Building a learning healthcare system for suicide prevention

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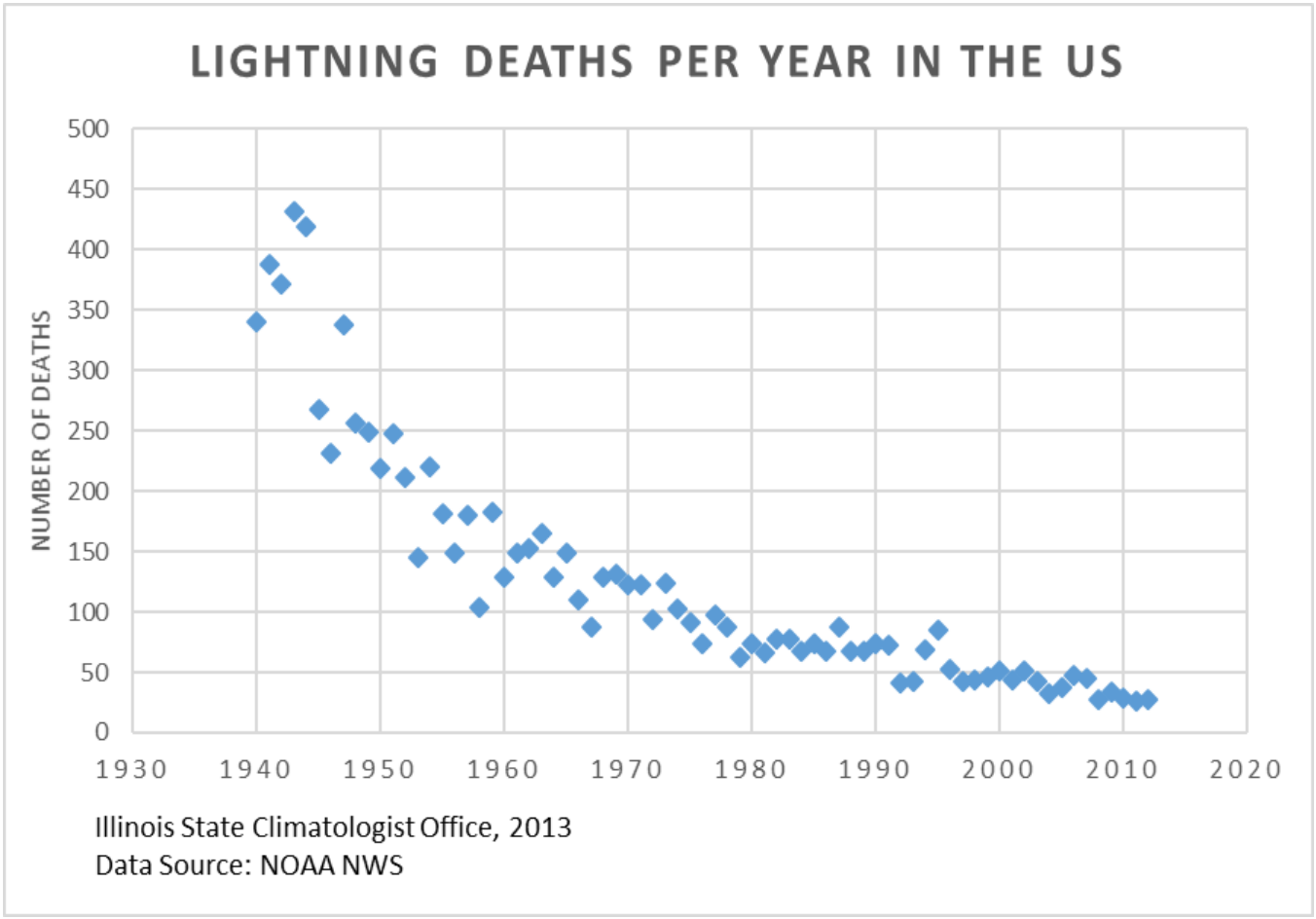
What's actually possible?



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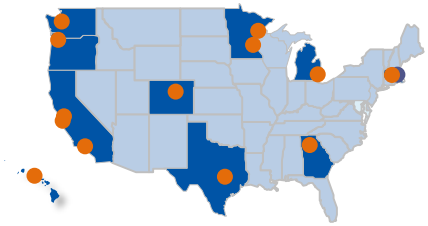
Mental Health Research Network



MHRN Mental Health Research Network

- 13 integrated health systems and affiliated research centers
- Combined member/patient population of approximately 14 million
- Comprehensive care delivery and insurance coverage
- Longitudinal data from EHRs and insurance claims
- Harmonized data resources following HCSRN common data model
- Strong partnerships with delivery system and health plan leaders

