

# REACH VET

*Recovery Engagement and Coordination  
for Health – Veterans Enhanced Treatment*

Predictive Analytics for Suicide Prevention

May, 2017

# What is *REACH VET*?

- Based on the finding that although suicide rates in VHA patients have decreased relative to the US adult population as a whole, they remain high
- Supported by senior VA leadership as part of establishing suicide prevention as a major priority
- Goes beyond intercepting people on the trajectory towards suicide
- Uses predictive models to identify Veterans whose care should be enhanced
- **Supplements** current clinical strategies to identify at-risk Veterans
- **Complements** other VHA initiatives designed to identify new opportunities to enhance care for Veterans

# Strategy

- Proof of the concept and feasibility was established by VA and NIMH investigators with a logistic regression model using 2011 data
- Further analyses guided by academic investigators demonstrated that the performance of the predictive model can be improved by using machine learning methods
  - Cross validation to determine the number of variables included
  - Using penalized regression models (elastic net) for modeling
- The initial focus will be on those at highest risk ( 0.1% of the population)
- Soft implementation began in Q1, FY 2017
- Implementation with the full 0.1% stratum began early in Q2
- Over time, the focus will expand to include at people who are at more moderate risk (5%), who account for a substantial proportion of the total burden of suicide

# Variables and Coefficients

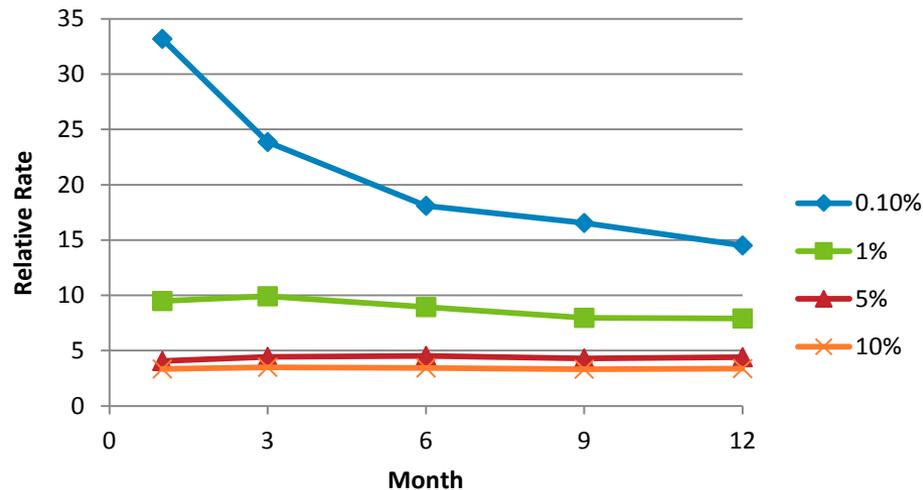
Variable	Coefficient	Variable	Coefficient
Intercept	-6.63091	DaysUsein7MoPrior	-6.3E-05
age_nest6	-0.081	DaysUsein13MoPrior	-0.00562
sexm	0.455962	depr12	0.144556
mar_coh	-0.20209	depr24	0.37701
rwhite	0.583887	dm12	-0.07439
rnwhite	-0.11804	EDvisits_prior1	0.148058
region4	0.205799	EDvisits_prior24	-0.00152
scg_nest1	-0.13606	FirstUse1Yr	0.054022
scg_nest2	-0.3361	homeless24	-0.12012
scg_nest3	-0.10893	IPMHDaysUsein7MoPrior	-0.00556
alprazolam24	0.182599	IPMHDaysUsein7MoPrior_t	-4.5E-05
antidep24	0.163978	lorazepam12	0.072544
antipsy12	0.133965	mirtazepam12	0.008552
anyattempt1	0.092617	mirtazepam24	0.049665
anyattempt6	0.462463	moodst12	0.050651
anyattempt18	0.55684	OPDaysUsein7MoPrior	-0.02517
AnyEDvisits_prior1	0.125069	OPDaysUsein8MoPrior	-0.00504
AnyEDvisits_prior2	0.185415	OPDaysUsein15MoPrior	-0.01086
anymhdisprior1mos	0.607597	OPDaysUsein23MoPrior	-0.00084
anymhdisprior6mos	0.221106	opioid12	0.01767
anymhdisprior12mos	0.037677	OPMHDaysUsein1MoPrior_t	-0.00049
anymhdisprior24mos	0.558725	sedative_anxiolytic12	0.251451
anymhtx12	0.041127	sedative_anxiolytic24	0.34872
anymhtx24	0.001539	sle24	0.273718
arth12	-0.04119	statin12	-0.14057
arth24	-0.04437	sud24	0.215471
bipoli24	0.125538	zolpidem24	0.020936
ca_head12	0.159196	int16	0.082083
ca_head24	0.02409	int23_3	0.086295
chronic24	0.220349	int23_4	0.03008
clonazepam12	0.113876		
clonazepam24	0.194522		

