Prevention of Hepatitis C Virus Transmission among People who Inject Drugs

Professor Sharon Hutchinson
VHPB, Split
15th November 2013
Outline

- What is the prevalence of PWID and HCV?
- How is HCV transmitted among PWID?
- What is the effectiveness of interventions in preventing HCV among PWID?
  - Community
  - Prison
- What is the potential of HCV antiviral therapy to prevent HCV among PWID?
- What has been the impact of Scotland’s HCV Action Plan on prevention of infection?
Global estimates of the number of PWID

Global estimate: 15.9 million PWID

W. Europe: 1M  E. Europe: 3.5M
Canada & US: 2.3M  Asia: 4.8M  Latin America: 2M  Sub-Saharan Africa: 1.8M

Prevalence
- ≥1%
- ≥0.5% to <1%
- ≥0.25% to <0.5%
- >0% to <0.25%
- No reports of injecting drug use identified
- Injecting drug use reported but no estimate of prevalence

Global estimate: 10 million PWID with anti-HCV

W. Europe: 0.7M  E. Europe: 2.3M

Canada & US: 1M

Asia: 3.1M

Sub-Saharan Africa: 0.8M
Outline

- What is the prevalence of PWID and HCV?
- How is HCV transmitted among PWID?
- What is the effectiveness of interventions in preventing HCV among PWID?
  - Community
  - Prison
- What is the potential of HCV antiviral therapy to prevent HCV among PWID?
- What has been the impact of Scotland’s HCV Action Plan on prevention of infection?
Association between Needle/Syringe sharing and HCV among PWID in Europe (Palmateer, et al. IJDP 2013)

Meta-analysis of 16 Studies
(involving 4,666 PWID)

Pooled Odds Ratio

\[ \hat{OR} = 3.3 \quad (95\% \text{ CI } 2.4 \text{ – } 4.6) \]

High rates of HCV found among those who did not report N/S sharing
(prevalence ranged 33-82%; pooled prevalence of 59%)

Increased

Decreased

Risk of HCV with N/S sharing
Association between sharing of Injecting Equipment and HCV transmission among PWID in Scotland

*(Palmateer et al. JVH 2013)*

<table>
<thead>
<tr>
<th>Paraphernalia* (but not N/S)</th>
<th>(Adjusted Odds of recent HCV infection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/S</td>
<td>1.2 (0.5-3.3)</td>
</tr>
<tr>
<td>Shared events per PWID</td>
<td>4-8</td>
</tr>
<tr>
<td>2.5% HCV trans. probability</td>
<td>(2.5%)</td>
</tr>
<tr>
<td>37% HCV infections</td>
<td>(37%)</td>
</tr>
</tbody>
</table>

*a) All PWID (N~1,800)*

<table>
<thead>
<tr>
<th>Paraphernalia* (but not N/S)</th>
<th>(Adjusted Odds of recent HCV infection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/S</td>
<td>6.7 (2.6-17.1)</td>
</tr>
<tr>
<td>Shared events per PWID</td>
<td>59-75</td>
</tr>
<tr>
<td>0.3% HCV trans. probability</td>
<td>(0.3%)</td>
</tr>
<tr>
<td>63% HCV infections</td>
<td>(63%)</td>
</tr>
</tbody>
</table>

*b) PWID, not shared N/S (N~1,600)*

<table>
<thead>
<tr>
<th>Paraphernalia* (but not N/S)</th>
<th>(Adjusted Odds of recent HCV infection)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookers</td>
<td>3.1 (1.3-7.8)</td>
</tr>
<tr>
<td>Filters</td>
<td>3.1 (1.3-7.5)</td>
</tr>
<tr>
<td>Water</td>
<td>1.2 (0.5-3.3)</td>
</tr>
<tr>
<td>Shared events per PWID</td>
<td>(8-16)*</td>
</tr>
</tbody>
</table>

*(Corson et al. DAD 2013)*

<table>
<thead>
<tr>
<th><em>Sensitivity analysis shown in brackets</em></th>
<th>37% HCV infections attributed to this practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/S</td>
<td>0.3%</td>
</tr>
<tr>
<td>Cookers &amp; Filters</td>
<td>(30%)</td>
</tr>
</tbody>
</table>

