback loop: perception of psychotherapy availability.

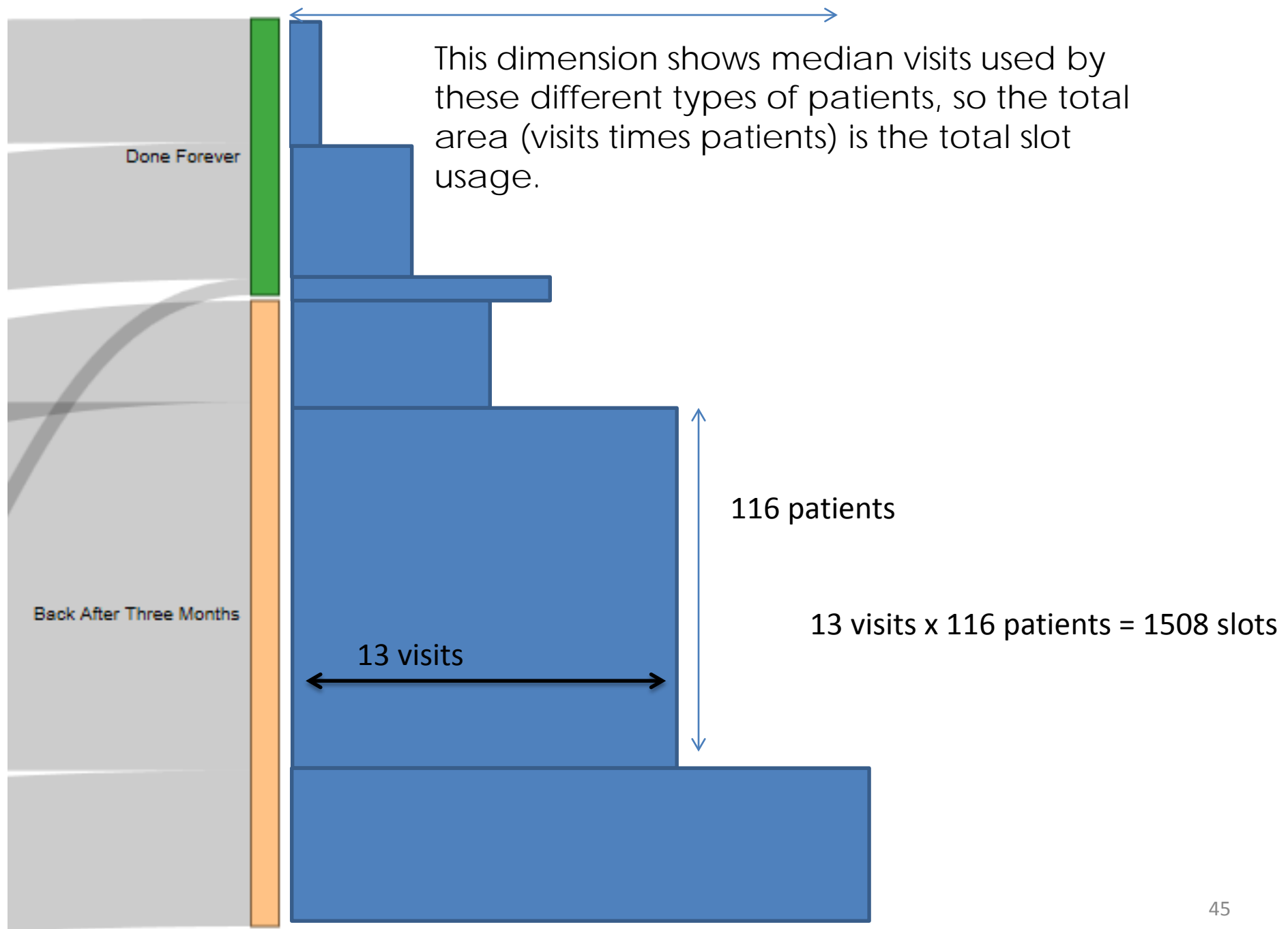
We identified 6 patterns of psychotherapy engagement in teams.

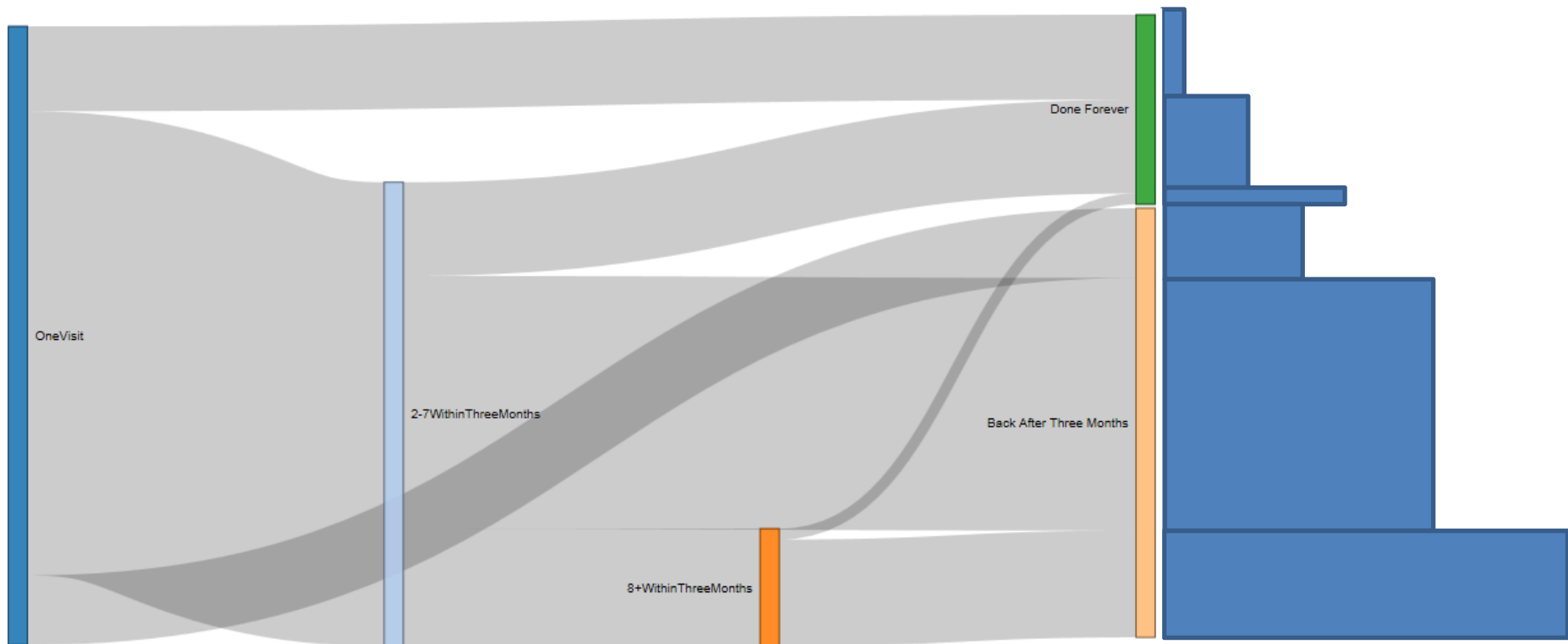
1. One and done
2. Initiators
3. Completers
4. One visit and return later
5. Initiators who return later
6. Completers who don't graduate

- To get a sense of patients' typical psychotherapy flow in the teams, we examined the total psychotherapy engagement for any patient seen in CY2016.
- If a patient had any psychotherapy visit in CY2017 we looked backward in time to find their first visit, and then looked forward to August of 2017.