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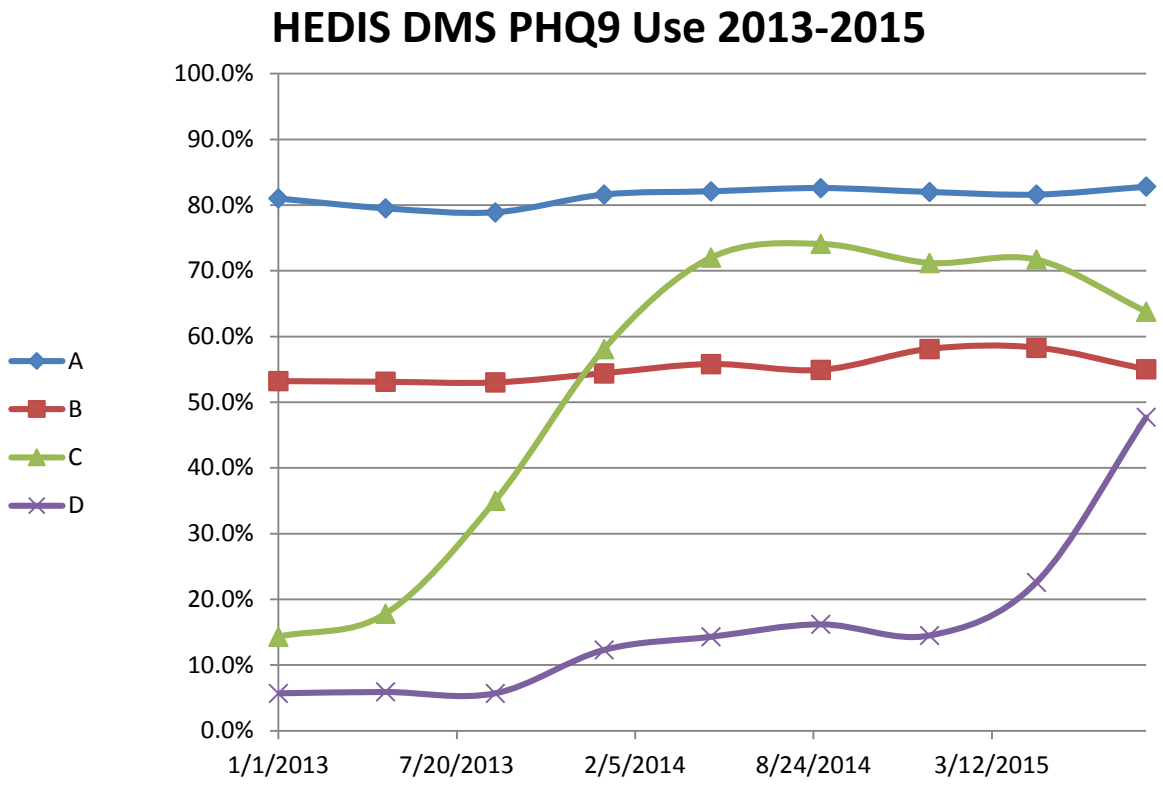
Measurement-based mental health care: Uptake of PHQ9 in 4 MHRN health systems



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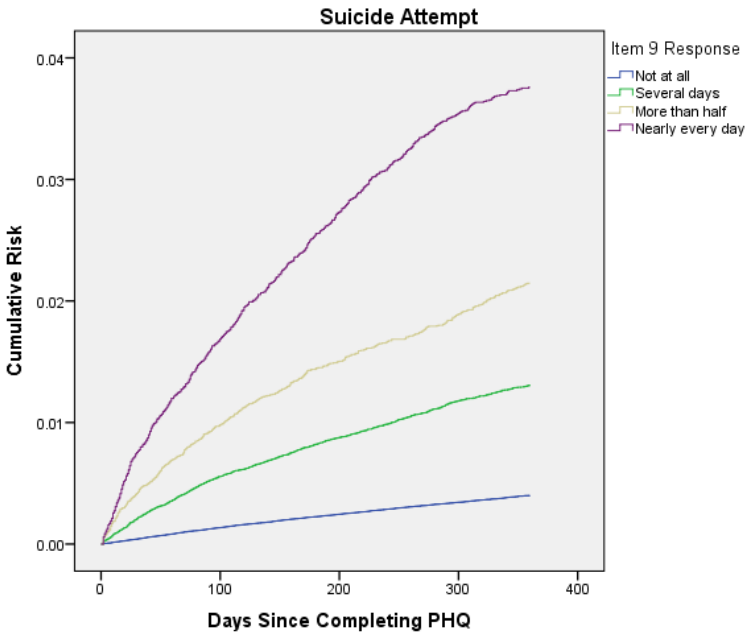
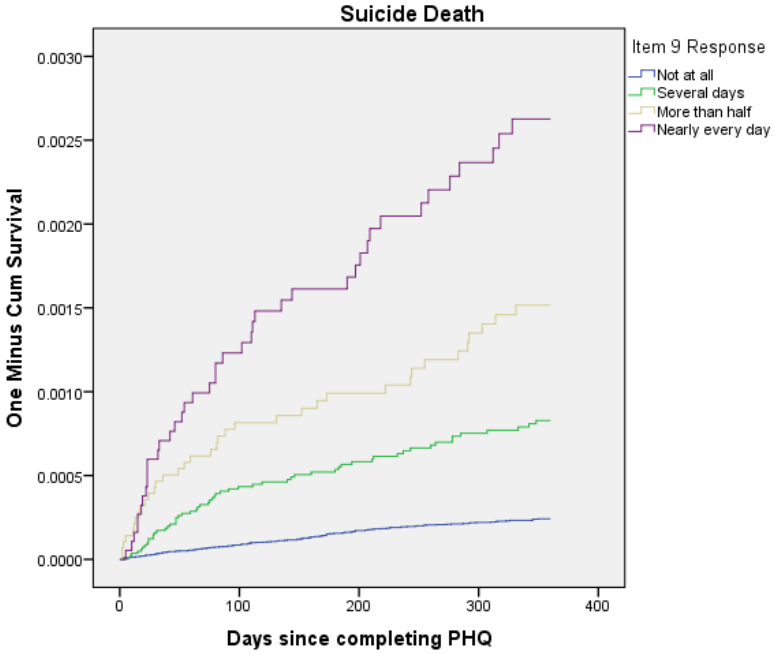
Improvement creates new data
New data make new questions

- Providers ask: What does it mean if my patient reports thoughts of death or self-harm “nearly every day”?
- Researchers answer: “Nobody knows. But we could find out.”

