Web-based Behavioral Health Screen (BHS) for adolescents and young adults
An innovative suicide prevention tool
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The three leading causes of death among adolescents – unintentional injury, homicide and suicide – are preventable (Downs & Klein, 1995; Ellen et al., 1998).

Screening tools can maximize efficient use of time (Rhodes et al., 2001).

Screening in places like primary care has also been shown to alleviate problems by addressing risk-taking behaviors directly (Gadomski et al., 2003).

Teens are willing to discuss risk-taking behaviors with practitioners (Townsend et al., 1991).

However, patients are more likely to disclose “socially undesirable” behaviors on a screening tool than they are in a face-to-face interview (Kurth et al., 2004).

Screening adolescents for risk-taking behaviors or symptoms of emotional distress is a first step in helping practitioners to better address the needs of adolescents (AACAP, 2009; US Preventive Services Task Force, 2009).

Why Screen in Primary Care?

- The three leading causes of death among adolescents — unintentional injury, homicide and suicide — are preventable (Downs & Klein, 1995; Ellen et al., 1998).
- Screening tools can maximize efficient use of time (Rhodes et al., 2001).
- Screening in places like primary care has also been shown to alleviate problems by addressing risk-taking behaviors directly (Gadomski et al., 2003).
- Teens are willing to discuss risk-taking behaviors with practitioners (Townsend et al., 1991).
- However, patients are more likely to disclose “socially undesirable” behaviors on a screening tool than they are in a face-to-face interview (Kurth et al., 2004).
- Screening adolescents for risk-taking behaviors or symptoms of emotional distress is a first step in helping practitioners to better address the needs of adolescents (AACAP, 2009; US Preventive Services Task Force, 2009).

Why use a standardized screen?

- Increase case identification
- Identify and refer patients prior to suicidal crisis
- Standardize assessment questions
- Reduce provider bias
- Possible to increase staff efficiency
Barriers to Screening in Primary Care

- Lack of provider training
- Minimal reimbursement, if any
- Difficulty accessing behavioral health services

Limitations of current screening tools:
- Single domain (e.g., depression)
- Lack psychometric validation
- Fail to reduce staff and patient burden

The BHS seeks to address these limitations through a validated, multi-domain, web-based screening design.

BHS Development

- Developed by a team of psychologists, pediatricians, and adolescent medicine physicians
- Comprehensive review of best practice guidelines, existing screening tools, behavioral health and risk behavior measures, and psychiatric diagnostic criteria
- Behavioral health items were designed around DSM-IV criteria
- Items were reviewed by 20 national experts
- Focus groups with pediatricians to tailor for primary care setting

Psychosocial Domains of BHS

- Demographics
- Medical
- School
- Family
- Safety
- Substance Use
- Sexuality
- Nutrition and Eating
- Anxiety
- Depression
- Suicide and Self-Injury
- Psychosis
- Trauma
Suicide Items
- Have you ever felt that life is not worth living?
  - Has this feeling occurred in the past week?
- Have you ever thought about killing yourself?
  - In the past week, including today, have you ever thought about killing yourself?
- Did you ever make a plan to kill yourself?
  - In the past week, including today, did you have a plan to kill yourself?
- Have you ever tried to kill yourself?
  - In the past week, including today, have you tried to kill yourself?
- Have you ever done anything to intentionally harm yourself?
  - In the past week, including today, have you done something to intentionally hurt yourself?

BHS Procedures
- Patient completes the BHS prior to medical appointment
- Can be completed in waiting room or exam room
- Computer scores answers and generates a report
- Provider reviews report prior to seeing the patient

Feasibility Study
- 24 adolescents were consented and administered the BHS before a medical appointment
- Satisfaction Questionnaire Results
  a) liked the software (75%)
  b) completed the tool on average within 12.4 minutes (sd=5.04)
  c) understood the questions
  d) reported honestly (92%)
  e) thought it should be used in future appointments (92%)
  f) found it helpful during the appointment (94% of those patients whose doctors used the printout during the appointment)
**Validation Study**