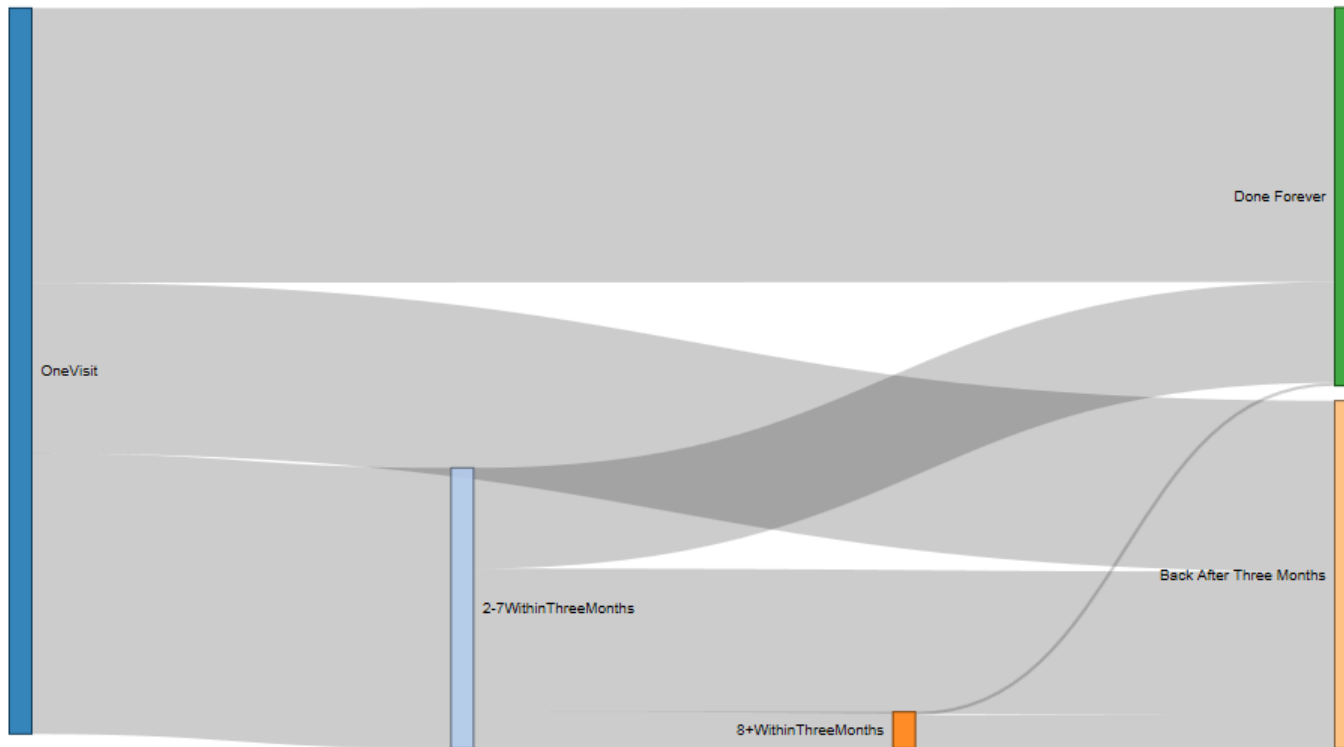
284 psychotherapy patients in CY 2016 in PCT