Risk of suicidal behavior following completion of PHQ9





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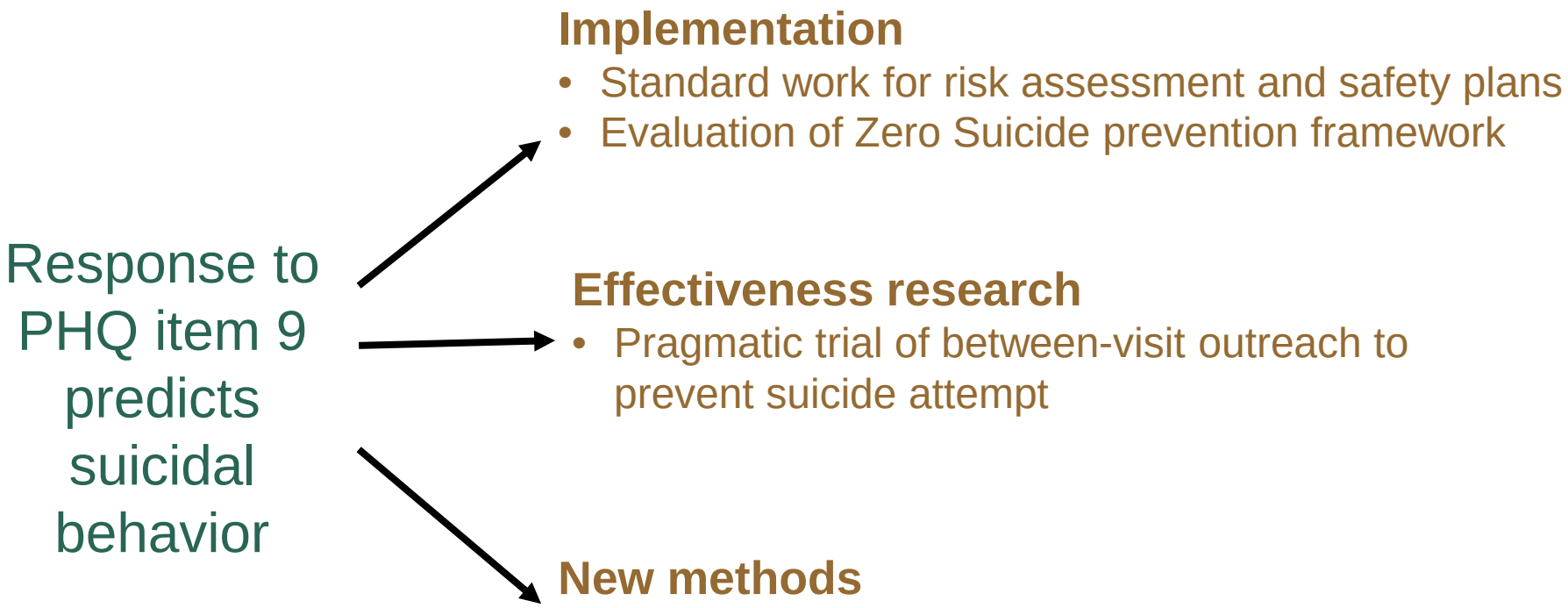
Response to PHQ9 Item 9 predicting suicidal behavior: Three streams of new work:



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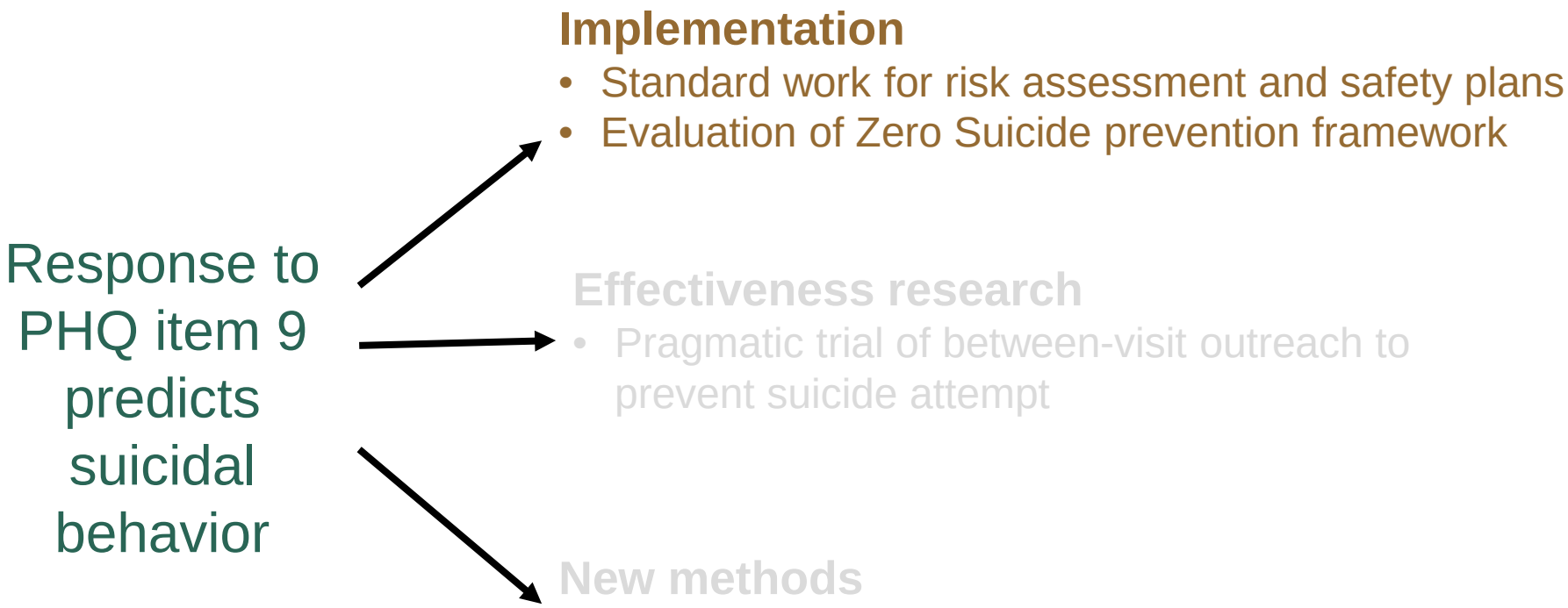