# Predicting Suicide: Rate relative to the entire VHA population

Top x%	Patients	Month				
		1	3	6	9	12
0.10%	5970	33.2	23.9	18.1	16.5	14.5
1.00%	59697	9.5	9.9	9.0	8.0	7.9
5.00%	298484	4.1	4.4	4.5	4.3	4.4
10.00%	596968	3.4	3.5	3.4	3.3	3.4
50.00%	2984831	1.5	1.6	1.5	1.5	1.5
100.00%	5969662	1.0	1.0	1.0	1.0	1.0

Note that the proportion of cases in the x% stratum (that is, the sensitivity of the predictive model) is the relative rate\*x/100.

# Predicting Suicide: Rate relative to the entire VHA population



# Predicting non-Suicide External Cause Mortality

## Rate relative to the entire VHA population

Stratum	Patients	Month				
		1	3	6	9	12
0.10%	5970	9.3	7.9	9.5	10.1	8.8
1.00%	59697	5.1	5.5	5.3	4.9	4.8
5.00%	298484	3.2	3.2	3.1	3.0	3.0
10.00%	596968	2.6	2.4	2.4	2.3	2.3
50.00%	2984831	1.4	1.3	1.3	1.3	1.3
100.00%	5969662	1	1	1	1	1

Note that the proportion of cases in the x% stratum (that is, the sensitivity of the predictive model) is the relative rate\*x/100.

# Predicting non-Suicide All-Cause Mortality: Rate relative to the entire VHA population

Stratum	Patients	Month				
		1	3	6	9	12
0.10%	5970	1.89	1.53	1.56	1.46	1.48
1.00%	59697	1.76	1.60	1.47	1.44	1.43
5.00%	298484	1.66	1.51	1.42	1.38	1.36
10.00%	596968	1.57	1.46	1.40	1.36	1.34
50.00%	2984831	1.26	1.22	1.21	1.21	1.20
100.00%	5969662	1	1	1	1	1

Note that the proportion of cases in the x% stratum (that is, the sensitivity of the predictive model) is the relative rate\*x/100.

# Predicting Suicide Attempts: Rate relative to the entire VHA population

Stratum	Patients	Month				
		1	3	6	9	12
0.10%	5970	167.4	136.0	107.2	90.9	81.0
1.00%	59697	44.4	38.7	32.6	29.5	27.7
5.00%	298484	13.2	12.1	11.0	10.3	9.9
10.00%	596968	7.4	7.1	6.6	6.3	6.1
50.00%	2984831	1.8	1.8	1.8	1.8	1.8
100.00%	5969662	1	1	1	1	1

Note that the proportion of cases in the x% stratum (that is, the sensitivity of the predictive model) is the relative rate\*x/100.

# Predicting Mental Health Bed Days of Care: Rate relative to the entire VHA population

Stratum	Patients	Month				
		1	3	6	9	12
0.10%	5970	112.6	89.9	75.4	68.6	65.7
1.00%	59697	39.0	32.8	29.6	28.0	27.3
5.00%	298484	12.6	11.4	10.7	10.3	10.1
10.00%	596968	7.4	6.9	6.6	6.4	6.3
50.00%	2984831	1.9	1.8	1.8	1.8	1.8
100.00%	5969662	1.0	1.0	1.0	1.0	1.0

Note that the proportion of cases in the x% stratum (that is, the sensitivity of the predictive model is the relative rate\*x/100.