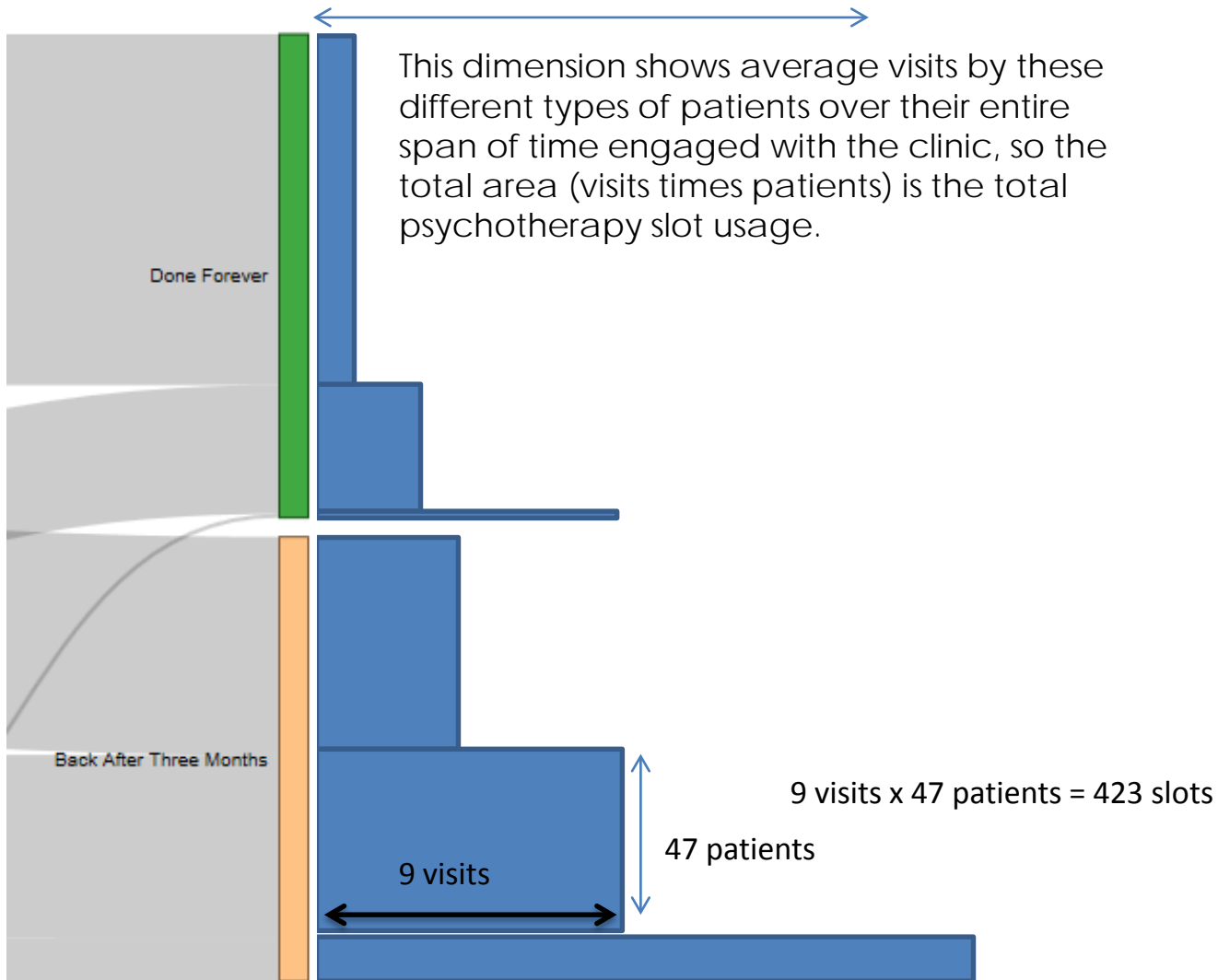


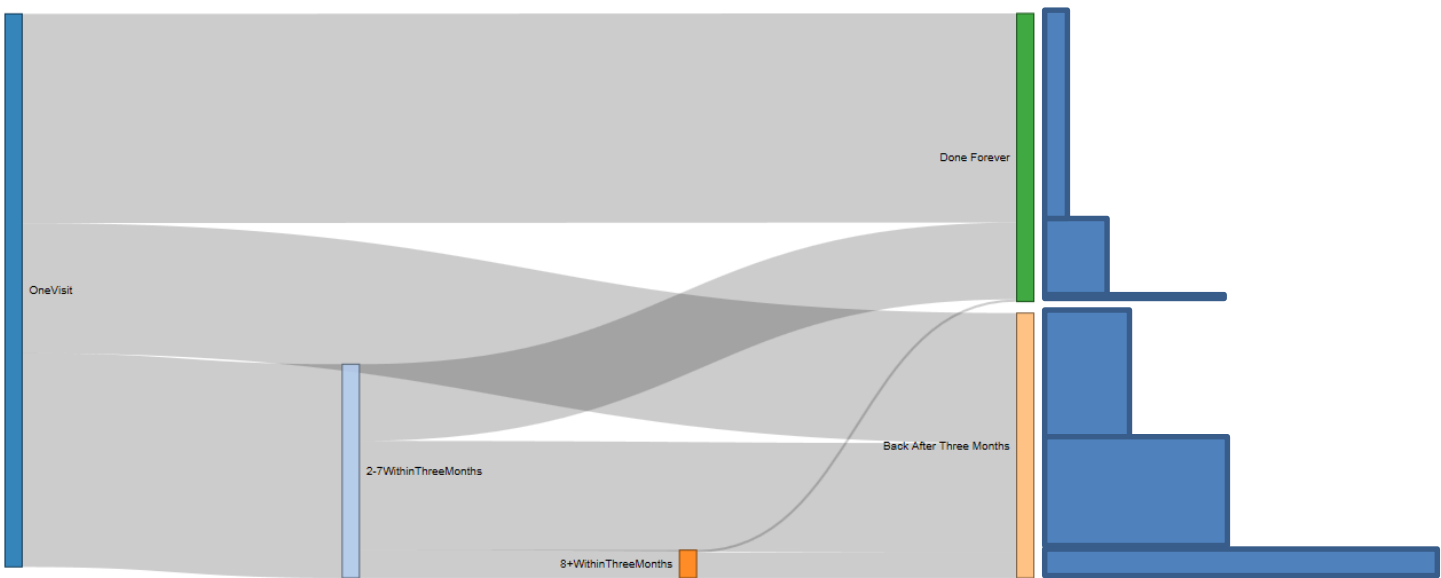




238 psychotherapy patients in BHIP Team Blue in CY 2016



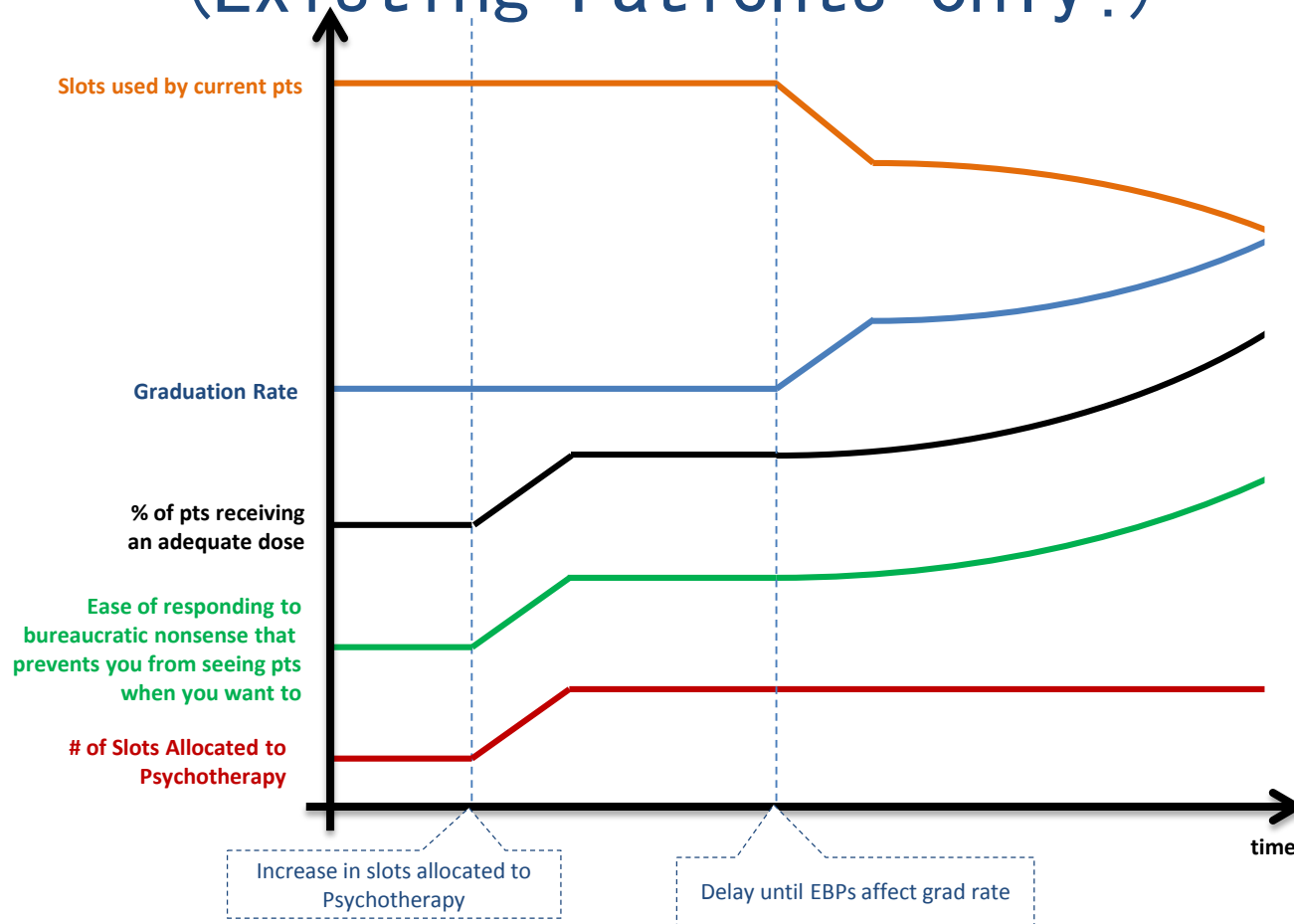




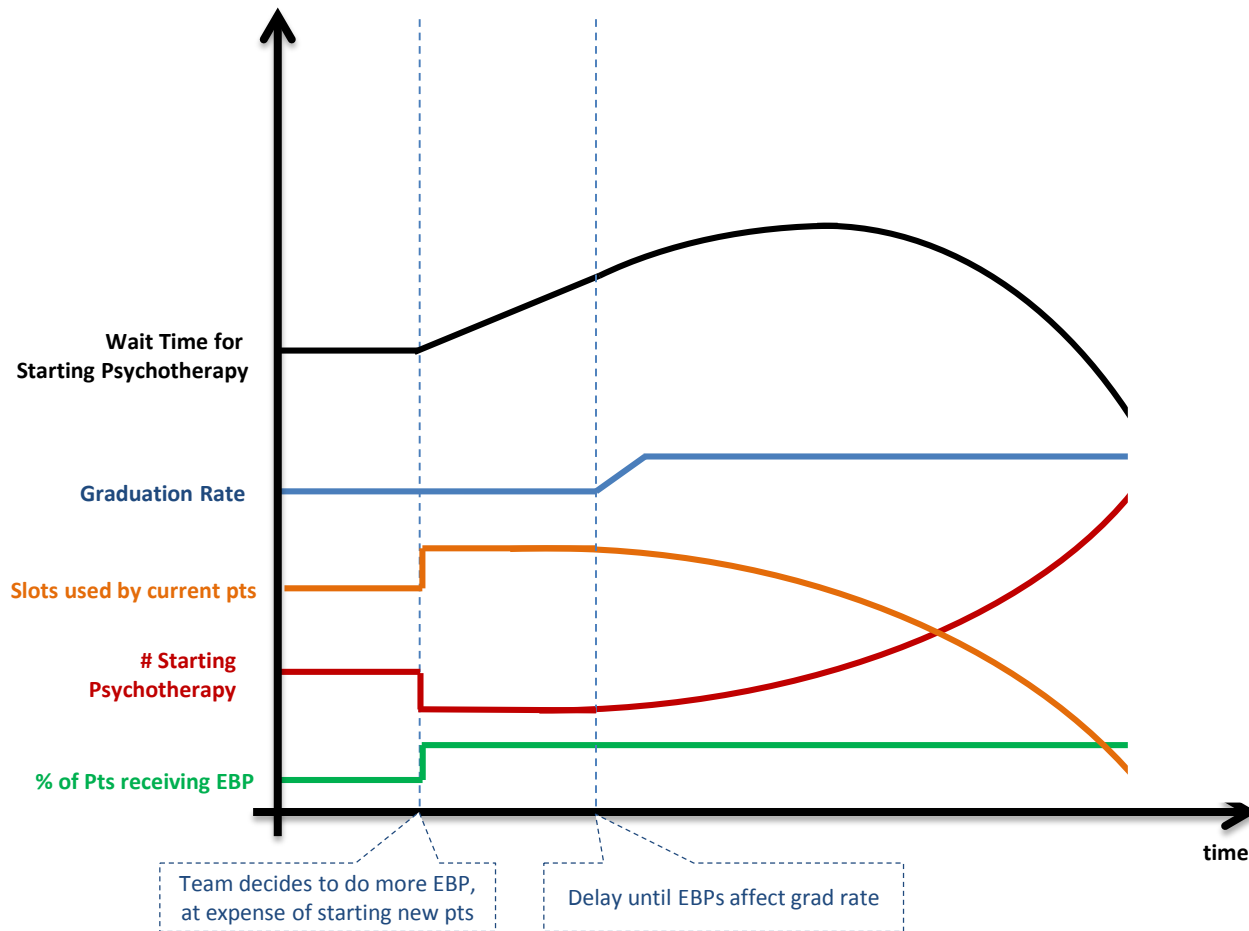
Dynamic Hypotheses about Psychotherapy

Continuity of Care

(Existing Patients only!)