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Risk stratification using PHQ9 Item 9

Mental health specialty visits - Suicide death within 90 days

Thoughts of death or self-harm	% of Visits	% of Suicide Deaths
Nearly every day	2.5%	20%
More than half the days	3.5%	19%
Several days	11%	26%
Not at all	83%	35%

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Standard work for risk assessment and safety planning

Publish in 2013:

Implement in 2014: Standard work for identifying and addressing suicide risk

- If Item 9 response >=2, then perform standardized risk assessment (CSSRS)
- If CSSRS >=3, then create safety plan addressing lethal means
- Routine assessment of access to firearms
- All supported by provider training and tools embedded in EHR

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Routine assessment of suicidal ideation and access to lethal means

watching television

8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3
10. Feeling nervous, anxious or on edge	0	1	2	3
11. Not being able to stop or control worrying	0	1	2	3
12. Have your problems interfered with your work, family or social activities?	0	1	2	3

Please answer these questions about the past year. (If you have changed your drinking or substance use in the past year, please report on your most recent use.)

13. How often do you have a drink containing alcohol?	Never[0]	Monthly or less[1]	2 to 4 times a month[2]	2 to 3 times a week[3]		4 or more times a week[4]
14. How many drinks containing alcohol do you have on a typical day when you are drinking?	0 drinks[0]	1 or 2 drinks[0]	3 or 4 drinks[1]	5 or 6 Drinks[2]	7 to 9 drinks[3]	10 or more drinks[4]
15. How often do you have 6 or more drinks on one occasion?	Never[0]	Less than monthly[1]	Monthly[2]	Weekly[3]		Daily or almost daily[4]
16. How often have you used marijuana?	Never[0]	Less than monthly[1]	Monthly[2]	Weekly[3]		Daily or almost daily[4]
17. How often have you used an illegal drug or used a prescription medication for non-medical reasons?	Never[0]	Less than monthly[1]	Monthly[2]	Weekly[3]		Daily or almost daily[4]
18. Do you have access to guns?				Yes	No	

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Standard work for risk assessment and safety planning

Publish in 2013:


Psychiatric Services

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Volume 64, Issue 12, December 2013, pp. 1195-1202

Next Article

Articles

Does Response on the PHQ-9 Depression Questionnaire Predict Subsequent Suicide Attempt or Suicide Death?

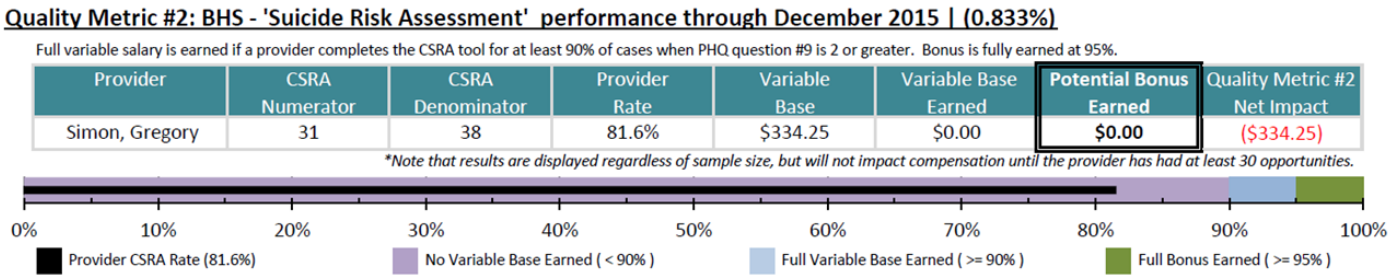
Gregory E. Simon, M.D., M.P.H., Carolyn M. Rutter, Ph.D., Do Peterson, M.S., Malia Oliver, B.A., Ursula Whiteside, Ph.D., Belinda Operskalski, M.P.H., and Evette J. Ludman, Ph.D.

View Author and Article Information

Published online: December 01, 2013 | http://dx.doi.org/10.1176/appi.ps.201200587

Implement in 2014: If Item 9 response >=2, then do CSSRS
If CSSRS >=3, then create safety plan addressing lethal means
(supported by provider training and EHR tools)

Consequences in 2015:


Quality Metric #2: BHS - 'Suicide Risk Assessment' performance through December 2015 | (0.833%)

Full variable salary is earned if a provider completes the CSRA tool for at least 90% of cases when PHQ question #9 is 2 or greater. Bonus is fully earned at 95%.

Provider	CSRA Numerator	CSRA Denominator	Provider Rate	Variable Base	Variable Base Earned	Potential Bonus Earned	Quality Metric #2 Net Impact
Simon, Gregory	31	38	81.6%	$334.25	$0.00	**$0.00**	($334.25)

**Note that results are displayed regardless of sample size, but will not impact compensation until the provider has had at least 30 opportunities.*

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National Action Alliance for Suicide Prevention Zero Suicide model for prevention in healthcare

- IDENTIFY: Systematically identify people at increase risk
- ENGAGE: Consistently engage people at risk in ongoing care
- TREAT: Provide evidence-based interventions
- TRANSITION: Attend to transitions between care settings or providers

Evaluation of Zero Suicide Implementation in Large Health Systems

- 6 MHRN health systems serving 9 million members in 5 states
- Each system will choose specific improvement targets and improvement strategies from Zero Suicide “menu”
- Develop specific metrics to assess:
  - Intended effect on care processes
  - Desired effect on outcomes in target population
  - Desired effect on outcomes in entire population
- Use metrics to provide feedback to leaders and practice teams
- Transparent comparisons of performance between health systems and within systems over time