- Sample recruited from primary care clinics
- Completed BHS
- Also completed validation battery that included:
  - Beck Depression Inventory-II (BDI-II)
  - Scale for Suicidal Ideation (SSI)
  - Trauma Symptoms Checklist for Children (TSCC)

**Sample**

- 415 adolescents aged 12–21 (M = 15.8, SD = 2.2)
- 66.5% female
- 77.5% African American, 10.7% Caucasian, 9.7% mixed race, 2.1% of another race

**Scales**

- Single-factor confirmatory factor model fit statistics support the unidimensionality of the four scales (depression, suicide, trauma, anxiety)
- All scales had adequate internal consistency reliability (range: .75 – .87)
- Overall accuracy of each scale 78–85%

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**BHS Reliability and Validity**

<table>
<thead>
<tr>
<th></th>
<th>Depression</th>
<th>Anxiety</th>
<th>Suicide risk</th>
<th>PTSD symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean raw</td>
<td>0.30 (SD)</td>
<td>0.30 (SD)</td>
<td>0.30 (SD)</td>
<td>0.30 (SD)</td>
</tr>
<tr>
<td>Mean transformed</td>
<td>0.67 (SD)</td>
<td>0.72 (SD)</td>
<td>0.67 (SD)</td>
<td>0.72 (SD)</td>
</tr>
<tr>
<td>One-factor CFA fit statistics and standardized factor loadings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFI</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td>TFI</td>
<td>0.97</td>
<td>0.98</td>
<td>0.97</td>
<td>0.98</td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.08</td>
<td>0.05</td>
<td>0.08</td>
<td>0.04</td>
</tr>
<tr>
<td>Factor loadings, range (β)</td>
<td>0.72</td>
<td>0.81</td>
<td>0.64</td>
<td>0.64</td>
</tr>
<tr>
<td>Item fit statistics and parameters ranges</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infit</td>
<td>0.81 – 1.25</td>
<td>0.82 – 1.32</td>
<td>0.81 – 1.24</td>
<td>0.82 – 1.32</td>
</tr>
<tr>
<td>Outfit</td>
<td>0.74 – 1.34</td>
<td>0.85 – 1.59</td>
<td>0.74 – 1.25</td>
<td>0.79 – 1.45</td>
</tr>
<tr>
<td>Item discrimination (a)</td>
<td>0.66 – 1.16</td>
<td>0.85 – 1.53</td>
<td>0.96 – 1.53</td>
<td>0.96 – 1.53</td>
</tr>
<tr>
<td>Item difficulty (b)</td>
<td>-0.41 – 1.41</td>
<td>-1.20 – 2.12</td>
<td>-1.25 – 2.01</td>
<td>-0.74 – 0.84</td>
</tr>
<tr>
<td>Convergent and divergent validity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BDI correlation</td>
<td>0.64</td>
<td>0.59</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>SSI correlation</td>
<td>0.44</td>
<td>0.37</td>
<td>0.72</td>
<td>0.36</td>
</tr>
<tr>
<td>TSCC – anxiety correlation</td>
<td>0.49</td>
<td>0.64</td>
<td>0.26</td>
<td>0.36</td>
</tr>
</tbody>
</table>
### Operating curve characteristics of the BHS subscales

<table>
<thead>
<tr>
<th>Subscale</th>
<th>Sensitivity, % (95% CI)</th>
<th>Specificity, % (95% CI)</th>
<th>Overall accuracy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>85 (73-93)</td>
<td>76 (71-80)</td>
<td>81</td>
</tr>
<tr>
<td>Suicidal risk</td>
<td>83 (71-90)</td>
<td>87 (83-91)</td>
<td>85</td>
</tr>
<tr>
<td>Anxiety</td>
<td>88 (68-97)</td>
<td>67 (62-72)</td>
<td>78</td>
</tr>
<tr>
<td>PTSD symptoms</td>
<td>80 (56-93)</td>
<td>80 (72-86)</td>
<td>80</td>
</tr>
</tbody>
</table>

