Evaluation of the Feasibility and Validity of Short Message System (SMS) Text Messaging for Assessment of Antiretroviral Therapy Adherence among Youth Living with HIV/AIDS (YLH)

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Robert Garofalo, MD, MPH

Intelecare®
from remedy health media
Disclosures

• Nadia Dowshen, MD has documented that her presentation will not involve discussion of unapproved or off label, experimental or investigational use.

• Nadia Dowshen, MD has no financial relationships to disclose or conflicts of interest (COIs) to resolve.
The HIV Epidemic among Youth in the United States

• Over 1 million people in the US living with HIV/AIDS

• Approximately 50,000 new infections each year

• Large portion of new infections occurring among youth, mainly through sexual contact

• Many perinatally infected individuals now surviving to adulthood
Antiretroviral Adherence

• High level of adherence required for optimal health outcomes
• Associated risk factors for poor adherence include
  – Depression
  – Stigma
  – Substance abuse
• Reasons cited for poor adherence include
  – Pill burden/frequency
  – Side effects
  – Stigma/Privacy
  – Simply forgetting
Adherence Interventions

- Directly observed therapy (DOT)
- Phone call reminders
- Regular counseling
The Challenge of Measuring Adherence

• Current methods
  – Self report
  – Pharmacy refill
  – Drug levels
  – Electronic drug monitoring

• Strengths and weaknesses
  – Variability in correlation with biologic outcomes
  – Cost and practicality
Short Message System (SMS) Technology

- 331 million cell phones in use and 7 billion text messages sent every month
- common mode of communication among all youth
- may increase adherence among children and adolescents living with other chronic diseases
- Technology offers opportunity to both intervene on and assess adherence in real time
Hypotheses

• Interactive text message response (ITR) to measure adherence will be feasible and acceptable for HIV-positive youth.

• ITR rates will correlate with the validated VAS adherence measure.
  – †during the first 12 weeks
  – †during weekdays
Study Participation

• Eligibility Criteria
  – HIV-positive serostatus,
  – Aged 12 -29,
  – Use of personal cell phone,
  – English-speaking
  – On ART with poor adherence

• Enrollment
  – Recruited consecutively from June to November 2009
  – 24-week study period
Measures

- **Baseline Measures**
  - Demographics
  - Alcohol and Other Drugs (AOD)
  - Brief Symptoms Inventory (BSI)

- **Primary Outcome**: Satisfaction Survey

- **Primary Outcome**: Adherence
  - Visual Analog Scale (VAS)
  - AIDS Clinical Trial Group (ACTG) Adherence Questionnaire
  - Interactive text response

- **Secondary Outcome**: Disease Specific Markers
Intelecare Technology

Program message

Pt receives daily reminder

Message 1 hr later asking whether they have taken meds

Pt sends text back 1= yes, 2= no
Personal Information

*First Name
Matthew

*Last Name
Pepe

*Primary/Login Email Address
matt@intelecare.com

Additional Email Address(es)

Phone Number(s)
1 (203) 506-0233

Account Information

Creation Date
2009-06-15 14:08:35

Last Activation
2009-06-15

Last Updated
2010-11-17 14:46:09

First Reminder
2009-06-15

Account Status
Active

Admin Expiration

Survey Tags

Password

User PW Reset

Passwords are stored as a hash. Enter a plain text password and it will be hashed when saved. Leave the password alone to not change it. Use the 'User PW Reset' to prompt the user to update their password.
Adherence measures
BSI, AOD

Adherence Measures
Satisfaction survey

Adherence Measures
Satisfaction Survey

Adherence Measures
Satisfaction Survey

Adherence Measures
Satisfaction Survey

Wk 0

Wk 6

Wk 12

Wk 16

Wk 24
Data Management

• Database created in Excel which included:
  – phone number for the participant
  – text of the outgoing or incoming message
  – whether it was an outgoing or incoming message
  – date message was sent/received
  – time of day/night the message was sent/received

• Over 15,500 rows of sent/received messages
• Messages sorted by participant and cleaned
Analysis

• Messages successfully sent with appropriate responses from participant were summed

• Interactive text response adherence scores from 0-100% were calculated

• ITR adherence scores on weekday vs. weekend and 0-12 vs. 13-24 weeks were compared using paired t-tests

• Pearson correlations between ITR adherence and VAS scores overall and for each time-period (6, 12, 18, and 24 weeks) were calculated to assess comparability
# Sample Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Mean or frequency, (SD or %; range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N=25</strong></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>23 (3.08; 14-29)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>23 (92%)</td>
</tr>
<tr>
<td>Female</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>15 (60%)</td>
</tr>
<tr>
<td>White</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Latino</td>
<td>6 (24%)</td>
</tr>
<tr>
<td>Multiracial</td>
<td>2 (8%)</td>
</tr>
</tbody>
</table>
## Sample Characteristics