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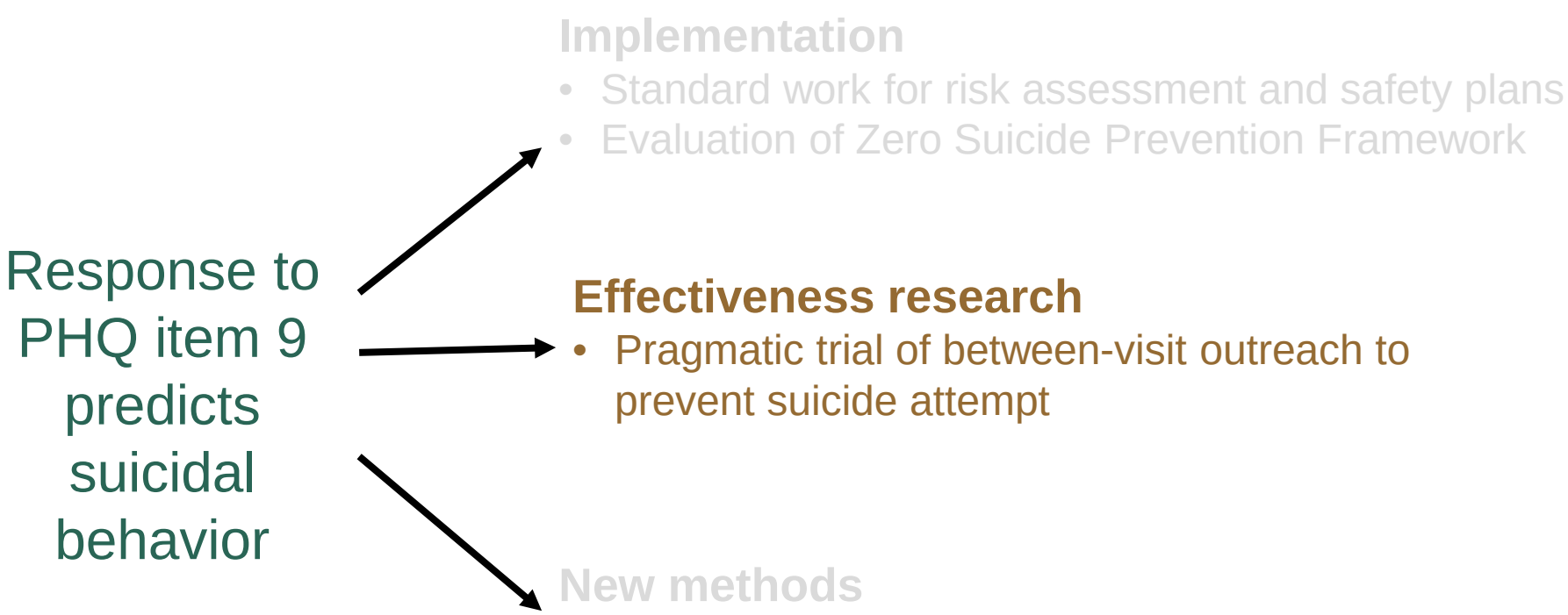
Response to PHQ9 Item 9 predicting suicidal behavior: Three streams of new work:



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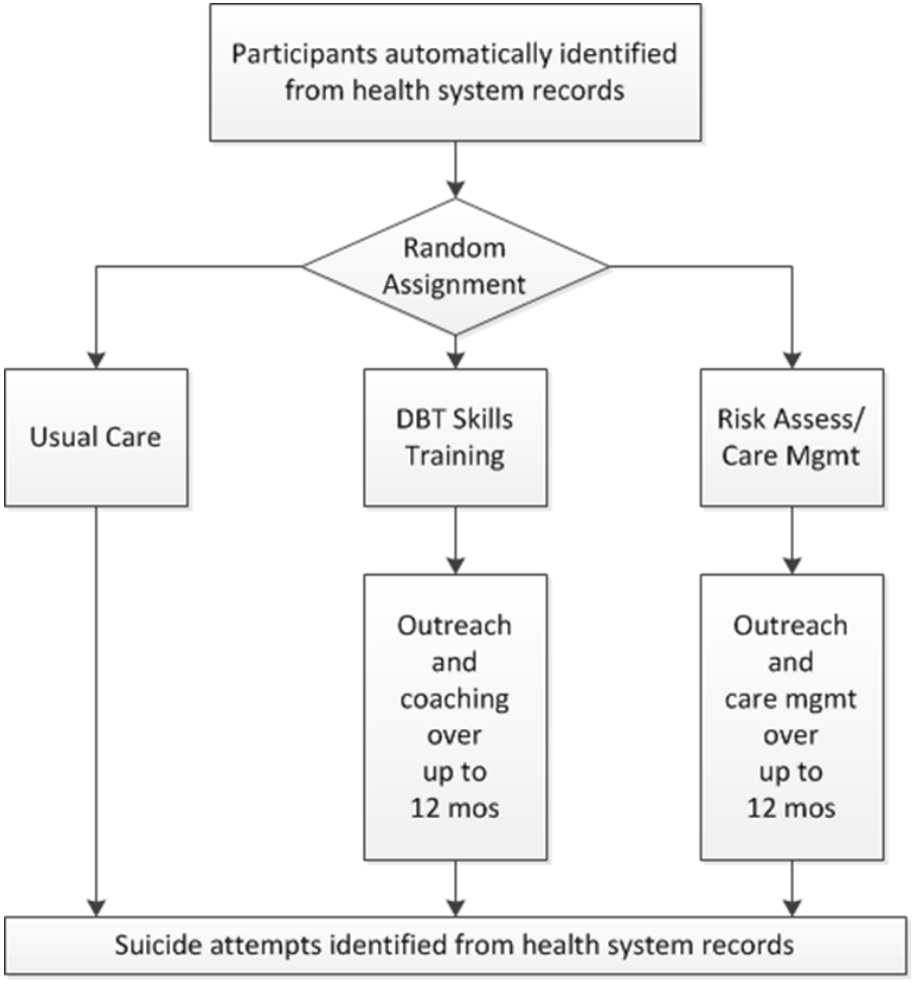
Intervention Research: Pragmatic trial of population-based selective prevention programs (funded by NIH Collaboratory)



