TEXT MESSAGE RESPONSE PREDICTS TENOFOVIR LEVELS IN MEN WHO HAVE SEX WITH MEN TAKING PRE-EXPOSURE PROPHYLAXIS

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Disclosures

• Gilead Educational Grant Recipient
• Study drug supplied by Gilead
Pre-exposure prophylaxis (PrEP) effectiveness is strongly linked to adherence. The gold standard research method for tracking PrEP adherence is intracellular tenofovir-diphosphate (TFV-DP) concentrations, which are expensive and not commercially available. Text messaging has been shown to increase ART adherence among HIV+ individuals and is being evaluated in several PrEP demonstration projects. Response to daily, automated, SMS text messages to support adherence may be a good predictor of biological adherence measures and thus a non-biologic surrogate for PrEP adherence.

Moore et al., AIDS Care, 2012; Marcus et al. HIV Med 2014.
iTab Intervention

- iTAB= Individualized Texting for Adherence Building
- Texting content developed via focus group
  - both health behavior and “factoid” messages
- Texts sent daily at participant-preferred time
  - two-way texts—participants asked to respond
- Participants go through text training and select content
  - 2 health behavior and 5 factoid messages per week
Objectives

• To compare PrEP drug levels at weeks 12 and 48 with the proportion of daily reported pill taking by iTAB over 2 half-lives prior to study visit

• To establish the optimal level of adherence as determined by iTAB that best predicts PrEP drug level equivalent to taking ≥4 doses per week
Methods

- The TAPIR Study (RCT of Daily Text Messages To Support Adherence to PrEP In At-Risk for HIV Individuals) is a 48-week study of 398 HIV-uninfected MSM and TGW randomized to iTAB versus SoC.
- Analysis was performed on subjects on iTAB at weeks 12 and 48 with at least one TFV-DP level.
- TFV-DP concentrations were compared to the proportion of positive iTAB responses over 34 days prior to weeks 12 and 48 visit.
  - Positive iTAB response: (“A= Yes, I took my PrEP”)

<table>
<thead>
<tr>
<th>TFV-DP (fmol/punch)</th>
<th>Adherence Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥1250</td>
<td>7 doses/week</td>
</tr>
<tr>
<td>700-1249</td>
<td>4-6 doses/week</td>
</tr>
<tr>
<td>350-699</td>
<td>2-3 doses/week</td>
</tr>
<tr>
<td>&lt;350</td>
<td>0-1 doses/week</td>
</tr>
</tbody>
</table>
Statistical Analysis

• Wilcoxon rank sum test was used to compare proportions of positive iTAB response in adherence categories by TFV-DP levels

• Intraclass Correlation Coefficient (ICC) was used to assess the association between iTAB response and TFV-DP dosing levels

• ROC analyses were used to assess optimal iTAB response in predicting adequate adherence
  – Defined as TFV-DP > 719 fmol/punch (≥ 4 doses/wk)
### Demographic Characteristics of Study Population (n=179)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, median (IQR)</td>
<td>33 (28-41)</td>
</tr>
<tr>
<td>Male</td>
<td>178 (99%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>131 (74%)</td>
</tr>
<tr>
<td>Black</td>
<td>23 (13%)</td>
</tr>
<tr>
<td>Hispanic Ethnicity</td>
<td>50 (28%)</td>
</tr>
<tr>
<td>Bachelor or advanced degree</td>
<td>90 (50%)</td>
</tr>
<tr>
<td>Income &gt; $2000/month</td>
<td>105 (59%)</td>
</tr>
</tbody>
</table>
## Results

<table>
<thead>
<tr>
<th></th>
<th>Week 12 Mean% (SD)</th>
<th>P-value</th>
<th>Week 48 Mean% (SD)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TFV-DP, mean level</strong></td>
<td>1345 (± 577)</td>
<td>--</td>
<td>1259 (± 527)</td>
<td>--</td>
</tr>
<tr>
<td><strong>Pos iTAB responses</strong></td>
<td>87% ± 17%</td>
<td>--</td>
<td>84% ± 20%</td>
<td>--</td>
</tr>
<tr>
<td><strong>Pos iTAB responses by doses/wk</strong></td>
<td></td>
<td><strong>p=0.029</strong></td>
<td></td>
<td><strong>p&lt;0.001</strong></td>
</tr>
<tr>
<td>&lt;2 doses</td>
<td>61% ± 30%</td>
<td></td>
<td>56% ± 22%</td>
<td></td>
</tr>
<tr>
<td>2-3 doses</td>
<td>69% ± 29%</td>
<td></td>
<td>68% ± 32%</td>
<td></td>
</tr>
<tr>
<td>4-6 doses</td>
<td>88% ± 15%</td>
<td></td>
<td>83% ± 16%</td>
<td></td>
</tr>
<tr>
<td>7 doses</td>
<td>89% ± 17%</td>
<td></td>
<td>84% ± 20%</td>
<td></td>
</tr>
</tbody>
</table>

Mean% = proportion of positive iTAB responses

TFV-DP concentrations by dosing categories were associated with proportion of positive iTAB responses.
Week 48 Plot

ICC = 0.359

Proportion of positive raltegravir response

DBS TFV-DP Dosing

- <2 doses
- 2–3 doses
- 4–6 doses
- 7 doses
Results

ROC analysis suggests that the optimal cut-score of proportion of positive iTAB responses to predict protective TFV-DP levels at week 48 was 75% (specificity 52%, sensitivity 85%, PPV 91%, NPV 38%).

<table>
<thead>
<tr>
<th>iTAB $&gt;75%$</th>
<th>TFV-DP $&gt;719$</th>
<th>N (Proportion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>109 (71%)</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>12 (8%)</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>11 (7%)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>20 (13%)</td>
</tr>
</tbody>
</table>
Limitations

• iTAB adherence is self-report, but daily and relates to biologic endpoint
• iTAB responses analyzed over 2 half-lives of intracellular TFV-DP thus iTAB data only ~1 month prior to study visit
• May be variance due to high biological variation
Conclusions and Future Directions

- Overall adherence to PrEP was high among iTAB users.
- Self-reported dosing by daily text messaging is associated with TFV-DP levels.
- In settings where PrEP drug level testing is not used, text message adherence reporting could be used to prompt and assess adherence.
- iTAB is currently being evaluated in settings where adherence may (1) be more challenging and (2) need to be higher (e.g., women, transgender individuals).
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