# Predicting Med/Surg/Rehab Bed Days of Care: Rate relative to the entire VHA population

Stratum	Patients	Month				
		1	3	6	9	12
0.10%	5970	8.1	7.4	6.8	6.5	6.3
1.00%	59697	5.3	4.9	4.5	4.3	4.2
5.00%	298484	3.4	3.1	2.9	2.8	2.8
10.00%	596968	2.8	2.6	2.5	2.4	2.4
50.00%	2984831	1.4	1.4	1.3	1.3	1.3
100.00%	5969662	1	1	1	1	1

Note that the proportion of cases in the x% stratum that is, the sensitivity of the predictive model is the relative rate\*x/100.

# Identified At-risk Veterans Provide Opportunities for Enhanced Care

Of those in the top **.1%**, only **30%** were identified as high risk for suicide based on clinical signs and symptoms.

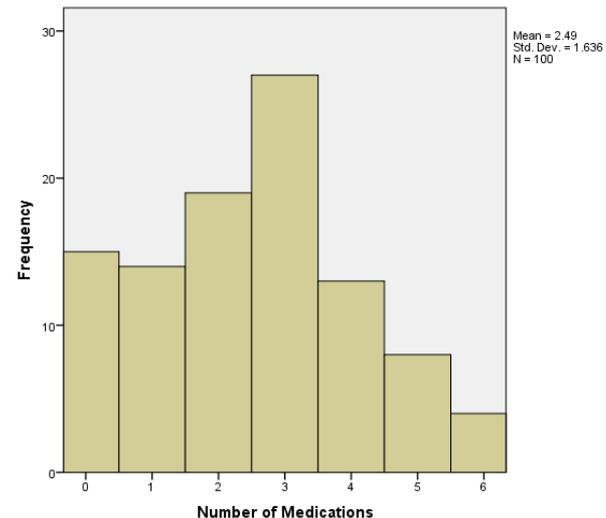
# Making the Case for Reviewing Care

- Chart review of the 0.1% stratum demonstrated
  - Possible under-use of evidence based psychotherapy and recovery-oriented services
  - Possible under-use of non-pharmacological strategies for pain management
  - Frequent use of polypharmacy suggesting over-reliance prescribing
  - Possible missed opportunities for providing evidence-based pharmacotherapy for specific mental health conditions

## Polypharmacy as an example

27% on 4 or more  
12% on 5 or more  
4% on 6 or more

Polypharmacy may be a clue that simpler medication regimens may not have been effective



# Patient Characteristics Relative to the Average VHA Patient

- Demographic characteristics:
  - More male
  - More urban
  - Mostly middle aged
- More frequent diagnoses of:
  - Mental health conditions
  - Pain diagnoses
  - Insomnia
- More previous suicide attempt
- Greater use of specific services:
  - Emergency departments or urgent care
  - Inpatient mental health
  - Mental health residential care
  - Homelessness services
- All of the clinical characteristics would have been expected on the basis of the known risk factors for suicide
- The power of the strategy is in accounting for the increased risks associated with multiple risk factors
- The value of the strategy is in identifying individuals at risk, not in identifying risk factors
- Clinical strategies for each patient must be individualized

## Identified at risk Veterans provide opportunities for enhanced care

- Although **REACH VET** aims to prevent suicide and other adverse outcomes, interactions with patients should emphasize they are patients with complex care needs who may benefit from enhanced care.
- It is important to note that not all identified at-risk Veterans will have reported or experienced suicidal ideation or behavior.