Ongoing at four MHRN sites:

- KP Washington
- HealthPartners
- KP Colorado
- KP Northwest

18,900 enrolled

Results expected in early 2020

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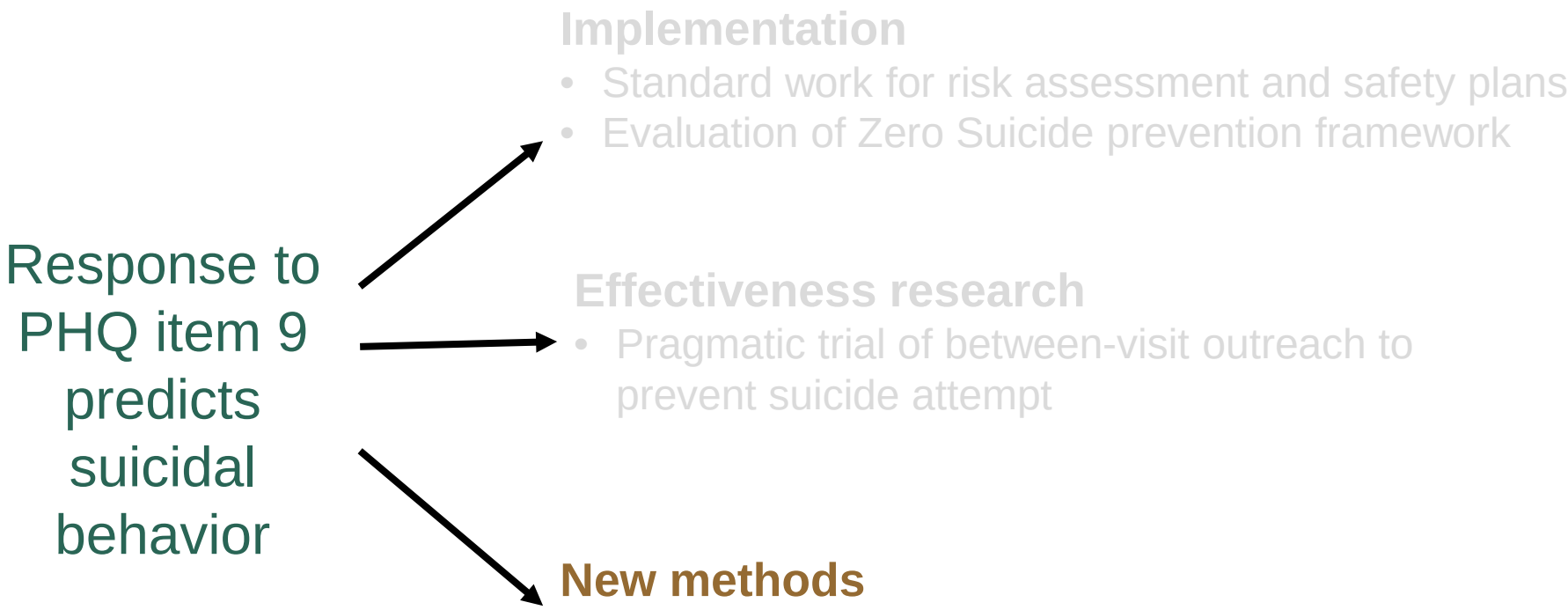

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Several days	11%	26%
Not at all	83%	35%

But: Only 7-fold risk concentration at the top
35% missed at the bottom
Completely missed if PHQ9 not completed

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Machine learning prediction of suicidal behavior

- 7 MHRN health systems with combined enrollment of 8 million
- 20 million visits by 4 million members aged 13 or older
  - Mental health specialty visits
  - General medical visits with mental health or substance use diagnosis
- Linked to nonfatal suicide attempt or suicide death within 90 days
- Approximately 150 potential predictors (and 200 possible interactions)
  - Demographic characteristics (age, sex, race/ethnicity, SES)
  - Current/recent/past mental health diagnoses
  - Current/recent/past mental health medications
  - Current/recent/past acute care utilization for mental health diagnosis
- Prediction models developed in 65% sample, validated in 35%

Strongest predictors of suicide death in 90 days following outpatient visit

SUICIDE FOLLOWING MH VISIT **(of 62 predictors selected)**	SUICIDE PRIMARY CARE VISIT (of 43 predictors selected)
Suicide attempt diagnosis in last year	Mental health ER visit in last 3 mos.
Benzodiazepine Rx. in last 3 mos	Alcohol abuse diagnosis in last 5 yrs.
Mental health ER visit in last 3 mos	Benzodiazepine Rx. in last 3 mos.
2nd Gen. Antipsychotic Rx in last 5 years	Depression diagnosis in last 5 yrs.
Mental health inpatient stay in last 5 years	Mental health inpatient stay in last year
Mental health inpatient stay in last 3 mos	Injury/Poisoning diagnosis in last year
Mental health inpatient stay in last year	Anxiety disorder diagnosis in last 5 yrs.
Alcohol use disorder Diag. in last 5 years	PHQ-9 Item 9 score=1 with PHQ8 score
Antidepressant Rx in last 3 mos	PHQ-9 item 9 score=3 with Age
PHQ-9 Item 9 score = 3 with PHQ8 score	Suicide attempt diag. in past 5 yrs with Age
PHQ-9 item 9 score = 1 with Age	Mental health ER visit in past year
Depression diag. in last 5 yrs. with Age	PHQ-9 Item 9 score=2 with Age
Suicide attempt diag. in last 5 yrs. with Charlson Score	PHQ-9 Item 9 score=3 with PHQ8 score
PHQ-9 Item 9 score = 2 with Age	Bipolar disorder diagnosis in last 5 yrs with Age
Anxiety disorder diag. in last 5 yrs. with Age	Depression diagnosis in last 5 yrs with Age