### Domain Number of Items

<table>
<thead>
<tr>
<th>Domain</th>
<th>Number of Items</th>
<th>Time Frame(s)</th>
<th>Description</th>
<th>Cut Off</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td>3</td>
<td>Current</td>
<td>Race, ethnicity, gender</td>
<td>N/A</td>
</tr>
<tr>
<td>Medical</td>
<td>2</td>
<td>Past year</td>
<td>Health over past year</td>
<td>N/A</td>
</tr>
<tr>
<td>School</td>
<td>3 and 5*</td>
<td>Current and Past year</td>
<td>Grades, attendance, enrollment status, job, activities</td>
<td>N/A</td>
</tr>
<tr>
<td>Family</td>
<td>4</td>
<td>Current</td>
<td>Conflict, cohesion, monitoring</td>
<td>N/A</td>
</tr>
<tr>
<td>Safety</td>
<td>5 and 1</td>
<td>Current and Past year</td>
<td>Personal safety</td>
<td>N/A</td>
</tr>
<tr>
<td>Substance Use</td>
<td>4 and 8</td>
<td>Past 30 days and Past year</td>
<td>Use of tobacco, alcohol, other drugs and abuse of drugs</td>
<td>N/A</td>
</tr>
<tr>
<td>Sexuality</td>
<td>3 and 12</td>
<td>Current and Whole life</td>
<td>Unprotected sex, number of partners, orientation</td>
<td>N/A</td>
</tr>
<tr>
<td>Nutrition and Eating</td>
<td>6</td>
<td>Current</td>
<td>Exercise habits and weight control</td>
<td>0 - 2.045 = NS, 2.046 - 4 = At risk</td>
</tr>
<tr>
<td>Anxiety</td>
<td>6 and 1 Past 2 weeks and Past year</td>
<td>Generalized anxiety, OCD symptoms, panic, social phobia, and impairment</td>
<td>0 - 1.1523 = NS, 1.1524 - 4 = Significant</td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>4 and 8 Past 2 weeks and Past year</td>
<td>Feeling sad, loss of interest in things, and impairment</td>
<td>0 - 0.3568 = Minimal, 0.3569 – 1.2752 = Mild, 1.2753 – 1.6058 = Moderate, 1.6059 – 4 = Severe</td>
<td></td>
</tr>
<tr>
<td>Suicide and Self-Harm</td>
<td>5 and 5 Past week and Whole life</td>
<td>Suicidal thoughts, plan, attempt, self-harm</td>
<td>If life = 0, week = 0, then &quot;No History&quot;, if life = 1, week = 0, then &quot;History of Suicide, but not current&quot;, if week = 1, then &quot;Currently at risk for Suicide&quot;</td>
<td></td>
</tr>
<tr>
<td>Psychosis</td>
<td>2</td>
<td>Past year</td>
<td>Seeing or hearing things that aren't there</td>
<td>N/A</td>
</tr>
<tr>
<td>Trauma</td>
<td>8 and 1 Past year and Whole life</td>
<td>Exposure to difficult or upsetting things and symptoms of avoidance</td>
<td>0 - 0.94324 = NS, 0.94325 – 4 = At risk for PTSD</td>
<td></td>
</tr>
</tbody>
</table>

* Item numbers after "and" refer to number of drop-down items that are only asked if earlier items are endorsed.

