FAST FORWARD: ASSESSMENT AND TREATMENT OF SUICIDAL PEOPLE IN THE FUTURE

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Disclosures

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- Royalties from Guilford, UpToDate
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- Member, Scientific Board, Klingenstein Third Generation Foundation

Objectives

- To review limitations of current approaches to assessment and treatment of suicidal people
- To discuss advances in "objective" measures of suicidal risk
- To discuss advances in the treatment of suicidal adolescents

Limitations of Current Approaches

- Assessment of suicidal patients dependent on their self-report
- Patients do not always disclose suicidal risk
- Clinicians vary in their skills for assessing suicidal risk
- Patients who die by suicide are most often seen in non-mental health sectors
- Few risk factors for imminent risk for suicidal behavior
- Suicide is a rare outcome

Approaches to Overcome These Limitations

- Focus research on imminent suicidal risk
- Need large samples given low rate of suicide
- Identification of indicators of suicidal risk from existing data, like electronic medical records
- Need for objective measures of suicidal risk that may be less sensitive to patient attempts for lack of disclosure

Limitations with Regard to Treatment

- Few evidence-based treatments for treatment of suicidal patients
- Treatments are often long, intensive, and require extensive training
- Therefore, hard to find qualified therapists
- Few objective measures of treatment targets, which impedes dissemination and quality control
- Treatments don't provide intervention based on daily fluctuation in mood and circumstances

Possible Solutions

- Use of technology to provide decision and therapeutic support for clinicians
- Use of technology to expand reach of evidence-based care
- Convert evidence-based treatments to games or other accessible forms of on-line interventions
- Use technology to monitor patients and shape patient and clinician response
- Identify biological mechanisms of suicidal behavior and directly target these mechanisms

Approaches to Assessment that Could Lead to Novel Interventions

Assessment	Treatment
Electronic Health Record data mining	Clinician best practice alerts in real time
Passive cell phone data	Use information to alert clinicians, guide mobile interventions
Use of speech quality, language content, facial expression	Can alert clinicians and guide mobile interventions
Implicit Association Test for Suicide	Mobile app to target IAs
Neurosemantic Signatures for Suicidal Concepts	Direct Cranial Stimulation
Metabolomic Assessment of treatment-refractory, suicidal patients	Correction of metabolomics abnormalities

Use of Electronic Health Records to Identify Individuals at High Suicidal Risk

- Can get large samples
- Low cost
- Most at-risk patients present in medical health sector, where expertise in assessing suicidal risk not always readily available
- New techniques such as machine learning and natural language processing can to extract more useful data from electronic health records than previous approaches

Machine Learning is a Powerful Technique for Classification and Prediction

Machine Learning

- **Herbert Alexander Simon:** "Learning is any process by which a system improves performance from experience."
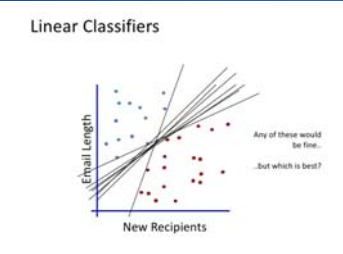- "Machine Learning is concerned with computer programs that automatically improve their performance through experience. "

Herbert Simon
Turing Award 1975
Nobel Prize in Economics 1978

https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045

Training Data Set

Linear Classifiers
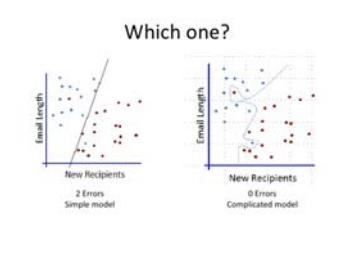
Any of these would be fine...

...but which is best?

Email Length

New Recipients

https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045

Testing Different Algorithms

Which one?

