



# 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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# 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



[Save User](#)[Manage 2 Reminders](#)[Reset Password](#)[Send Welcome Email](#)

## Personal Information

**\*First Name****\*Last Name****\*Primary/Login Email Address** No Login [\[?\]](#)**Additional Email Address(es)**[+ add additional email\(s\)](#)**Phone Number(s)** Mobile [remove](#)[+ add additional phone number\(s\)](#)

## 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****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.*[Save User](#)

**Wk 0**

Adherence measures  
BSI, AOD

**CD4**  
**VL**

**Wk 6**

Adherence Measures  
Satisfaction survey

**Wk 12**

Adherence Measures  
Satisfaction Survey

**CD4**  
**VL**

**Wk 16**

Adherence Measures  
Satisfaction Survey

**Wk 24**

Adherence Measures  
Satisfaction Survey

**CD4**  
**VL**

# 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

<b>N=25</b>	Mean or frequency, (SD or %; range)
Age	23 (3.08; 14-29)
Gender	
Male	23 (92%)
Female	2 (8%)
Race/Ethnicity	
Black	15 (60%)
White	2 (8%)
Latino	6 (24%)
Multiracial	2 (8%)



# Sample Characteristics

<b>N=25</b>	Mean or frequency, (SD or percentage; range)
Transmission Mode	
Perinatal	3 (12%)
Unprotected sex	21 (84%)
Unsure	1 (4%)
Time since dx (months)	41 (43.4; 7-180)
Time on ART (months)	37 (59.4; 1-240)
Medication frequency	
Daily	20 (80%)
Twice Daily	5 (20%)

# 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%)

# ITR adherence rates by study period and week day

Weekday		Weekend		
Mean	SD	Mean	SD	<i>P</i> value
58.3	27.8	54.6	28.5	.07
Weeks 0-12		Weeks 13-24		
58.4	27.4	53.9	34.3	.37

# Correlation of VAS and ITR adherence rates by time period

	6 wk ITR	12 wk ITR	18 wk ITR	24 wk ITR
6 wk VAS	$r=.52^*$			
12 wk VAS		$r=.09$		
18 wk VAS			$r= -.09$	
24 wk VAS				$r= -.14$

\*  $p \leq .05$

# 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
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- Youth who participated in the study

# Message Content

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 1<sup>st</sup>, so take your meds!



# Feasibility/Acceptability

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

# Adherence Outcomes

N=21	Mean (baseline)	Mean (24 wks)	P value
VAS	74.7	93.3	<0.01
ACTG	2.33	3.19	<0.01

# Disease Specific Outcomes

N=17	Mean (baseline)	Mean (24 wks)	P value
CD4	501	544	0.370
Viral load	2750	28	0.226