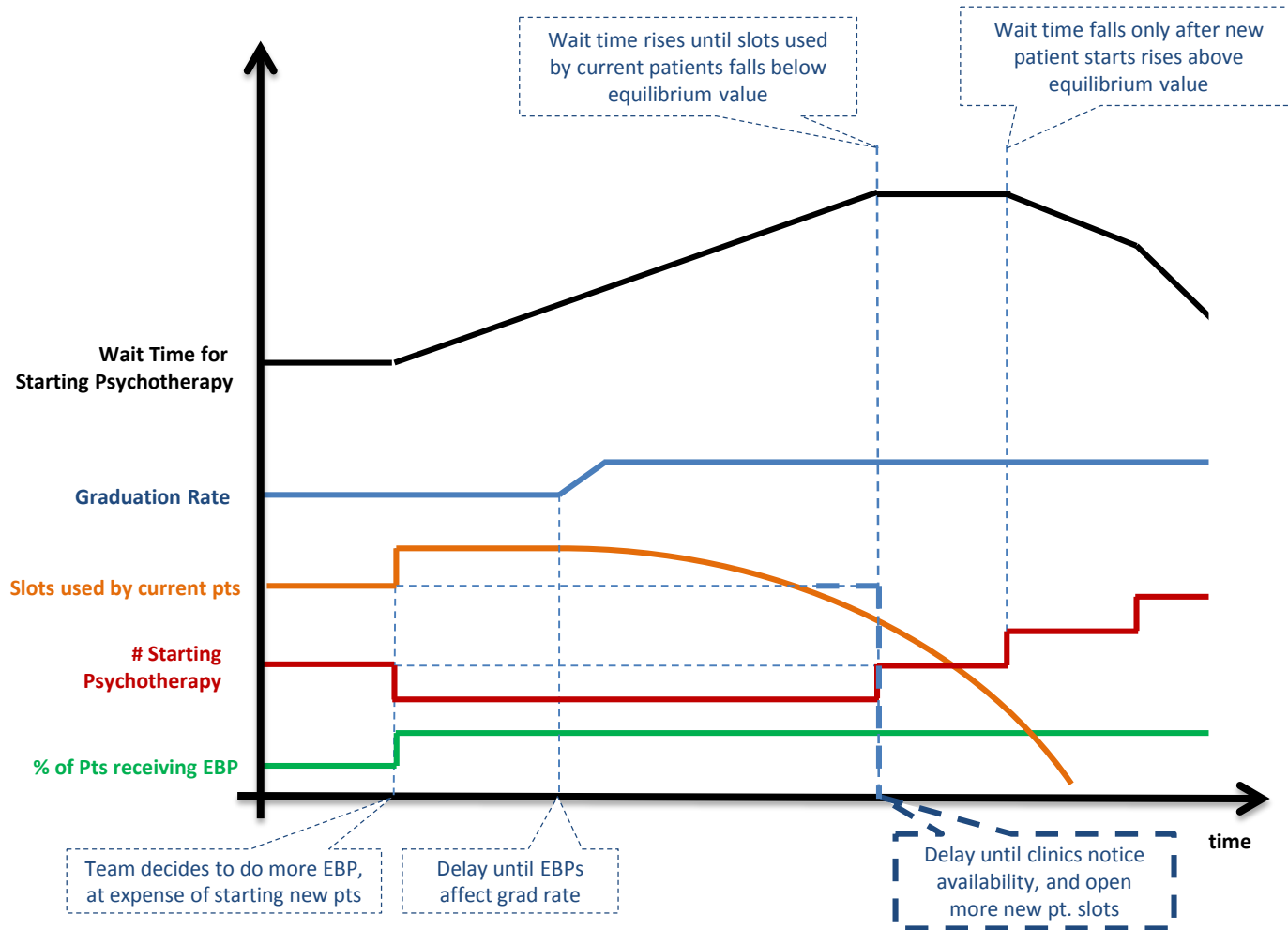


Balancing Access to Care Priority for New Patients, with Completion of EBPs by Existing Patients

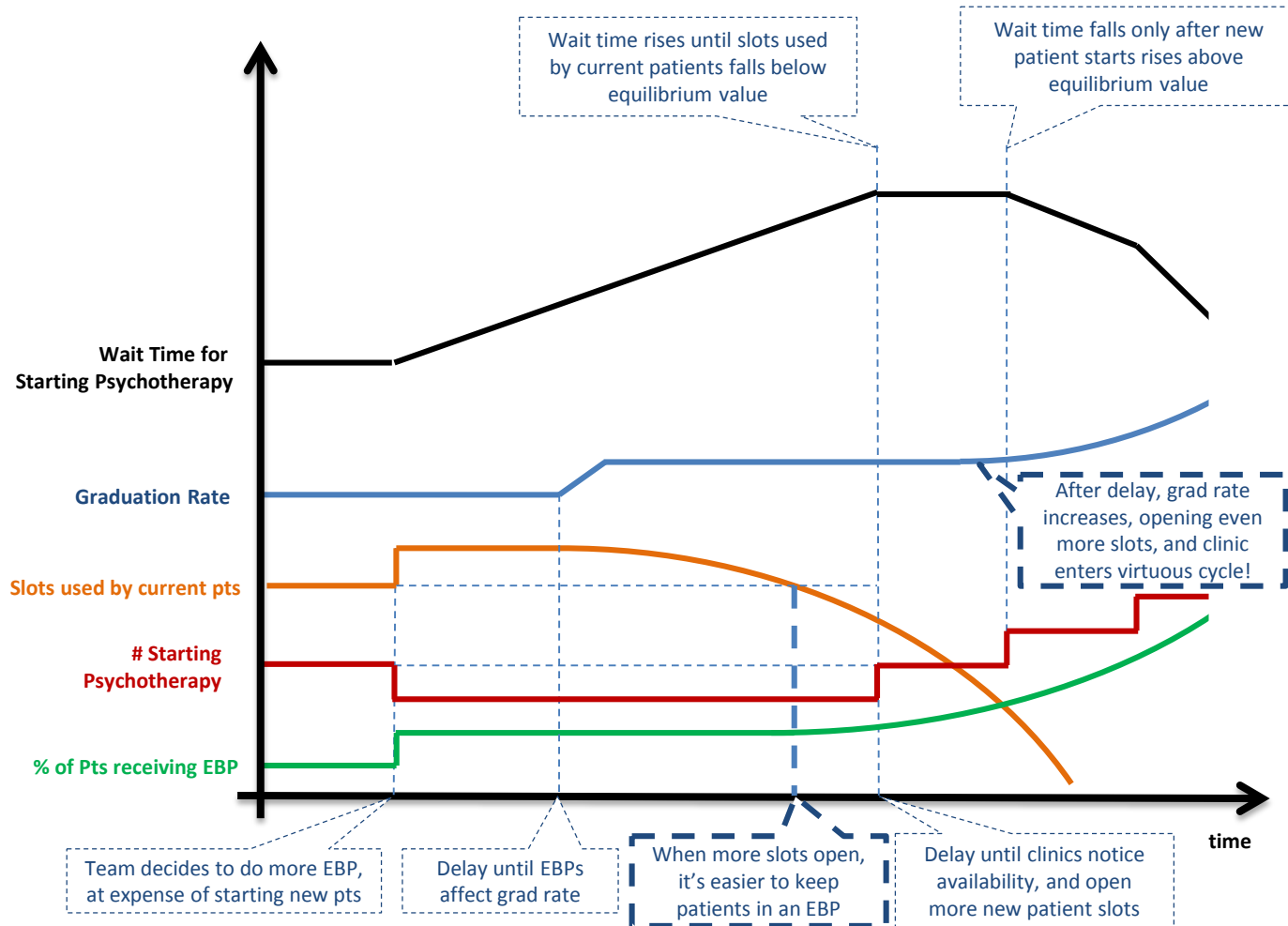


Dynamic Hypothesis: Worse before better!⁵¹

With information delays among providers,
it's actually way worse before better!!!!



Yes, way worse before better, but with increasing long term improvement!!!!!!!