### Odds ratios for risk factors and BHS subscale scores

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Depression</th>
<th>Anxiety</th>
<th>Suicidal Risk</th>
<th>PTSD Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance Abuse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol use (≥ 1 day in past 30 days)</td>
<td><strong>2.57</strong>*</td>
<td><strong>2.54</strong>*</td>
<td><strong>2.79</strong>*</td>
<td><strong>2.28</strong>*</td>
</tr>
<tr>
<td>Marijuana use (≥ 1 day in past 30 days)</td>
<td><strong>3.62</strong>*</td>
<td><strong>3.26</strong>*</td>
<td><strong>3.57</strong>*</td>
<td><strong>3.81</strong>*</td>
</tr>
<tr>
<td>Substance use to get high or relax (lifetime)</td>
<td>4.65</td>
<td>15.94***</td>
<td>6.18</td>
<td>15.02***</td>
</tr>
<tr>
<td>Substance abuse disorder</td>
<td><strong>3.62</strong>*</td>
<td><strong>6.82</strong>*</td>
<td><strong>4.62</strong>*</td>
<td><strong>6.12</strong>*</td>
</tr>
<tr>
<td>Alcohol use (≥ 1 day in past 30 days) for the driver had been using alcohol, marijuana, or other drugs (≥ 1 time in past year)</td>
<td>2.74</td>
<td>3.46***</td>
<td>3.98***</td>
<td>3.95***</td>
</tr>
<tr>
<td>Intimacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been pregnant (females)</td>
<td><strong>4.75</strong>*</td>
<td>2.90</td>
<td>1.45</td>
<td>2.79</td>
</tr>
<tr>
<td>Cut someone pregnant (males)</td>
<td>2.60</td>
<td>1.79</td>
<td><strong>6.52</strong></td>
<td>2.79</td>
</tr>
<tr>
<td>Sexual preference (heterosexual, gay, bisexual, or questioning)</td>
<td><strong>3.62</strong>*</td>
<td><strong>3.64</strong>*</td>
<td><strong>2.92</strong>*</td>
<td><strong>2.68</strong>*</td>
</tr>
</tbody>
</table>
### Odds ratios for risk factors and BHS subscale scores (continued)

<table>
<thead>
<tr>
<th></th>
<th>Depression</th>
<th>Anxiety</th>
<th>Suicidal Risk</th>
<th>PTSD Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victimization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically or sexually hurt by a romantic partner (in past year)</td>
<td>6.82***</td>
<td>7.60***</td>
<td>7.63***</td>
<td>14.15***</td>
</tr>
<tr>
<td>Physically or sexually hurt by an adult who lives in your home (in past year)</td>
<td>14.43***</td>
<td>1.71***</td>
<td>14.35***</td>
<td>6.18***</td>
</tr>
<tr>
<td>Dating Disordered Behavior</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Think of yourself as fat despite others saying you’re skinny (often)</td>
<td>3.89***</td>
<td>2.22*</td>
<td>1.87*</td>
<td>1.52</td>
</tr>
<tr>
<td>Self-induced vomiting (sometimes or often)</td>
<td>5.27***</td>
<td>3.89*</td>
<td>3.15*</td>
<td>1.54</td>
</tr>
<tr>
<td>School failure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dropped out of high school</td>
<td>2.35*</td>
<td>2.47*</td>
<td>1.91</td>
<td>2.73*</td>
</tr>
<tr>
<td>Family Disengagement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequent arguing in the home (often)</td>
<td>2.25***</td>
<td>3.77****</td>
<td>2.92***</td>
<td>4.68***</td>
</tr>
</tbody>
</table>

### Behavioral Health Screen

- BHS has promising initial psychometric support
- The web-based platform is innovative and solves common administration problems
- BHS is comprehensive, providing information about psychiatric symptoms and risk behaviors

### Demonstration
BHS in broader context – The Pennsylvania GLS project

- BHS is a key component in a multi-layered strategy to help PCPs become better gatekeepers.

Collaborators and Partners in PA GLS Project

- OMHSAS: Sherry Peters (PI)
- Denise Short (Program Director)
- State Suicide Monitoring Committee
- Children’s Hospital of Philadelphia
- Thomas Jefferson University
- Lackawanna County
- Luzerne County
- Schuylkill County

Objectives of PA GLS project

1. Create a task force of a broad range of stakeholders.
2. Provide a youth suicide “gatekeeper” training program to participating primary care providers in the designated counties.
3. Provide medical practitioners in three counties free access to a web-based, patient self-report screening tool to assess for suicide and related risk factors.
4. Increase the integration, if not collocation, of behavioral health services with medical services.
5. Provide clinical training in best practice therapy models for suicidal youth to behavioral health providers.
Adapting the BHS to practice

- New model emerging
- Two versions of BHS:
  - Short version – (depression & suicide → other domains)
  - Long version – comprehensive (as described)
- Spanish language version
- Expand to adult populations
- This could fit the sick and well visit structure at primary care practices
- Could also allow flexibility in other settings

Questions?

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