Background

- Integrate strand-transfer inhibitors (INSTI) represent one of the most efficacious classes of antiretroviral treatments (ART) currently available to achieve virologic suppression
- HIV transmission risk is highly dependent on plasma HIV-1 RNA (pVL) levels, which are very high at the early (acute) stage, drop significantly and remain stable during the chronic stage, and again rise in the late stage disease (AIDS)
- Individuals can also be at risk of HIV transmission due to behavioral and biological determinants of risk, or the composition of their sexual networks

Objectives

- Determine the difference in time to virologic suppression when initiating ART with INSTI-based regimens versus non-INtSI-based regimens
- Estimate the amount of potential averted HIV incidence from ART-naive men who have sex with men (MSM) initiating ART with INSTI regimens, considering different risk profiles and accounting for the stage of HIV infection at ART initiation

Methods

- HIV transmission risk due to the stage of HIV at ART initiation was estimated using two mathematical models (see Fig. 1 and references), and applied to a model of the HIV natural history (Figure 2)
- The change in pVL from ART initiation to virologic suppression was calculated from a subset of the HOMER cohort: 1743 naive individuals who initiated ART between 2011 and 2015 with at least one year of follow-up in BC; 326 individuals initiated ART with INSTI regimens (Figure 3)
- HIV transmission risk due to individual risk behaviour was based on Momentum cohort data by dividing a simulated population into 4 groups based on HIRI-MSM scores (Table 1)
- Averted infections due to ART initiation on INSTI regimens were estimated for both mathematical models, by stage of HIV at ART initiation and by individual risk behaviour

Figure 1: Mathematical models of pVL-related transmission risk

- Wilson et al early stage
- Fraser et al early stage
- Wilson et al late stage
- Fraser et al late stage

Figure 2: Relative transmission risk along the HIV natural history

- HIV natural History
- Risk: Wilson et al model
- Risk: Fraser et al model

Table 1. Estimated risk characteristics of the HIV positive MSM population in BC in 2017

<table>
<thead>
<tr>
<th>HIRI-MSM risk groups</th>
<th>&lt;10</th>
<th>10−19</th>
<th>20−24</th>
<th>&gt;25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion</td>
<td>43.0%</td>
<td>30.7%</td>
<td>11.7%</td>
<td>14.9%</td>
</tr>
<tr>
<td>MSM Population (N)</td>
<td>17132</td>
<td>12230</td>
<td>4683</td>
<td>5767</td>
</tr>
<tr>
<td>MSM PLWH (N)</td>
<td>1199</td>
<td>1645</td>
<td>3562</td>
<td></td>
</tr>
<tr>
<td>Incident cases</td>
<td>421</td>
<td>57</td>
<td>1199</td>
<td></td>
</tr>
<tr>
<td>Relative contact rate</td>
<td>1.0</td>
<td>3.4</td>
<td>7.4</td>
<td></td>
</tr>
<tr>
<td>Transmission cases</td>
<td>7.9</td>
<td>6.3</td>
<td>173.8</td>
<td></td>
</tr>
<tr>
<td>Transmissions per 1000PY</td>
<td>6.6</td>
<td>22.5</td>
<td>45.8</td>
<td></td>
</tr>
</tbody>
</table>

Results

- Time to first virologic suppression for INSTI regimens was 22.7 days (95% credible interval CI 20.7-25.4), compared to 64.4 days (95% CI 60.8-69.0) for non-INtSI (Figure 3)
- There was no statistically significant difference between the populations that achieve virologic suppression, whether on INSTI or non-INtSI regimens
- INSTI-initiating HIRI-MSM ≥ 25 individuals are estimated to avert 0.04 (chronic stage), 9 (late stage), and 25 (early stage) incident cases per 1000 PY
- HIRI-MSM ≥ 20 individuals would avert less than 4 incident cases per 1000 PY independent of stage of HIV at ART initiation
- Individuals in the chronic stage would avert less than 0.3 incident cases per 1000 PY independent of HIRI-MSM risk group (Table 2)
- Estimates for the late stage of HIV were the most sensitivity to the transmission risk assumptions (Table 3)
- Number need to treat with INSTI to avert one incident case is ≥ 40 for high risk individuals that initiate ART in the early stage, but > 500 for individuals initiating ART in the chronic stage, independent of risk behaviour

Table 2. Averted infections (per 1000 PY) by stage of HIV and risk group

<table>
<thead>
<tr>
<th>HIRI-MSM risk groups</th>
<th>Early ART</th>
<th>Delayed ART</th>
<th>Late ART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilson et al</td>
<td>2.51</td>
<td>8.54</td>
<td>18.53</td>
</tr>
<tr>
<td>Fraser et al</td>
<td>3.45</td>
<td>11.76</td>
<td>25.45</td>
</tr>
</tbody>
</table>

Table 3. Sensitivity analysis on transmission risk by stage of HIV

<table>
<thead>
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Conclusions

- INSTI regimens achieve faster virologic suppression than other regimens
- Initiating high risk individuals on INSTI-based regimens has the potential to avert incident cases when compared to other regimens
- The potential gains are highly dependent on risk behavior and the stage of HIV at ART initiation

References and Contact


Ethics: H05-50123
I have no conflicts of interest
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