Pilot

- Preliminary pilot

NIH R21

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Modeling to Learn

- **QI training continuing education credit**
- **Accessible simulation user-interface**
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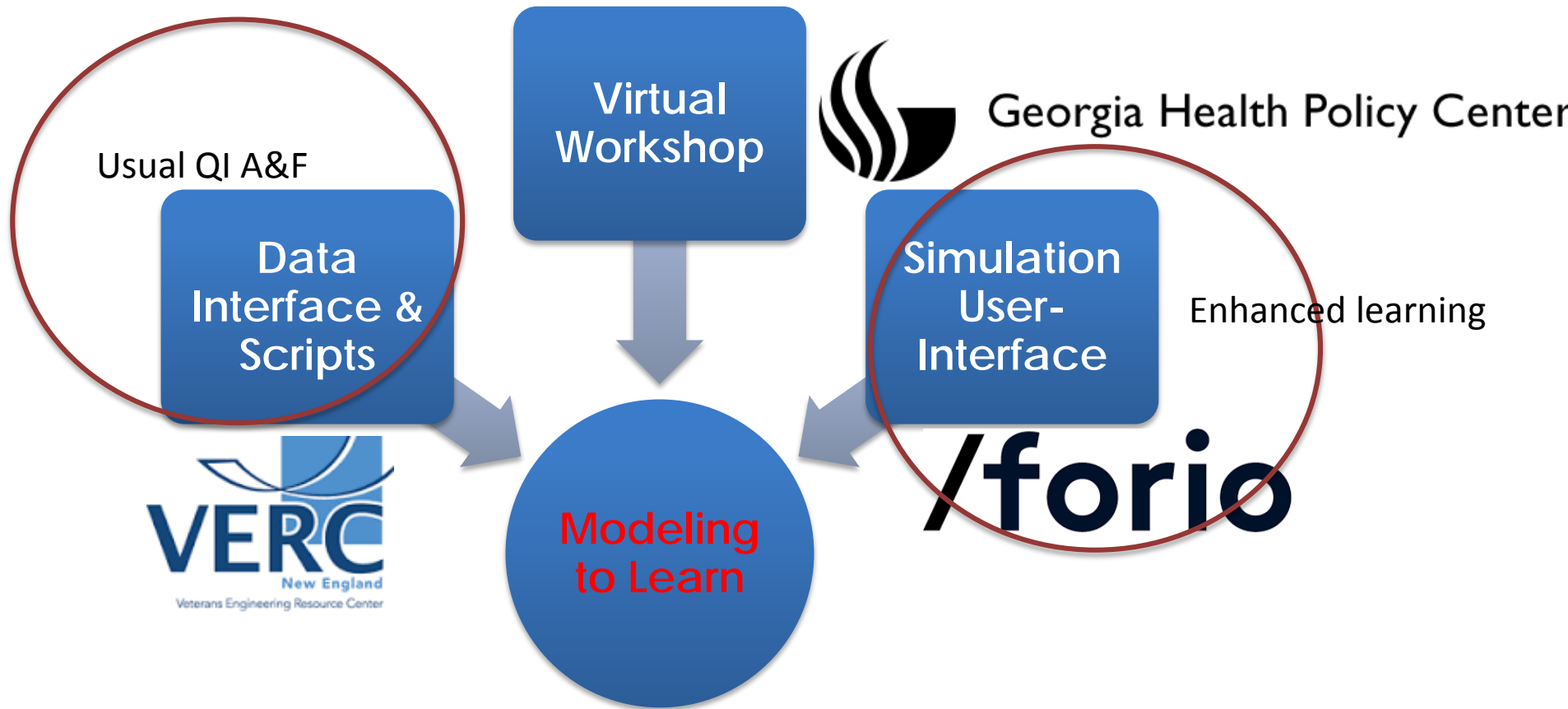
Suicide Prevention

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VA learning health system

- VA learning to achieve
 - timely access
 - coordination of care
 - consistent high quality
- Using systems theory PSD examines trade-offs among competing priorities to optimize existing resources

Modeling to Learn Workshop Series



Team-based quality improvement training.
VA Employee Education Services (EES) working with us for accreditation.

Session prototypes in Rmarkdown

<https://github.com/lzim/teampsd>

Four simulation models have been developed

Lessons that can be learned in 1 team meeting:


1. Care Coordination
2. Medication Management & EBPharm
3. Psychotherapy & EBPharm
4. Aggregate Model “Putting it all Together”

OSI/VERC and NCPTSD/ OMHSP developed a site for reviewing data used in team simulations.

BISL

CDW

VISNs

**BISL**

PTSD_OMHO

[Drill Down To Your Team](#)

[Request New Team Folder](#)

[Request Team Membership Change](#)

Pages

Administrative

User Guide

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Site Contents

Select Your VISN

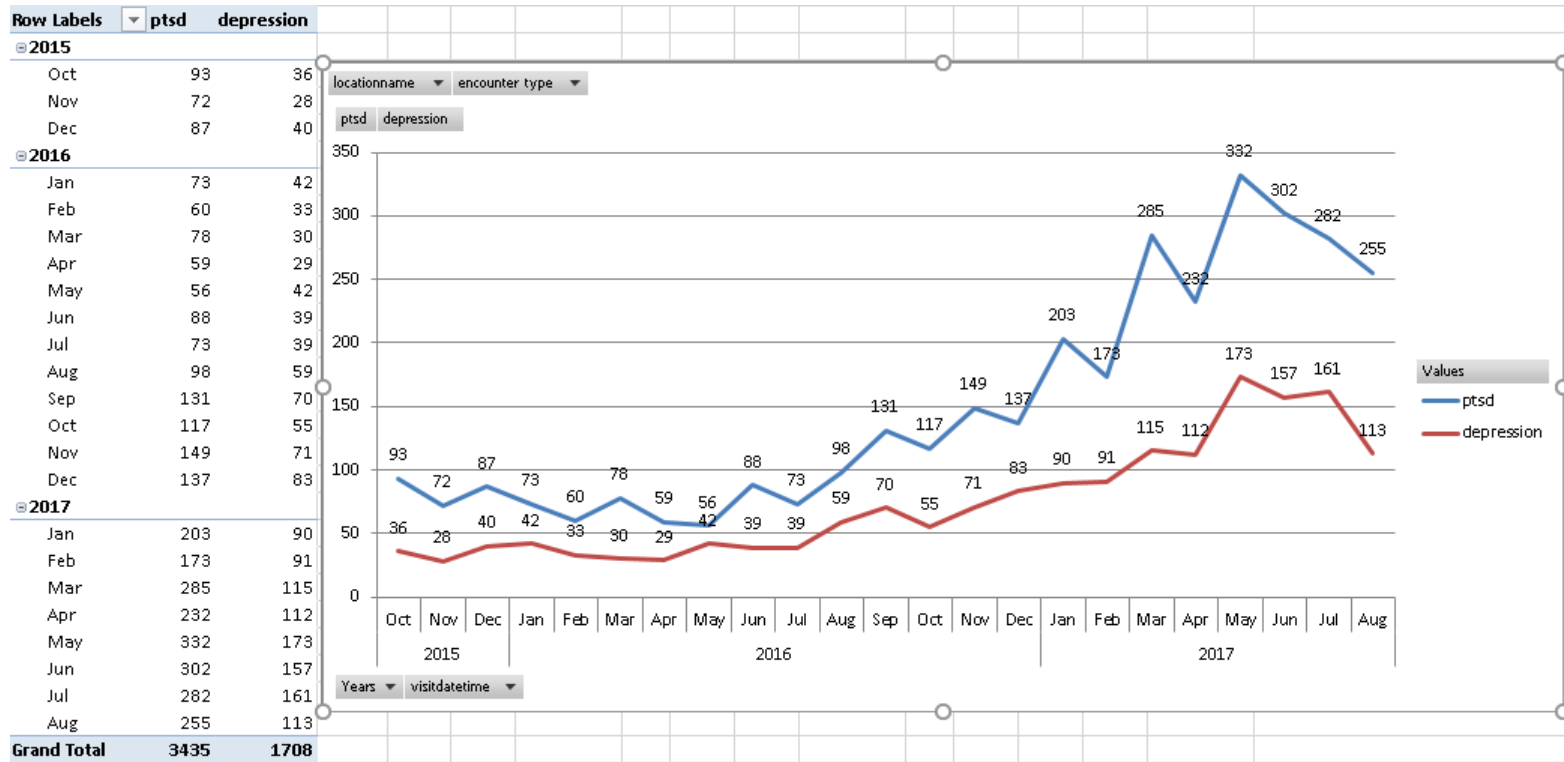
- VA Office of Strategic Integration (OSI) and Veterans Engineering Resource Center (VERC)
- National Center for PTSD (NCPTSD) and Office of Mental Health and Suicide Prevention (OMHSP)
- The data and code have been developed for consistency with other OMHSP dashboards and quality metrics, such as SAIL.