Email Length

Email Length
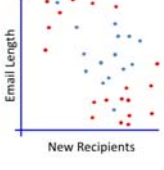
New Recipients

New Recipients

2 Errors
Simple model

0 Errors
Complicated model

https://www.slideshare.net/liorrokach/introduction-to-machine-learning-13809045

Test Data Set

The Non-linearly separable case
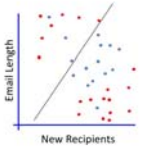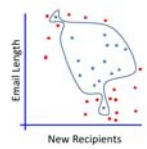
Non-linear Algorithm Will Perform Better

The Non-linearly separable case

The Non-linearly separable case

Electronic Medical Records and Suicide

- Use of diagnoses and prescriptions to identify people who attempt or complete suicide (Barack-Cohen et al., 2017; Kan et al., 2012)
- Natural language processing to identify individuals who made a suicide attempt or had suicidal ideation when not reflected in diagnoses (Anderson et al., 2015)
- Use of content of natural language processing to identify those at risk for suicide ("positive valence" protective) (McCoy et al., 2016; Pestain et al., 2017)
- Could have the advantage of identifying people seen in primary care or ED who would benefit from mental health care and closer follow-up

## Acoustic and Linguistic Aspects of Speech and Suicidality (Pestian et al., 2017)

- Analyzed linguistic and phonic quality of speech
- For adolescents, linguistic alone, 87% accurate; acoustic, 74%, combination, 93%
- Type of linguistic factors: less likely to laugh, get angry, express hope, more likely to sigh
- Adds to clinical data, and could be used to monitor clinical status and alert patient and clinician of status
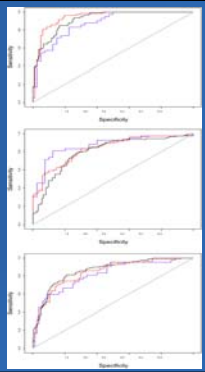
Use of Passive Cell Phone Data to Monitor Clinical Status

- With passive cell phone data, can examine motion, number of locations visits, number and duration of conversations, circadian cycle, voice quality, facial expression
- Joshi et al., 2013: facial movement and speech quality, could classify depressives with 92% accuracy
- Saeb et al., 2015: found that depressive symptoms were correlated with location, mobility, number of conversations, circadian indices
- Used to monitor patients with schizophrenia and bipolar disorder
- Could alert patient and/or clinician and encourage changes in activity, sleep, and social activity

Use of Passive Cell Phone Data to Monitor Depressive Symptoms (Saeb et al., 2015)
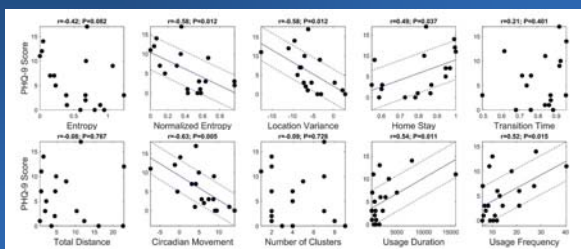
Mobile Apps for Suicidal Individuals
(Larsen et al., 2016)

- 123 phone apps of which 49 had suicide specific applications
- 27– support from friends and family
- 4– safety planning
- 17– facilitate connection with a crisis center
- Most had only 1 type of intervention, but Safety Planning apps had 4 on average
- No apps to help parents or clinicians respond

As Safe As Possible (ASAP)

PITTSBURGH

- Tina Goldstein
- Antoine Douaihy
- Dana McMakin (now at FIU)
- Candice Biernesser
- Erin Wentroble
- Giovanna Porta
- Jamie Zelazny
- Satish Iyengar

DALLAS

- Betsy Kennard
- Aleksandra Foxwell
- Taryn Mayes
- Kristin Wolfe
- Alexandra Moorehead
- Victoria Owen
- Jessica Wiblin
- Lucas Zullo
- Jessica Jones

ASAP: Rationale

- Period post-discharge from hospital the highest risk for repeat attempts and suicides
- Often gap between discharge and first session
- With outpatient treatment, suicidal events occur early in care, before have been able to teach much in the way of skills
- Therefore, considered doing a brief intervention on the inpatient unit PRIOR to discharge
- No treatment has used technology to augment and extend the impact of intervention

What Patients Actually Got in ASAP vs. TAU

Treatment As Usual (TAU)
- Inpatient
  - Standard safety plan
- Outpatient
  - most often IOP or Partial

