Suicide Supplement: Development of a Population-Based Risk Calculator for Suicidal Behavior

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| **Project Name:**  Suicide Supplement: Development of a Population-Based Risk Calculator for Suicidal Behavior | |
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| **Principal Investigator institution:**  Group Health Research Institute |  |
| **Funder** NIMH |  |
| **Funding Period:** 07/2015 – 06/2017 |  |
| **Abstract:**  We propose to use population-based data from large health systems to develop evidence-based suicide attempt risk calculators for mental health and primary care clinicians.  Seven Mental Health Research Network (MHRN) sites will contribute data to this work.  Domains of predictors or risk indicators will include:   * Sociodemographic characteristics: age, sex, race/ethnicity, household socioeconomic status * General clinical history: psychiatric diagnoses, co-occurring substance use disorder, co-occurring medical illness, outpatient treatment history, inpatient treatment history * Suicidal behavior history: prior suicide attempt, other prior injury or poisoning * Suicidal ideation history: number, timing, and results of previous responses to PHQ item 9 * Current presentation: depression and anxiety symptom severity, frequency/intensity of suicidal ideation, current substance use   Nonfatal and fatal suicide attempts will be identified using health system records and state mortality data.  Analyses will estimate cumulative hazard of suicide attempt over 30, 90, and 180 days following an index encounter, contingent on specific characteristics in each of the five predictor domains listed above.  We will build predictive models using all observations on the same individual over time as well as randomly sampling one observation per individual - to assess the bias in the risk prediction model in the combined population.  We will use statistical learning methods to build and evaluate prediction models to identify who is at increased risk of suicide and when that risk is reduced or elevated.  Results of these analyses will inform creation of EHR-based risk calculator tools to support outpatient providers’ decisions regarding suicide risk assessment and follow-up care.  Distinct models and decision support tools will be used to inform pre-visit planning (using all risk factor information present prior to the index visit) and within-visit planning (using additional information recorded during the index visit). |  |
| **Grant Number:** U19MH092201 (Supplement under MHRN II) |  |
| **Participating Sites:**  Group Health Cooperative, Washington Henry Ford Health Systems, Michigan  HealthPartners Institute for Education and Research, Minnesota  Kaiser Permanente, Colorado  Kaiser Permanente, Hawaii  Kaiser Permanente, Northwest  Kaiser Permanente, Southern California |  |
| **Investigators:** Gregory Simon, MD MPH Brian Ahmedani, PhD Rebecca Rossom, MD, MSCR Arne Beck, PhD Beth Waitzfelder, PhD Frances Lynch, PhD Karen Coleman, PhD |  |
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| **Major Goals:** This study will inform creation of EHR-based risk calculator tools to support outpatient providers’ decisions regarding suicide risk assessment and follow-up care.  Our consultations with stakeholders (both front-line clinicians and health system leaders) identify two key information needs:   * Pre-visit planning – Prior to each visit (all mental health specialty visits or primary care visits for patients with mental health conditions), treating providers would receive a risk prediction based on clinical information available prior to the appointment. This predicted risk score would be calculated using Epic’s Reporting Workbench functions and displayed in each provider’s Epic Schedule Review function, following a process now used for other clinical risk prediction tools in participating health systems * Within-visit assessment – During each visit, entry of PHQ9, GAD2/7 or AUDIT-C questionnaire data would trigger an updated risk prediction, incorporating most recent response to PHQ item 9 as well as other symptom severity scales. This predicted risk score would be calculated and displayed using Epic’s SmartLink function, following a process now used for cardiovascular risk predictions.   In addition to serving different practical needs (pre-visit preparation and within-visit treatment planning), these alternative models will address a more general scientific or public health question: the relative importance of long-term characteristics and time-varying or immediate characteristics in predicting risk of suicidal behavior. |  |
| **Description of study sample:** The sample will include all patients aged 13 or older with at least one outpatient visit between 1/1/2009 and 6/30/2015 that is either with a specialty mental health provider OR with a recorded diagnosis of mood, anxiety, personality, or psychotic disorder.  Sample includes 19.6 million visits for approximately 2.9 million people. |  |
| **Current Status:**  Data have been collected from participating sites and combined, creating one analytic dataset.  Primary analyses are complete (as of 3/1/2018) with some secondary analyses ongoing |  |
| **Study Registration:**  N/A |  |
| **Publications:**  Simon GE, Johnson E, Lawrence JM, Rossom RC, Ahmedani B, Lynch FL, Beck A, Waitzfelder B, Ziebell R, Penfold RB, Shortreed SM. Predicting suicide attempts and suicide deaths following outpatient visits using electronic health records. Am J Psychiatry (in press) |  |
| **Resources:**  Code for identifying the study sample and computing predictors is available via the MHRN GitHub site: <https://github.com/MHResearchNetwork> |  |
| **Lessons Learned:**   * Prediction models using electronic health records data can accurately identify outpatients at increased risk for suicide attempt and suicide death. * Separate prediction models for adolescents are not necessary. * Self-reported suicidal ideation accurately predicts suicide attempt in people with psychotic disorders. |  |
| **What’s next?** A manuscript regarding risk in people with psychotic disorders is currently under review.  Secondary analyses may lead to additional manuscripts regarding:   * Risk prediction in adolescents * Risk prediction in people with substance use disorders * Disagreement between risk models and self-reported suicidal ideation |  |