Dynamic Data Tool for Reviewing Data Used in Simulation Model

	A	B	C	D	E	F	G	H
1				preset:				
2				Tele				
3	Clinic names to use go in the box below. Double click a clinic name below to remove it or to the right to add it.				Get Patient-level Data			
4								
5		->	remove all					
6		<-	add all					
7			Clinic Name	Division Name	Physical Location	Primary Stopcode	Secondary Stopcode	Default Provider
8			MHC-TELEPHONE(MPD)	PALO ALTO, MPD		TELEPHONE MH	MENTAL HEALTH CLINIC - IND	
9			PC-BEHAV-HEALTH-PHONE(MOC)	PALO ALTO, MOC	PHONE CALL TO PT	TELEPHONE MH	MH INTGRD CARE IND	MACK, EVANA LAVONN
10			LD-MH-TELE-SPC	PALO ALTO, LD		TELEPHONE MH	MENTAL HEALTH CLINIC	SHIRLEY, NADINE A
11			PC-BEHAV-HEALTH-PHONE(SJC)	PALO ALTO, SJC	PHONE CALL TO PT	TELEPHONE MH	MH INTGRD CARE IND	
12			PC-BEHAV-HEALTH-PHONE(LD)	PALO ALTO, LD	PHONE CALL TO PT	TELEPHONE MH	MH INTGRD CARE IND	
13			PC-BEHAV-HEALTH-PHONE(STC)	PALO ALTO, STC	PHONE CALL TO PT	TELEPHONE MH	MH INTGRD CARE IND	KEENER, MELINDA J
14			PC-BEHAV-HEALTH-PHONE(MONT)	PALO ALTO, FOC	PHONE CALL TO PT	TELEPHONE MH	MH INTGRD CARE IND	
15			LD-MH-TELE-OEF/OIF-FAM	PALO ALTO, LD		TELEPHONE MH	SERV-MH INDIVIDUAL	
16			MOC-MH-TELE-OEF/OIF-FAMILY	PALO ALTO, MOC	MODESTO	TELEPHONE MH	SERV-MH INDIVIDUAL	
17			MHC-OEF/OIF-FAMILY-PHON(PAD)	PALO ALTO, PAD	PALO ALTO	TELEPHONE MH	SERV-MH INDIVIDUAL	
18			PC-BEHAV-HEALTH-PHONE(PAD)	PALO ALTO, PAD	BLDG 5, 2ND & 3RD FLOOR	TELEPHONE MH	MH INTGRD CARE IND	HOCKEMEYER, JILL R
19			PC-BEHAV-HEALTH-PHONE(PAD)	PALO ALTO, PAD	BLDG 5, 2ND & 3RD FLOOR	TELEPHONE MH	MH INTGRD CARE IND	MAZZONE, JAMES
20			MHC-OEF/OIF-FAMILY-PHON(STC)	PALO ALTO, STC	STOCKTON CLINIC	TELEPHONE MH	SERV-MH INDIVIDUAL	
21			SJC-MH-TELE	PALO ALTO, SJC	SAN JOSE	TELEPHONE MH	MENTAL HEALTH CLINIC - IND	

Providers can select the clinic “grids” that make up the dataset they want to explore. There may be a preset set up already, such as the telephone encounters presented here.

Data Used in Simulation Model is Graphically Displayed as Trends over Time for the Team.



This shows that the Telehealth team has been serving an increasing number of patients in which the visits (all encounter types shown) listed PTSD or depression as a primary or secondary diagnosis. Providers can filter to different views.

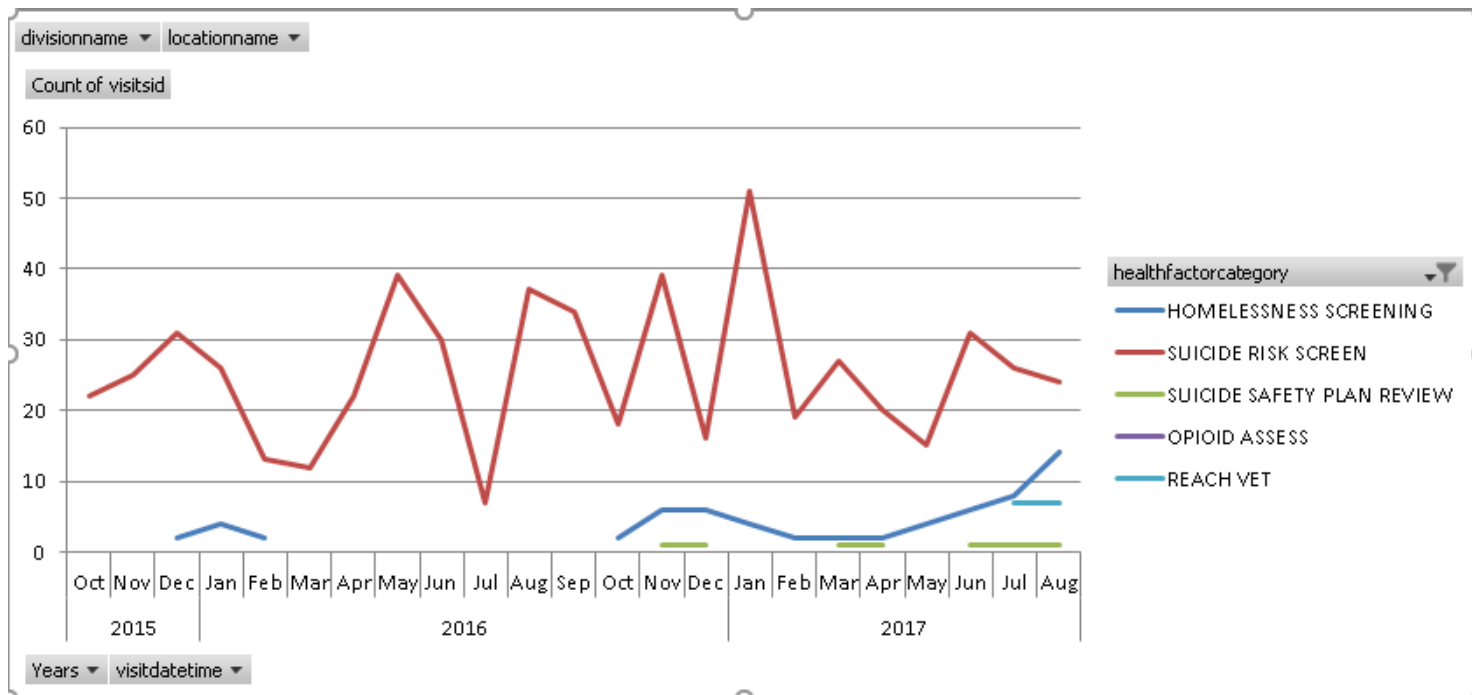
Trends Graphs also produce searchable reports.

A	B	C	D	E	F	G	H	I	
patients	visitsid	visitdatetime	patientName	patientSSI	divisionname	locationname	encounter type	icd10cd	icd10description

Teams can discuss graphs and reports during team huddles for care coordination decisions and for quality improvement.