Added ASAP Components
- Chain analysis
- Safety Plan
  - Internal strategies
  - Interpersonal strategies
  - Clinical contact
- Distress Tolerance
- Emotion Regulation
- MI to encourage outpatient follow-up

Development of App and Intervention

- Did first version that also including family, social support, and sleep that could not be completed on inpatient unit
- Then streamlined to 6-8 hrs. plus coaching calls
- App prototype developed and then got feedback from clinicians, parents, and patients
- Current prototype: BRITE

BRITE

- Personalized reminders daily to rate distress level

- Rating level of distress in real time:
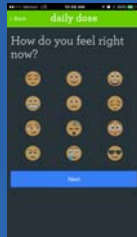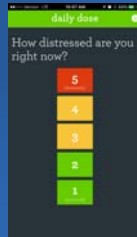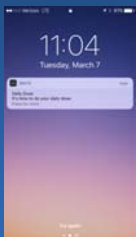
BRITE

Routes patient to possible interventions -Savor, Distract, Soothe, Reasons to Live, Reaching out to Contacts—which all can be customized
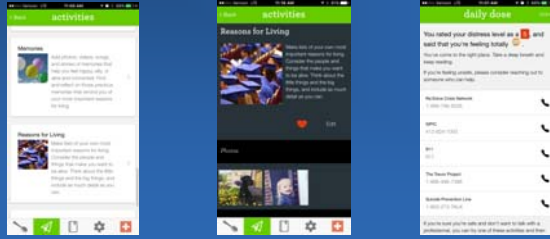
BRITE
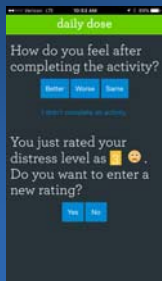
- Rating the usefulness of the Activity

- Re-Rating of Distress Post Intervention

Sample

	Pittsburgh	Dallas	Total	p
N	29	37	66	
Age	15.7±1.1	14.6±1.7	15.1±1.5	0.003
Caucasian Race	21 (72.4%)	30 (81.1%)	51 (77.3%)	0.40
Female Sex	26 (89.7%)	33(89.2%)	59 (89.4%)	>0.99
SES	5.0±2.7	9.3±4.8	7.7±4.6	0.001

Characteristics of Sample

Domain	Pittsburgh	Dallas	Total	p
% Previous Attempts	23 (79.3%)	30 (81.1%)	53 (80.3%)	0.86
% Previous Attempts/SRB	29 (100%)	32 (86.5%)	61 (92.4%)	0.06
SIQ	71.3±20.3	63.0±22.9	66.6±22.0	0.13
PHQ-9	19.1±5.0	17.8±5.5	18.4±5.3	0.30
SCARED	47.2±16.1	49.4±15.3	48.4±15.5	0.57
CRAFFT	1.6±1.6	1.4±1.7	1.5±1.7	0.52

Suicidal and Treatment Outcomes

	UC	ASAP	p	d
Any suicidality*	80.8%	57.1%	0.06	-0.53
Suicidal ideation	76.9%	57.1%	0.12	-0.43
Suicide attempt/SRB	26.9%	21.4%	0.64	-0.13
Suicide attempt	23.1%	14.3%	0.49	-0.23
NSSI	38.5%	39.3%	0.95	0.02
Engaged in treatment**	84.0%	78.6%	0.73	-0.14

*ideation/attempt/SRB
**defined as having attended ≥ 2 visits/days of partial, IOP, or outpatient program

Incident Suicidal Ideation
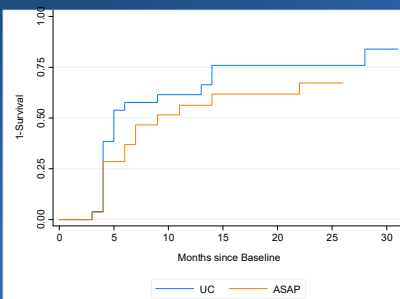
Wilcoxon χ^2_1=1.19, p=0.28
Log-rank χ^2_1=0.90, p=0.34