# REACH VET Steps

## **REACH VET Coordinators**



Provides training and technical assistance in facilities

For implementation

1. Accesses the dashboard
2. Identifies appropriate provider
3. Communicates with identified provider
4. Helps the provider gain access to the dashboard
5. Works with the provider to ensure document each step on the dashboard and electronic health record

## **MH and Primary Care Providers**



1. Receives notification about a high risk Veteran
2. Accesses the dashboard
3. Reevaluates care
4. Considers treatment enhancement strategies
5. Contacts the Veteran
6. Documents each step on the dashboard and electronic health record

# REACH VET Dashboard

OMHO Clinical Support Portal Home > Customized Reports > Reach

Actions | | | | 1 of 1 | | Find Next | 100% |

**ATTENTION:** Patient information may only be accessed for the purpose of treatment, payment or health care operations

		What clinical signals contribute to my patient's risk?			How can I follow-up with this patient?	
Patient Information	Contact Information	Events	Medications	Diagnosis	Recent Appointments	Upcoming Appointments
<b>Patient Name</b> Last Four: 9999 Age: 50 Gender: F Location: (4V19) (554) Denver, CO Risk Tier: <b>Top 0.1%</b>	17 Cherry Tree Lane London UK 99999 Home: 867-5309 Cell: 555-4823 Work: 004-023-1984	<i>History of:</i> Suicide Attempt  <i>In The Prior 2 Months</i> Emergency Dept Visit	<i>In The Prior 12 Months</i> Antipsychotic Clonazepam Mood Stabilizer Sedative Anxiolytic  <i>In The Prior 24 Months</i> Antidepressant	Depression Chronic Non-Cancer Pain Substance Use Disorder	<b>Primary Care</b> 11/11/1917 Primary Care/Medicine  <b>Mental Health</b> 01/01/1066 Mental Health Clinic - Ind	<b>Primary Care</b> None  <b>Mental Health</b> None

Initiation Checklist REACH VET Coordinator	Re-evaluation Checklist Provider	Care Evaluation Checklist Provider	Follow-up with the Veteran Provider
I am the REACH VET coordinator Doe,John <a href="#">Contact</a>	I am the REACH VET assigned provider	Care was reviewed and the following enhanced care options are indicated (As documented in the Medical Record):	Outreach attempts have been made but provider unable to get in touch with the Veteran
Identified a primary patient provider	I am the REACH VET Provider's Designee	Caring Communications	Veteran has been informed that they have been identified as being at risk
Notified provider of the specific patient and program requirements	Received notification from REACH VET Coordinator about the patient	Safety Planning	Care enhancement options have been discussed with the Veteran
Asked provider to re-evaluate patient's care	Reviewed current diagnoses and treatment plan	Increased monitoring of stressful life events	Access to care was discussed with the Veteran
High Risk Suicide Flag Documented in CPRS		Improve coping skills	Treatment plan changes have been discussed with the Veteran
Patient reported to be deceased		Other	
Spoke with Reach Coordinator at patient's preferred station to coordinate care.		Care was reviewed and no changes are clinically indicated at this time.	

# Re-Evaluation of Care

- Reviews medical record to re-evaluate the care the Veteran has been provided.
- Care should be evaluated in a **comprehensive** manner and not limited to the services that are provided by that provider.
  - Reviews screening evaluations and re-screen as needed.
  - Reviews diagnoses, current problems and treatment plans.
  - Ensures patients have access to all services requested and needed and are receiving evidence-based care.

# Care Enhancement Strategies

- Considers additional treatment **enhancement strategies**
  - Enhanced communication (e.g., via caring communications)
  - Safety Planning
  - Increased monitoring of stressful life events
  - Interventions designed to enhance coping strategies

# REACH VET Status

- As of February 2017 all VHA medical centers are working with the top 0.1% risk tier
- This tier includes ~6,400 Veterans (~46 per facility) receive clinical review and outreach in order to make sure their needs are being met
- The risk model updates monthly
  - In 1 year ~31,000 unique Veterans will be identified
- For the mid-April cohort as of the start of May,
  - 19/140 facilities reevaluated treatment plans in  $\geq 90\%$ , connected with ~ 74%
  - 28/140 facilities reevaluated treatment plans in 80%-90%, connected with ~ 66%
- Next steps include performance management, implementation evaluation, facilitation for sites requiring additional assistance, and effectiveness evaluation
- Ongoing enhancements include: integration with clinical work flow, updating model with latest suicide data, expanding use of caring communications

# REACH VET --Acknowledgments

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