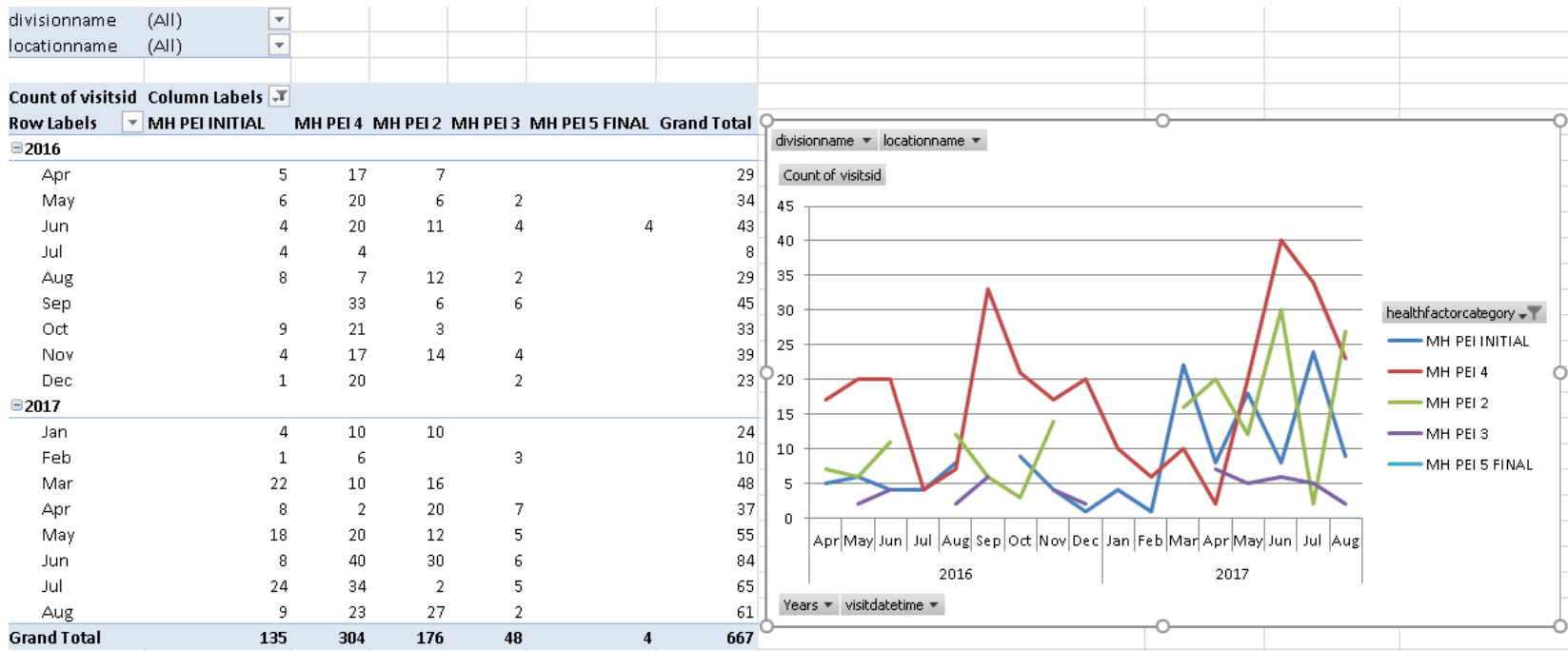
- Providers review data, and have the ability to drill-down to individual patient data
- This afford strengths for
 - Improving the quality of coding encounter, diagnosis and other EHR data through nearly real-time review
 - Improving provider confidence in the data that feeds the simulation models
 - Model simulations can more precisely guide decisions when parameters are a from a particular team

Teams report that they value graphically displayed trends (peaks) of time spent with high-risk patients.



The team can review their typical screening practices to note where gaps in quality exist. They can also review the underlying report to follow-up with specific patients who require care coordination and follow-up.

Teams value graphical review of EBP template data, such as this Team Prolonged Exposure graph.



The team can review EBP delivery to determine where gaps in continuity exist. They can also filter and review the underlying report to review specific patients and where they are in their treatment.

PSD Modeling Approaches for Building Consensus and Commitment for System Changes

Provide information about the local need for change	Show the system behavior reference mode (quality gap)
Identify demands/resources/constraints driving quality gaps	Explore tradeoffs and mechanisms of system behaviors
Explore how changes will impact frontline staff and patients	Simulate QI changes proposed by staff using local data
Use accessible tools for selecting and sharing the best changes	Interactive, Online Data Visualization, Simulation Tools

Adapted from Morecroft & Sterman, Modeling for Learning Organizations, 1994; Vennix, Group Model Building, 1996; Langley G.J. et al., The Improvement Guide: A Practical Approach to Enhancing Organizational Performance. San Francisco: Jossey-Bass

What staff think is useful

- If staff feel heard, that will improve morale. Some basic changes will be very helpful.
- Better scheduling and sensible workflow.
- Getting everyone on the same page.
- Show accurate numbers/stats to help give the overall staff understanding of process, uniformity and reflect workload adequately.
- Being able to implement change in a far more targeted way.
- Having a physical representation for fine tuning a process.
- That is looking at systems and allowing needed dialogue.
- Taking into consideration more real world complexity.
- Integration.
- Having an outside consultant with the potential to engage without vested interest to manipulate.

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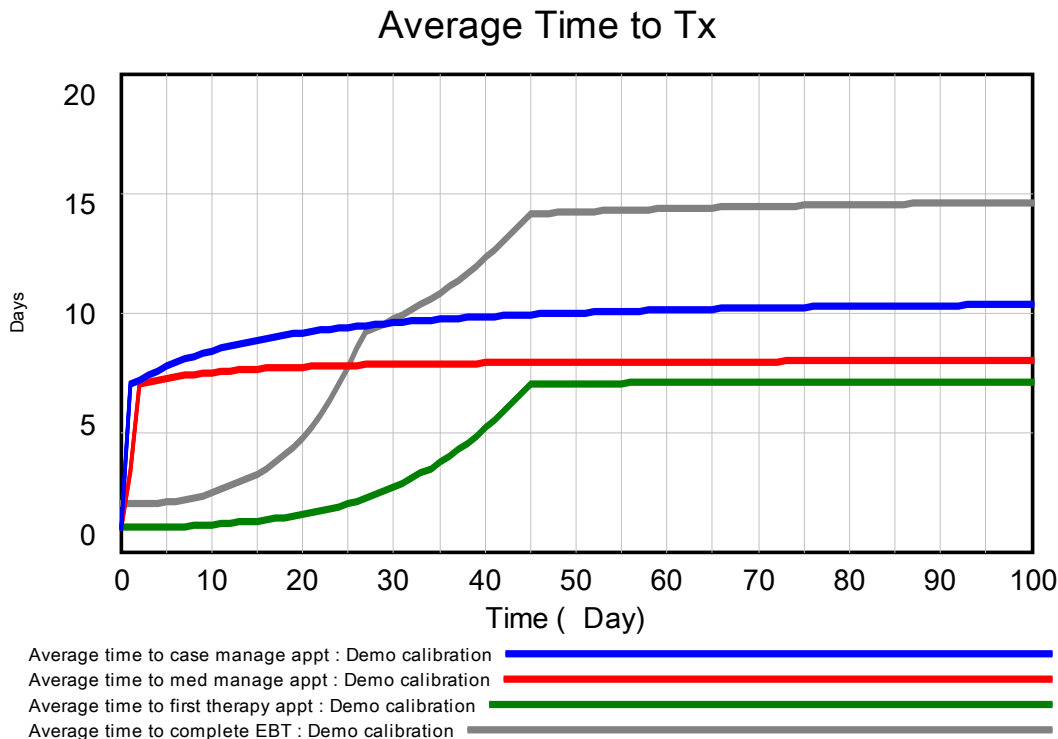
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Modeling saves time and effort.



We use simulation to see impacts of proposed changes on the whole system in real time before we actually try to implement anything.

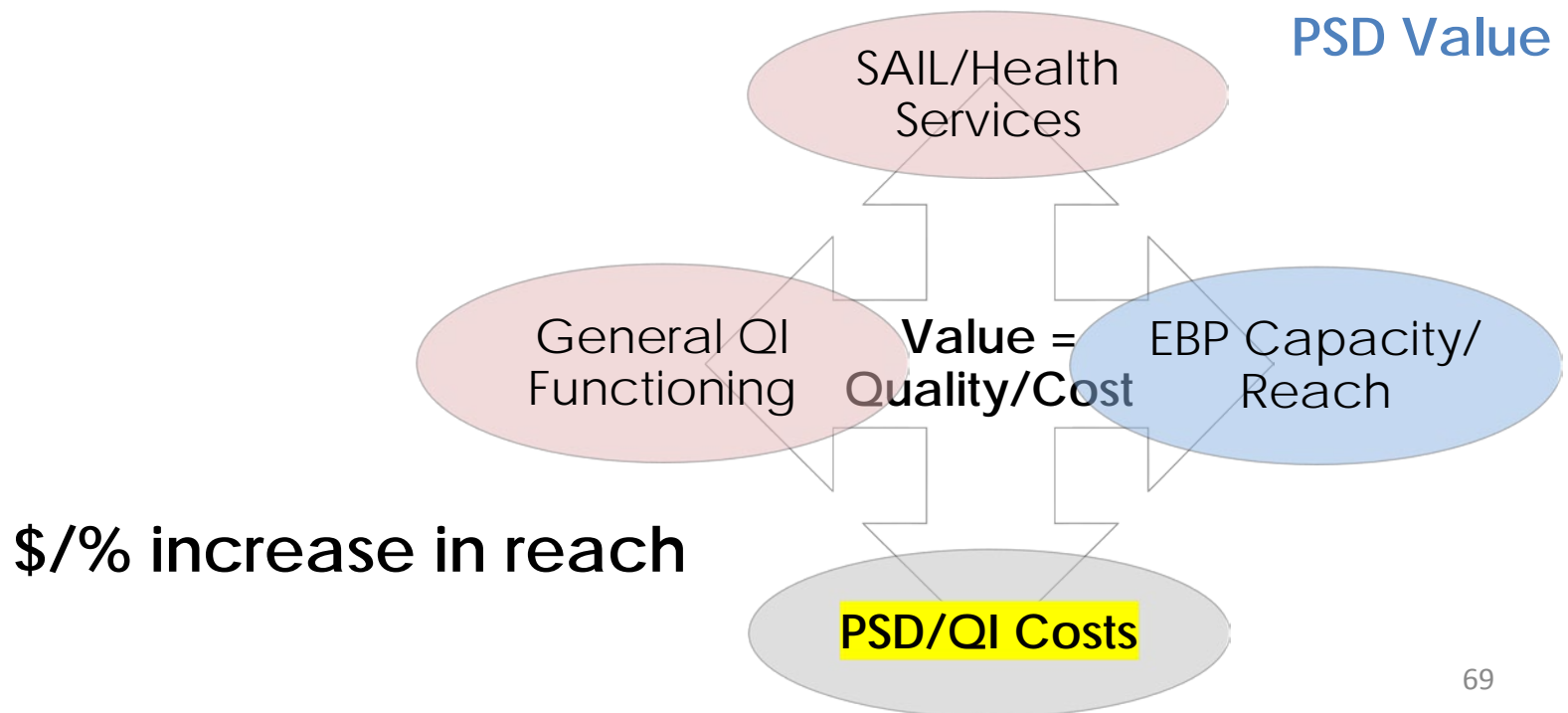
We also determine when we should achieve our goal.