* Spoons/cookers, Filters and Water
Outline

❖ What is the prevalence of PWID and HCV?
❖ How is HCV transmitted among PWID?
❖ What is the effectiveness of interventions in preventing HCV among PWID?
   ➢ Community
   ➢ Prison
❖ What is the potential of HCV antiviral therapy to prevent HCV among PWID?
❖ What has been the impact of Scotland’s HCV Action Plan on prevention of infection?
### Effectiveness of interventions in preventing HCV among PWID: review-level evidence

(Palmateer et al. Addiction 2010; MacArthur et al. IJDP 2013)

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Injecting risk behaviour</th>
<th>HCV transmission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle and Syringe Provision (NSP)</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Paraphernalia provision</td>
<td>+ +</td>
<td>No evidence</td>
</tr>
<tr>
<td>Opiate Substitution Therapy (OST)</td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Information, Education, and Counselling</td>
<td>+ +</td>
<td>No evidence</td>
</tr>
<tr>
<td>Supervised Drug Consumption/Injecting Facilities</td>
<td>+ +</td>
<td>No evidence</td>
</tr>
</tbody>
</table>

**Assessment:**

- **+++ Compelling** (multiple robust studies)
- **++ Sound** (few robust studies)
- **+ Limited** (less robust studies)
Combined impact of OST and NSP on HCV among PWID: pooled analysis of UK data (Turner et al. *Addiction* 2011)

(A) Effect of OST on HCV incidence

- Bristol
- Leeds
- Birmingham
- Glasgow
- Wales
- London

Pooled: 0.45 (0.25, 0.82)

(B) Effect of NSP on HCV incidence

- Bristol
- Leeds
- Birmingham
- Glasgow
- Wales

Pooled: 0.58 (0.30, 1.15)

(C) Combined effect of OST and NSP on HCV incidence (N=919)

<table>
<thead>
<tr>
<th>Adjusted OR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>OST + high coverage NSP</td>
</tr>
<tr>
<td>No OST + low coverage NSP</td>
</tr>
</tbody>
</table>
Interventions to prevent HCV within prisons

**OST in prison**

- **Systematic review of 8 studies** (Hedrich, Addiction 2011):
  - Compelling evidence that OST reduces injecting risk behaviours
  - Limited evidence that OST reduces HCV transmission (Dolan, DAD 2003)

- **National Survey of Scottish Prisoners** (Taylor, Addiction 2013):
  - Low incidence of HCV (4/100 pyrs among PWID), in context of high coverage of OST (57% of PWID)

**NSP in prison**

- UN and WHO advocate for NSP in prisons, yet only 60 of over 10,000 prisons worldwide have such programmes (Glauser, CMAJ 2013)

- **Review of international research** (Dolan, Addiction 2003):
  - 6 programmes across Europe evaluated (prison size: 100-250)
  - Reports that syringe sharing decreased significantly
  - No new cases of HIV, HBV or HCV reported

- **NSP in two Berlin prisons** (N=174) (Stark, Epid Infect 2006):
  - During 1 year follow-up, 4 HCV seroconversions detected (incidence: 18/100 pys)
Outline

❖ What is the prevalence of PWID and HCV?
❖ How is HCV transmitted among PWID?
❖ What is the effectiveness of interventions in preventing HCV among PWID?
   ➢ Community
   ➢ Prison
❖ What is the potential of HCV antiviral therapy to prevent HCV among PWID?
❖ What has been the impact of Scotland’s HCV Action Plan on prevention of infection?
Treatment of HCV among people who ACTIVELY inject drugs (Aspinall et al. CID 2013)

Meta-analysis of SVR after PEGIFN+RBV

- **ES (95% CI)**
  - Jafferbhoy 2011: 47 (37, 58)
  - Lindenburg 2011: 64 (51, 76)
  - Sasadeusz 2011: 57 (43, 70)
  - Papadopoulos 2010: 60 (47, 74)
  - Jack 2009: 62 (41, 83)
  - Wilkinson 2008: 53 (39, 67)

**Pooled SVR**: 56% (50%, 62%)

Comparison with Clinical Cohort & RCT studies

- Aspinall 2013 (PWID)
- Innes 2012 (Scottish Clinical Cohort)
- Thomson 2008 (English Clinical Cohort)
- Hadziyannis 2004 (RCT)

Pooled re-infection risk in PWID (who reported IDU post-SVR):

6.4 per 100 PY (95% CI 2.5, 16.7)
Modest levels of treatment could potentially reduce HCV prevalence among PWID, despite risk of re-infection.