<table>
<thead>
<tr>
<th>N=25</th>
<th>Mean or frequency, (SD or percentage; range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission Mode</strong></td>
<td></td>
</tr>
<tr>
<td>Perinatal</td>
<td>3 (12%)</td>
</tr>
<tr>
<td>Unprotected sex</td>
<td>21 (84%)</td>
</tr>
<tr>
<td>Unsure</td>
<td>1 (4%)</td>
</tr>
<tr>
<td><strong>Time since dx (months)</strong></td>
<td>41 (43.4; 7-180)</td>
</tr>
<tr>
<td><strong>Time on ART (months)</strong></td>
<td>37 (59.4; 1-240)</td>
</tr>
<tr>
<td><strong>Medication frequency</strong></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>20 (80%)</td>
</tr>
<tr>
<td>Twice Daily</td>
<td>5 (20%)</td>
</tr>
</tbody>
</table>
ITR and Adherence Rates (n=21 of 25)

• Total texts sent, mean=175 (SD=70.3), range=80 to 387 messages
• Overall response rate= 60.9% (SD= 29.5, range= 6.0% - 99.2%)
• Overall adherence rate= 57.0% (SD= 27.7%, range=6.0% - 94.8%)
<table>
<thead>
<tr>
<th>Weekday</th>
<th>Weekday</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>58.3</td>
<td>27.8</td>
<td>54.6</td>
<td>28.5</td>
<td>.07</td>
</tr>
<tr>
<td>Weeks 0-12</td>
<td></td>
<td>58.4</td>
<td>27.4</td>
<td>53.9</td>
<td>34.3</td>
<td>.37</td>
</tr>
</tbody>
</table>
Correlation of VAS and ITR adherence rates by time period

<table>
<thead>
<tr>
<th></th>
<th>6 wk ITR</th>
<th>12 wk ITR</th>
<th>18 wk ITR</th>
<th>24 wk ITR</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 wk VAS</td>
<td>r = .52*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 wk VAS</td>
<td></td>
<td>r = .09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 wk VAS</td>
<td></td>
<td></td>
<td>r = -.09</td>
<td></td>
</tr>
<tr>
<td>24 wk VAS</td>
<td></td>
<td></td>
<td></td>
<td>r = -.14</td>
</tr>
</tbody>
</table>

* p ≤ .05
Limitations

• Small sample size
• No control group
• No coaching/feedback on ITR provided to participants
• Unable to interpret inappropriate response data
• Generalizability may be limited
Conclusions

• ITR adherence rates were correlated with VAS during the first 6 weeks of the study period.

• Larger studies including coaching/feedback on ITR for participants are needed to determine the validity of ITR as an adherence measure.

• Non-significant trends in this small sample suggest that ITR can provide important clinical information about adherence patterns during various time periods.
Acknowledgements

• Co-Authors
• Howard Brown Health Center/Children’s Memorial Hospital Youth HIV program Staff for their support of this study
• Intelecare for their generous software donation
• Youth who participated in the study
Did you forget about rule #3?

Have you taken your pills yet?

Time to take my pills

Nick, take your meds. Take your vitamins

Your health comes 1st, so take your meds!
# Feasibility/Acceptability

<table>
<thead>
<tr>
<th>N=21</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention rate (N=25)</td>
<td>84%</td>
</tr>
<tr>
<td>Helpful to avoid missed doses?</td>
<td>95%</td>
</tr>
<tr>
<td>Helpful to remember refills?</td>
<td>76%</td>
</tr>
<tr>
<td>Helpful to remember medical appointments?</td>
<td>71%</td>
</tr>
<tr>
<td>Messages respected privacy</td>
<td>100%</td>
</tr>
<tr>
<td>Received all messages</td>
<td>81%</td>
</tr>
<tr>
<td>Would like to continue to receive reminders?</td>
<td>81%</td>
</tr>
<tr>
<td>Reminders would have been helpful when starting meds?</td>
<td>100%</td>
</tr>
</tbody>
</table>
### Adherence Outcomes

<table>
<thead>
<tr>
<th>N=21</th>
<th>Mean (baseline)</th>
<th>Mean (24 wks)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS</td>
<td>74.7</td>
<td>93.3</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>ACTG</td>
<td>2.33</td>
<td>3.19</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

### Disease Specific Outcomes

<table>
<thead>
<tr>
<th>N=17</th>
<th>Mean (baseline)</th>
<th>Mean (24 wks)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD4</td>
<td>501</td>
<td>544</td>
<td>0.370</td>
</tr>
<tr>
<td>Viral load</td>
<td>2750</td>
<td>28</td>
<td>0.226</td>
</tr>
</tbody>
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