IRR=0.73, 95% CI: 0.36, 1.49, p=0.36

Incident Suicide Attempt

Wilcoxon χ²₁=1.14, p=0.29
Log-rank χ²₁=0.63, p=0.43

IRR=0.58, 95% CI: 0.12, 2.46, p=0.42

Weeks since Baseline — UC — ASAP

70.6% participants viewed the App

75.0% added content | 37.5% removed

times content was added: M=14.2, SD=11.0, median=9, range: 2-41

times content was removed: M=10.3, SD=5.6, median=9, range: 7-25

Which activity was added (% times)
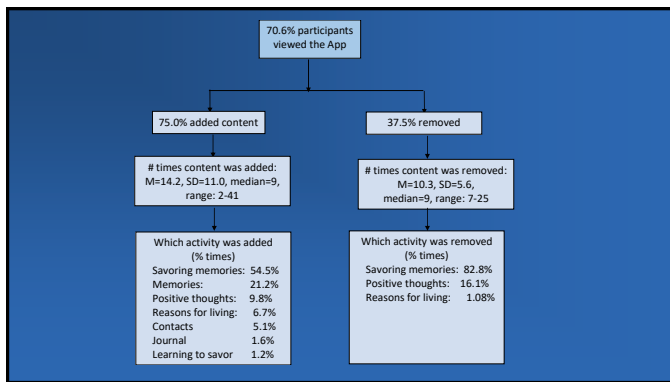Savoring memories: 54.5%
Memories: 21.2%
Positive thoughts: 9.8%
Reasons for living: 6.7%
Contacts: 5.1%
Journal: 1.6%
Learning to savor: 1.2%

Which activity was removed (% times)
Savoring memories: 82.8%
Positive thoughts: 16.1%
Reasons for living: 1.08%

Relationship between Use of App and Suicidal Outcomes

| | Viewed the App | | | |
	No	Yes	p	d
Any suicidality*	50.0%	59.1%	>0.9	0.18
Suicidal ideation	50.0%	59.1%	>0.9	0.18
Suicide attempt/SRB	16.7%	22.7%	>0.9	0.15
Suicide attempt	16.7%	13.6%	>0.9	-0.09
NSSI	50.0%	36.4%	0.65	-0.28

*ideation/attempt/SRB

Feedback about Intervention

	UC	ASAP	Total	p	d
Client Satisfaction Questionnaire	24.1±5.2	26.6±3.8	25.5±4.7	0.07	0.58

*Higher score indicates better satisfaction
Possible total score: 8 to 32

Participant Quotes:

- *"It taught me how to better understand my emotions and see when I'm more likely to get more upset and when I'm not as upset…like your emotional thermometer – how upset you are."*

- *"I was having really bad anxiety. I was able to calm myself down, I used grounding and mindfulness."*

- *" I know one of the skills was doing things that bring me joy, writing, painting, drawing, stuff like that. That helped me to tolerate distress. "*

Feedback about App

	Week 4	Week 12	Week 24
Computer Usability Satisfaction Questionnaire*	17.6±7.1	19.0±10.9	20.0±8.6

*Lower score indicates better satisfaction
Possible total score: 10 to 70

Participant Quotes:

- *"I've used guided imagery…It's really helpful for me when I can't sleep or having a panic attack. It calms me down a lot, deep breathing. Those were the most helpful parts."*

- *"It just helped me to focus on the good things, especially when I felt a little bit suicidal and I wasn't really focusing on things that made me happy. Good things – the people in my life and my goals to become a nurse and help people"*

- *"I really liked how you check in with yourself, your temperature's rising and you don't even know it. You can stop and check in. I started doing it without even the app, it became natural to me. It helped a lot."*

Suggestions for Brite 2.0

- **Resources:** Teens wanted recommendations of possible resources and then wanted to personalize
- **Functioning:** simple & straightforward means of interacting
- **Customization:** additional ways to add color and personal preference
- **Notification:** the key point is being prompted at the right time, some youth requested more notifications vs. less
- **Accessibility:** need to use without wifi