Similar predictors selected for nonfatal suicide attempt

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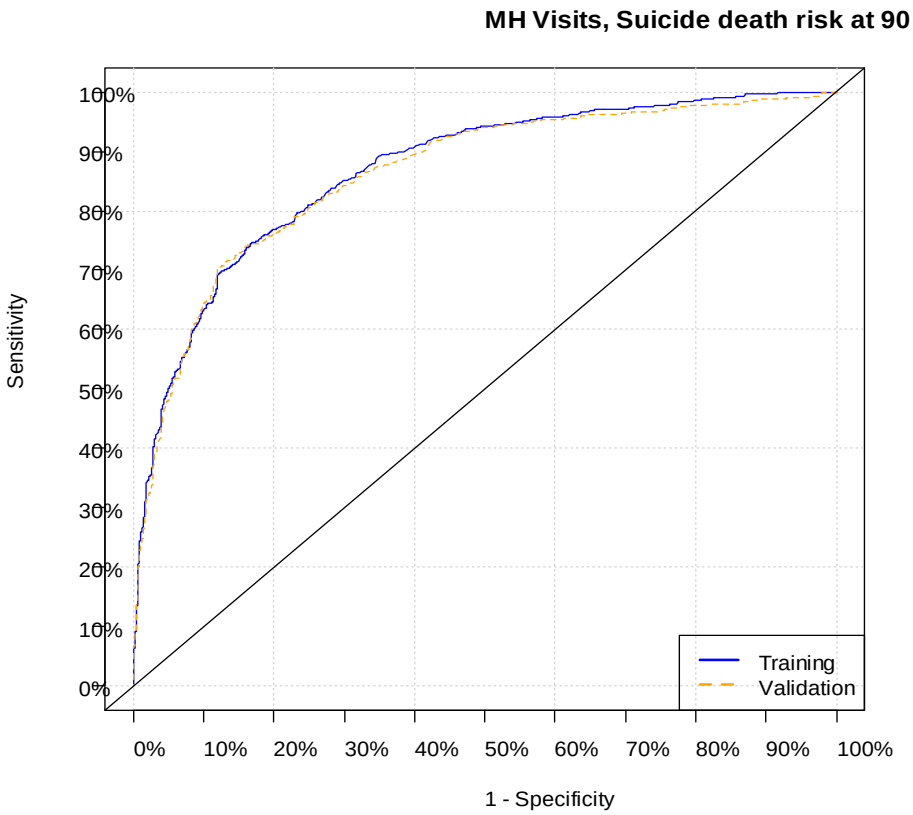
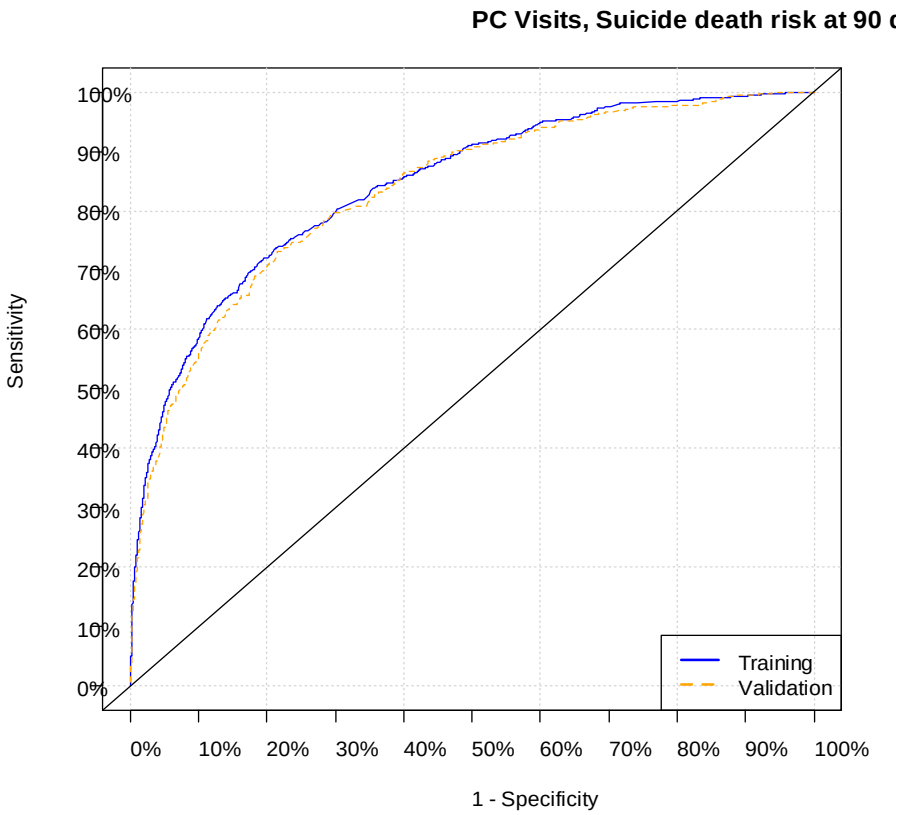
Predicting suicide death in 90 days following outpatient visit



AUC=0.861 (0.845 - 0.877)



AUC=0.833 (0.813 - 0.853)

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Risk scores vs. PHQ9 Item 9 scores: greater concentration of risk at the top AND fewer events "missed" at the bottom,

Thoughts of death or self-harm	% of Visits	% of Suicide Deaths
Nearly every day	2.5%	20%
More than half the days	3.5%	19%
Several days	11%	26%
Not at all	83%	35%

Percentile of Visits	% of Suicide Deaths
>99.5th	12%
99th to 99.5th	11%
95th to 99th	25%
90th to 95th	16%
75th to 90th	16%
50th to 75th	13%
<50th	6%

Excludes all those missing PHQ9!

