Text-messaging Promotes Adherence to Antiretroviral Therapy: A Meta-Analysis of Intervention Trials

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HIV=Global Pandemic

Source: UNAIDS, 2011
Promoting Adherence

• Standard of Care

• Research Interventions
  – Amico et al., 2006
    • \(d=0.35\)
      – 0.19 if ART naïve, 0.62 if pre-selected for MNA
Electronic Devices
1. Research Question:

How much do electronic messaging interventions improve adherence to anti-retroviral therapy (ART) in HIV+ individuals?
2. Data Collection

• **Inclusion Criteria:**
  – intervention studies that examine the use of electronic, text-based messaging to promote ART adherence in HIV+ samples
  – sufficient results to calculate effect size

• **Databases Searched:** PsycINFO, PubMed/Medline, Academic Search Premier, CINAHL, & ProQuest Dissertations and Theses

• **Reverse search:** references of all relevant studies
Search Terms

"CELL PHONE" OR "CELLULAR PHONE" OR "MOBILE PHONE" OR "TEXT MESSAGE" OR SMS OR "SIMPLE MESSAGE SERVICE" OR PAGER OR "TWO-WAY ELECTRONIC MESSAGING SYSTEM"

AND

HIV OR HIV+ OR HIV-POSITIVE OR "PEOPLE LIVING WITH HIV/AIDS" OR "HUMAN IMMUNO-DEFICIENCY VIRUS POSITIVE" OR PLWHA

AND

ART OR HAART OR “HIGHLY ACTIVE ANTIRETROVIRAL THERAPY” OR “ANTIRETROVIRAL THERAPY”

AND

ADHERENCE OR "MEDICATION ADHERENCE" OR MNA OR "MEDICATION NON-ADHERENCE"
Search Outcomes

4127 hits screened

- 4096 excluded: false hits, duplicates

33 papers examined closely

- 20 papers excluded: no intervention/no messaging (reviews, qualitative work, protocols, commentary)

13 papers coded for analysis

- 3 excluded: insufficient data to calculate effect sizes

10 papers included in analysis
4. Results: Participant Characteristics

• n=2010 consented
  – 1638 (81%) retained to follow up
• 46% female
• 63% African
• Mean age: 37.76 years
• 82% ART naïve
4. Results: Study Characteristics

- Design
  - Two groups, pre/post (k=5)
  - Two groups, post only (k=3)
  - One group, pre/post (k=2)

- Peer reviewed (k=9)
  - 1 unpublished dissertation

- Most (70%) data from 2007-2010
4. Results: Study Characteristics
4. Results: Intervention Characteristics

- 11 Interventions total
- Average length of intervention: 169.9 days
- Daily messaging in 7 (64%) interventions
- Matched to dose in 6 (54%) interventions
- Message tailored in 5 (45%) interventions
- Bidirectional in 6 (54%) interventions
4. Results: Study Characteristics

- DV: mean outcomes reported=2.6 (range 1-4)

<table>
<thead>
<tr>
<th>REPORTED OUTCOME</th>
<th>NUMBER OF STUDIES (k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-report</td>
<td>7</td>
</tr>
<tr>
<td>Electronic Data Monitoring</td>
<td>5</td>
</tr>
<tr>
<td>Viral Load</td>
<td>3</td>
</tr>
<tr>
<td>CD4+ Count</td>
<td>2</td>
</tr>
<tr>
<td>Pill Count</td>
<td>2</td>
</tr>
<tr>
<td>Pharmacy Refill Data</td>
<td>1</td>
</tr>
</tbody>
</table>
5. Synthesis

• Comparison by follow up

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean ES</th>
<th>SE</th>
<th>-95% CI</th>
<th>+95% CI</th>
<th>Z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>First follow up</td>
<td>.1226</td>
<td>.0513</td>
<td>.0221</td>
<td>.2232</td>
<td>2.3906</td>
<td>.0168</td>
</tr>
<tr>
<td>Last follow up</td>
<td>.1953</td>
<td>.0482</td>
<td>.1008</td>
<td>.2897</td>
<td>4.0523</td>
<td>.0001</td>
</tr>
</tbody>
</table>
5. Synthesis

Mean Effect Size by Follow Up

First F/U

Last F/U
## 5. Synthesis

<table>
<thead>
<tr>
<th>Condition</th>
<th>k</th>
<th>ES⁺</th>
<th>-95% CI</th>
<th>+95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control pre/post</td>
<td>5</td>
<td>-0.16</td>
<td>-0.37</td>
<td>0.05</td>
</tr>
<tr>
<td>Intervention pre/post</td>
<td>7</td>
<td>0.40</td>
<td>0.08</td>
<td>0.72</td>
</tr>
<tr>
<td>Intervention vs. Control</td>
<td>8*</td>
<td>0.20</td>
<td>0.10</td>
<td>0.30</td>
</tr>
</tbody>
</table>

*one study used a 2-arm design yielding 9 intervention groups total for this category
5. Synthesis: intervention group pre/post

Forest Plot: Derived Effect Size ($d$) by Study
Whiskers represent 95% Confidence Interval
5. Synthesis: intervention vs. control

Forest Plot: Derived Effect Size (d) by Study
Whiskers represent 95% Confidence Interval
## 5. Synthesis: Biological Outcomes

<table>
<thead>
<tr>
<th>Condition</th>
<th>K</th>
<th>$\text{ES}_+$</th>
<th>-95% CI</th>
<th>+95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention pre/post</td>
<td>3</td>
<td>.74</td>
<td>.58</td>
<td>.90</td>
</tr>
<tr>
<td>Intervention vs. Control</td>
<td>2</td>
<td>.28</td>
<td>.13</td>
<td>.44</td>
</tr>
</tbody>
</table>
5. Synthesis:
Assessing for Heterogeneity

\[ Q = \chi^2_{(k-1)df} = \sum_{i=1}^{k} w_i (d_i - d_\text{p})^2 \]

Cochrane’s \( Q = 4.55 \) (\( p = 0.80 \))

Higgins \( I^2 = Q \) as a percentage (0% in this case)
5. Synthesis: Publication Bias
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Bubble diameter represents sample size (n)

Effect Size ($d$) vs. Weight $1/(SE)^2$
5. Synthesis: Publication Bias

- Begg’s Test:
  \( \tau = 0.20; \ p = 0.02 \)

- Egger’s Test:
  \( b = -3.81; \ t(8) = -1.23; \ p = 0.22 \)
6. Conclusions

• A modest, significant effect
• Consistent
• Naïve vs. MNA
• Active ingredients
Acknowledgements

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  – Carter A. Lennon MA

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Thank you