Is it feasible to provide monetary incentives for viral load suppression among a cohort of HIV-infected veterans in care?

Farber S
Frank C
Tate J
Ardito D
Kozal M
Justice AC
Braithwaite RS
Background

- Nonadherence with ARV important problem despite newer regimens with fewer side effects
- Across VA (Braithwaite RS et al, AIDS, 2007)
  - Doses taken as directed
    - 67% Efavirenz
    - 59% Boosted PI
    - 61% Single PI
  - Pts in highest adherence stratum
    - 33% Efavirenz
    - 23% Boosted PI
    - 21% Single PI
Background

• Monetary incentives have been advocated as a means of improving adherence.

• However, adherence is
  – Difficult to verify
  – Easy to “game”
  – An elusive incentivization target
Objective

• To investigate whether a monetary incentive for viral load suppression is feasible and/or leads to changes in virological suppression.
Methods

• HIV-infected at the West Haven Infectious Disease clinic
  – Offered a monetary incentive ($100) on a quarterly basis for
    • Achieving undetectable viral load (<50 copies/ml)
    • Having a substantial viral load improvement (>=1 log unit) compared to their best result during the previous year.

• Eligibility
  – Attended clinic for >=1 year
  – Prescribed ARV for >= 1 year.
  – Did not focus on poor adherers exclusively because of fairness concerns
  – The size of the incentive based on estimated health care savings from preventing new HIV infections
## Methods

<table>
<thead>
<tr>
<th>Baseline transmission rate per person per year</th>
<th>Reduction in transmissions per person per year by improving adherence*</th>
<th>Cost saved per year</th>
<th>Cost saved per quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.01</td>
<td>0.0006</td>
<td>$218</td>
<td>$54</td>
</tr>
<tr>
<td>0.02</td>
<td>0.0012</td>
<td>$435</td>
<td>$109</td>
</tr>
<tr>
<td>0.05</td>
<td>0.003</td>
<td>$1088</td>
<td>$272</td>
</tr>
<tr>
<td>0.10</td>
<td>0.006</td>
<td>$2177</td>
<td>$544</td>
</tr>
<tr>
<td>0.20</td>
<td>0.012</td>
<td>$4354</td>
<td>$1088</td>
</tr>
<tr>
<td>0.50</td>
<td>0.030</td>
<td>$10,884</td>
<td>$2721</td>
</tr>
</tbody>
</table>

* Assuming viral load suppressed by partial adherence to 1 log viral load above detectability threshold of assay

Less risk behavior and/or viral load

More risk behavior and/or viral load
<table>
<thead>
<tr>
<th>Viral Load</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undetectable</td>
<td>A</td>
</tr>
<tr>
<td>50-499</td>
<td>B</td>
</tr>
<tr>
<td>500-4999</td>
<td>C</td>
</tr>
<tr>
<td>5000 or above</td>
<td>D</td>
</tr>
</tbody>
</table>
Methods

<table>
<thead>
<tr>
<th>If your best grade in the last year was</th>
<th>Grade needed for incentive</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>C</td>
</tr>
<tr>
<td>C</td>
<td>B</td>
</tr>
<tr>
<td>B</td>
<td>A</td>
</tr>
<tr>
<td>A</td>
<td>A</td>
</tr>
</tbody>
</table>
Methods

• Although this was a feasibility study with low power, compared pre- versus post-incentive
  – Viral Load
    • Proportion of detectable viral load
    • Area under the curve (AUC) log viral load
      – “Undetectable” was assigned a log viral load of 48 copies/ml
  – Adherence
    • # ART regimens filled
  – Intent-to-treat vs On-treatment

• Pre-specified target patients
  – >=1 detectable viral load prior to the incentive

• Pre- versus post-incentive results were compared
  – Proportions: Exact binomial test
  – Means: Paired sample t-test
Results

• 80 eligible patients
  – 77 consented to participate in the incentive program
  – 71 were available for 12 month follow-up
  • 3 relocations, 3 died, 1 was lost to follow-up

• Demographics
  – Median age 59
  – 100% male
  – 62% nonwhite
Results

- Nonadherence risk factors
  - 54% history of alcohol abuse
  - 51% had history of injection drug use
  - 34% had history of depression
- 47% (N=37) had $\geq 1$ detectable viral load in prior year
Results - Feasibility

• No evident adverse effect on clinic workflow.
• Time 5 -10 minutes per pt per quarter
• No clinician expressed frustration about the impact of the study on workflow
• The clinic administrator was concerned at the beginning about workflow challenges
  • By the end of the study, she no longer had concerns.
Results - Feasibility

• The incentive was acceptable to all patients except for one who

  • Expressed frustration after his first quarter because he did not qualify for the incentive.
  • His frustration was exhibited verbally, but without any threatening words or actions.
  • He chose to continue participating in the study,
  • During the subsequent quarter he qualified for the incentive, and became pleased with the intervention.
Results - Feasibility

• Patients generally appeared to understand the incentive system, and could predict whether they qualified
• No complaints about unfairness or lack of transparency.
  – During 1st quarter, some confusion about timing/eligibility
    • Some patients were disappointed that they were not able to receive at least a portion of the incentive.
    • Resolved by second quarter through education by research staff.
• No patients expressed concerns that the incentive targeted a clinical outcome rather than a behavior itself
• Acceptance of the premise that they could control the viral load by
  • Taking their medications with greater regularity
  • Working with clinician to find more effective drug regimen.
Results - Effectiveness

• Among target population, pre- vs post-intervention
  – % undetectable viral loads
    • Intent to treat: Increased from 57% to 69%, (p = 0.03)
    • As treated: increased from 59% to 71% (p = 0.04)
  – AUC viral load
    • Intent to treat: 2.2 to 1.9 (p = 0.2)
    • As treated: 2.1 to 1.9 (p = 0.2)
  – Adherence
    • Intent to treat: # refills 18.8 to 20.4 (p = 0.02)
    • As treated: # refills 19.3 to 21.0 (p = 0.02)

• Among all patients
  – No evident changes
Results – Posthoc analyses

• Substantial seasonal variation in viral load
  – Among those with detectable virus in the prior year, only 42\% of viral loads were undetectable during the winter quarter, a lower proportion than during the other seasons (64\%, \( p = 0.01 \)).
  – However in the intervention year the proportion of undetectable viral loads in winter, 64\% , was more similar to the proportion seen in the rest of the year 69\%( \( p = 0.4 \)).
Results

• Parallel qualitative study
  – Taped interviews about attitudes and beliefs about incentives and HIV care
  – Cyndi Frank, expected PhD
Limitations

- Small, single-site, observational study
- Many other possible explanations for viral load changes
  - Regression-to-the-mean.
- Large prevalence of patients with prior IDU
  - Would incentives would be generalizable to a population with fewer substance users?
- Potential inappropriateness of the incentive for patients with multiclass genotypic resistance.
Conclusion

• It is feasible to
  – Use financial incentives with the aim of reducing viral load among HIV patients in care
  – Specify the incentive by requiring cost-neutrality, based on the avoided costs from downstream infections averted
  – Target clinical goal rather than behavior
• Raises the possibility that the incentive payments increased undetectable viral loads by 12%
• Future studies are needed to assess its effectiveness, scalability, and sustainability.
Questions ???