Value of PSD Review

- **Front-end Value Proposition**
 - Improved consensus 49% (53 of 107 projects)
 - More efficient than other modalities for problem-solving 33% (34 of 107)
- **Back-end Value Proposition**
 - Systems change 42% (46 of 107)
 - Most (89%; 41 of 46) use the model to guide and evaluate
 - Commitment to change increased 33% (35 of 107)

Frameworks for the IIR

Theory	Systems Theory
Policy	OMHO SAIL (pink QI) VA EBP Dissemination (blue)
Strategy	Participatory System Dynamics (PSD)
Target	Quality Improvement Defined by EBP Reach



Pilot

- Preliminary pilot

NIH R21

- Increase reach of EBP initiation
- Increase reach of full EBP dose
- Increase EBP timeliness

Modeling to Learn

- QI training continuing education credit
- Accessible simulation user-interface
- Data/training tailored to local care teams

IIR

- PSD vs QI as usual for increasing EBP reach
- Determine Budget impact of PSD
- Calculate PSD Incremental Cost-effectiveness Ratio

R01

- **PSD vs Audit-&-Feedback for increasing EBP reach**
- **Measure hypothesized mechanisms of change**
- **Exploratory mediational analyses**

Suicide Prevention

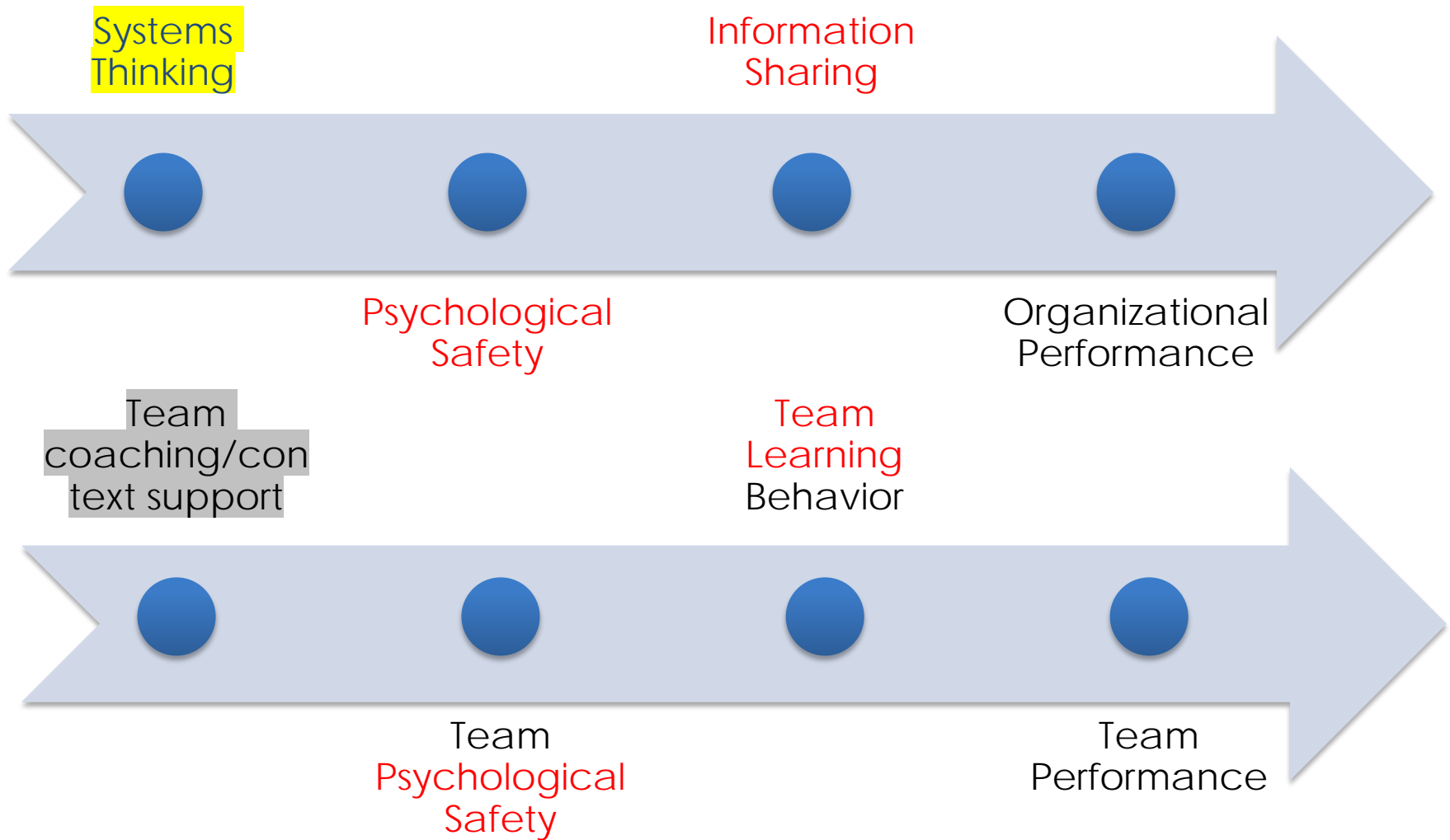
- Address new priority in team “Modeling to Learn” training
- Guide facility Suicide Prevention Coordinators
- Train OMSHP Tech. Assistants; Network Performance Plan

Mechanism of Change in Learning Organizations

Systems, Simulations and Psychological Safety

- Learning key to effectiveness (Senge, 1990; Argyris, 1993)
- Interpersonal interactions inhibit/facilitate learning
- Shared belief that a team is safe for interpersonal risk taking

Bendoly, 2014



Edmonson, 1999

Measures – Learning Organization Survey (LOS-27)

Singer et al., 2012

1. Supportive learning environment
2. Leadership reinforces learning
3. Experimentation
4. Time for reflection
5. Training
6. Knowledge acquisition
7. Performance monitoring

Measures - Systems Thinking Scale (STS)

Moore et al., 2010/VA Quality Scholars

- The 20-item Systems Thinking Scale has good reliability and construct and discriminate validity.
- **Systems thinking:** The ability to recognize, understand, and synthesize interactions and interdependencies.
- an understanding of how actions and components can reinforce or counteract each other.

Pilot

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Suicide Prevention

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High value deliverables for the suicide prevention priority.

1. An EES supported, accredited (CMEs/CEUs for mental health) “Modeling to Learn” national training program to improve care delivered by multidisciplinary mental health teams (BHIPs and special program teams)
2. A facility simulation model of the suicide prevention coordinator workflow and staffing to prevent suicide

Aim is for these resources to become standard practice for guiding mental health improvements.

1. Training of OMSHP Technical Assistants in this approach
2. Participating in the Suicide Prevention Council
3. Provide resources to support the suicide prevention priority in the network directors performance plan

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