Predicting Short-Term Suicidal Thoughts in Adolescents Using Machine Learning: Developing Decision Tools to Identify Daily Level Risk After Hospitalization

An important step in guiding real-time suicide-focused interventions

Psychiatrically hospitalized adolescents completed brief, daily surveys for 4 weeks following discharge.

The objective was to develop a decision algorithm identifying next-day suicidal thoughts.

Predictors included time-varying features based on risk and protective factors assessed each day:

- Hopelessness
- Connectedness to Family & Friends
- Feelings of Being a Burden
- Self-Efficacy to Refrain from Suicidal Action
- Worry & Rumination
- Agitation
- Feelings of Being a Burden
- Suicidal Ideation Duration
- Psychological Pain

Using multi-level classification and regression trees (CARTs) with repeated 5-fold cross-validation, 2 types of models were tested:

**Simple Model** includes previous-day response for each factor

**Complex Model** includes, for each factor, person-specific mean over prior days and deviation from that mean

**Best Performance**
- Complex model that included ideation duration, hopelessness, burdensomeness, and self-efficacy to refrain from suicidal action

**Acceptable Performance**
- Equivalent to the model above, but excluding ideation duration

**Weaker Performance**
- Models incorporating only previous-day scores showed relatively weaker performance

Conclusion: Dynamically changing risk and protective factors assessed in adolescents' daily life can be used to develop promising decision algorithms identifying elevations in daily suicidal thoughts.