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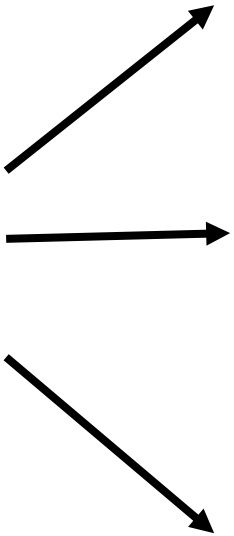
Improved risk prediction via machine learning: Three streams of new work:

Prediction models improve risk stratification



Implementation

- Augment standard work using computed risk scores

Effectiveness research

- Evaluate effectiveness of anticipated glutamate receptor modulatory drugs

New methods

- Improve prediction models using additional predictors and more detailed temporal encoding
- New prediction models for emergency department and inpatient mental health settings
- Linkage to financial and location data

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Using risk scores to drive standard work:

- During visits:
  - Trigger completion of CSSRS (as we do now based on PHQ9 Item 9 response)
  - Trigger creation/updating of safety plan (as we do now based on CSSRS score)
- Between visits:
  - Outreach for higher-risk patients who cancel or fail to attend scheduled visits
  - Outreach for higher-risk patients without follow-up scheduled within recommended interval

All technical tools in the public domain: https://github.com/MHResearchNetwork

Readily implemented in Epic EHR predictive analytics module (via PMML)

Recipe for a learning mental health system: Structural

- Integrated health systems responsible for defined populations
- Comprehensive and longitudinal health records
- Systematic and timely linkage to data on injury/poisoning mortality

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Recipe for a learning mental health system: Technical

- Harmonized data resources
- Systematic data quality assessment
- Skilled analysts
- Easy access to re-usable tools

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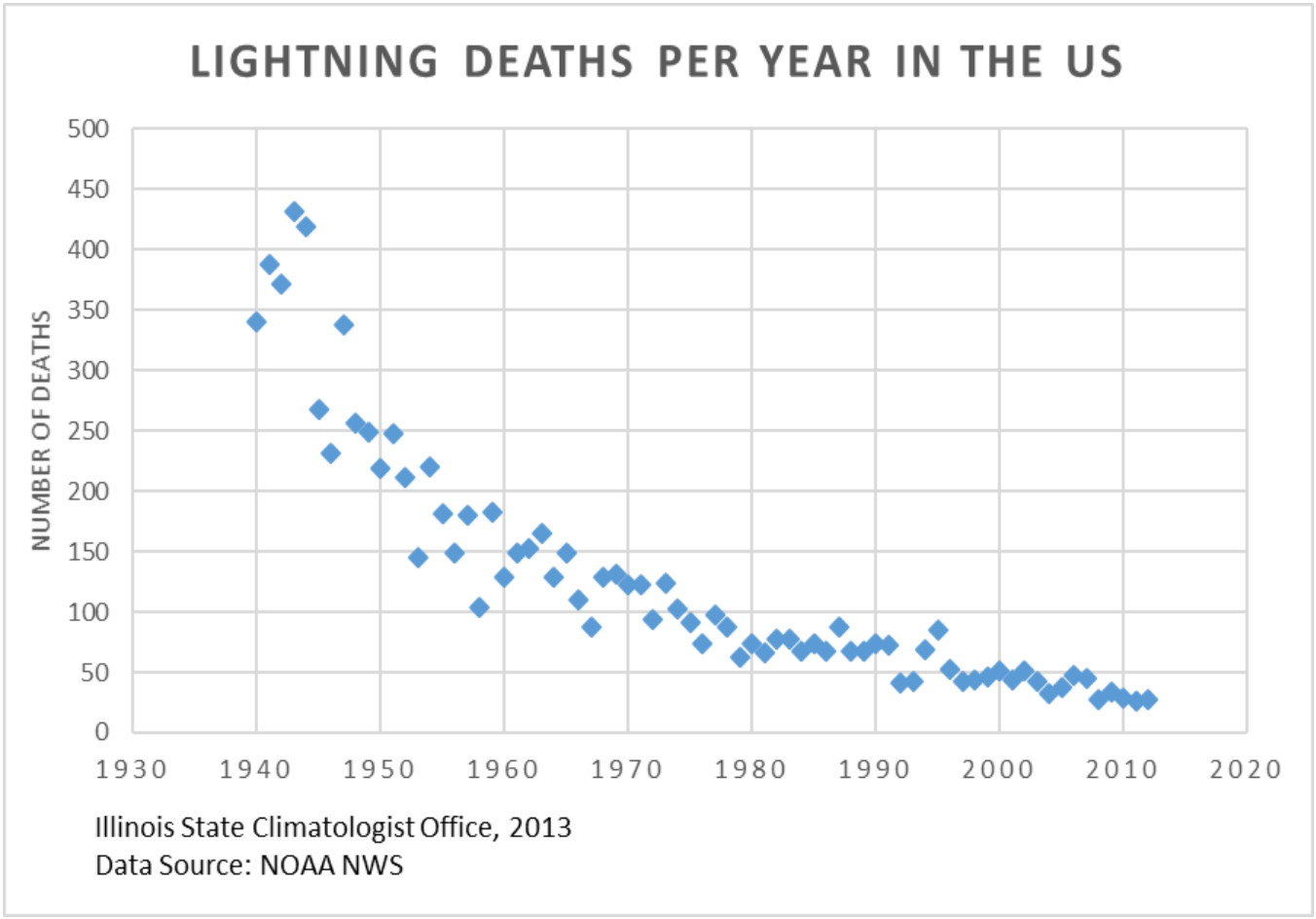
Recipe for a learning mental health system: Cultural

- Leadership committed to systematic improvement
- Systematic measurement for clinical care AND quality improvement
- Transparency and trust
- Accountability (within a just culture)

What's actually possible?



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