Estimated Cost Per QALY

<table>
<thead>
<tr>
<th>Chronic HCV prevalence</th>
<th>Active PWID</th>
<th>Ex/Non-PWID</th>
</tr>
</thead>
<tbody>
<tr>
<td>20%</td>
<td>~£500*</td>
<td>dominated</td>
</tr>
<tr>
<td>40%</td>
<td>~£2,500*</td>
<td>dominated</td>
</tr>
<tr>
<td>60%</td>
<td>dominated</td>
<td>~£6,800*</td>
</tr>
</tbody>
</table>

* Compared to No Treatment

Treatment of PWID is cost-effective, and is more cost-effective when chronic HCV prevalence among PWID <60%.
>30% reductions in prevalence at 10 years cannot be achieved with NSP/OST alone—requires HCV treatment

Scale-up of NSP & OST reduces the treatments required for a specific prevalence reduction

Modelled impact of scaling-up COMBINATION of interventions (PEGIFN+RBV, OST & NSP) among PWID

(Martin et al. CID 2013)
INF-free DAAs could enable increased HCV treatment uptake among PWID

There is potential to halve prevalence within 15 years with INF-free DAAs, but much harder in high prevalence settings

Treatment costs may limit scale-up and needs to be addressed
Outline

- What is the prevalence of PWID and HCV?
- How is HCV transmitted among PWID?
- What is the effectiveness of interventions in preventing HCV among PWID?
  - Community
  - Prison
- What is the potential of HCV antiviral therapy to prevent HCV among PWID?
- What has been the impact of Scotland’s HCV Action Plan on prevention of infection?
Scottish Hepatitis C Action Plan: Prevention

Aims
- To prevent the spread of HCV, particularly among PWID

Evidence/Issues (mid 2000s)
- ~ 1,500 PWID infected annually
- Sharing of injection equipment still highly prevalent

Actions
- National guidelines for injection equipment provision
- Investment to improve injection equipment services in accordance with guidelines
Preventing Infection in Scotland: Progress
The majority treated are now PWID (82% in 2011-12 versus 58% in 2000-01)
Preventing Infection in Scotland: Impact

Trends in recent HCV infection among PWID in Scotland

Estimated number of new HCV infections per year among PWID in Scotland*
Summary

- HCV among PWID is a global public health challenge
- HCV is spread through the sharing of injecting equipment (principally N/S & potentially other injecting paraphernalia)
- Strong evidence that harm reduction interventions reduce injecting risk behaviours
- Growing evidence that combining interventions can achieve greater impact in reducing HCV transmission
- Treating HCV infected PWID with antiviral therapy is considered an effective and cost-effective strategy
- INF-free DAAs could enable increased HCV treatment uptake among PWID, and achieve major preventative impact
- Downward trend in HCV incidence among PWID in Scotland, associated with national scale-up in key interventions
Acknowledgements

Glasgow Caledonian University
Esther Aspinall

University of the West of Scotland
Alison Munro
Avril Taylor

Hepatitis C Testing Laboratories (Glasgow and Edinburgh)
Celia Aitkin
Gina McAllister
Sam Shepherd
Kate Templeton

University of Strathclyde
Stephen Corson

Health Protection Scotland
David Goldberg
Norah Palmateer

University of Bristol
Matt Hickman
Georgina MacArthur
Natasha Martin
Katy Turner
Peter Vickerman

University of St Andrews
Ruth King
Antony Overstall

Cambridge MRC Biostatistics Unit
Sheila Bird

Supported through funding from Scottish Government and ECDC