TREATMENT AS PREVENTION FOR HCV AMONG HIV-POSITIVE MSM: MODELING DATA

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DISCLOSURES

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HCV TREATMENT AS PREVENTION?

- Modelling indicates HCV treatment for people who inject drugs may prevent onwards transmission and reduce prevalence/incidence$^{1-3}$....

What about HCV treatment as prevention among HIV-positive MSM?

# TREATMENT AS PREVENTION AMONG PWID VS HIV+ MSM

<table>
<thead>
<tr>
<th></th>
<th>HCV+ PWID</th>
<th>HIV+/HCV+ MSM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population size</td>
<td>Large (50-100k in UK)</td>
<td>Small compared with PWID (3-4k in UK)</td>
</tr>
<tr>
<td>HCV prevalence</td>
<td>Heterogeneous, but can be high (&gt;60%)</td>
<td>Relatively low (~10%)</td>
</tr>
<tr>
<td>Routine testing and HCV treatment integrated with other treatment settings</td>
<td>Poor/evolving</td>
<td>Good in many developed country settings (~50% treatment experienced in Berlin¹ &amp; UK²)</td>
</tr>
<tr>
<td>Next-generation DAA SVR for chronic infection</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Evidence for other prevention/behaviour change interventions</td>
<td>Good (opiate substitution therapy, needle/syringe programmes)</td>
<td>Poor</td>
</tr>
<tr>
<td>International transmission network</td>
<td>Probably minimal in most settings</td>
<td>High</td>
</tr>
<tr>
<td>Reinfection rate</td>
<td>Appears lower than primary incidence</td>
<td>Appears higher (5-10x) than primary incidence</td>
</tr>
</tbody>
</table>

2. Martin NK et al (submitted)
HCV AMONG HIV-POSITIVE MSM: UK EPIDEMIOLOGY
# CUMULATIVE PREVALENCE (AB+ OR RNA+) OF HCV AMONG HIV-POSITIVE MSM IN UK CHIC

<table>
<thead>
<tr>
<th>Year</th>
<th>Total number MSM under follow-up in that year in UK CHIC</th>
<th>% with a HCV test reported by end of that year</th>
<th>Cumulative number HCV positive (Ab+ or RNA+)</th>
<th>Cumulative HCV prevalence (Ab+ or RNA+) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>11012</td>
<td>61.51</td>
<td>492</td>
<td>7.26</td>
</tr>
<tr>
<td>2005</td>
<td>11765</td>
<td>71.38</td>
<td>641</td>
<td>7.63</td>
</tr>
<tr>
<td>2006</td>
<td>12335</td>
<td>77.42</td>
<td>752</td>
<td>7.87</td>
</tr>
<tr>
<td>2007</td>
<td>12895</td>
<td>83.82</td>
<td>896</td>
<td>8.29</td>
</tr>
<tr>
<td>2008</td>
<td>13262</td>
<td>88.97</td>
<td>1049</td>
<td>8.89</td>
</tr>
<tr>
<td>2009</td>
<td>13693</td>
<td>92.07</td>
<td>1195</td>
<td>9.48</td>
</tr>
<tr>
<td>2010</td>
<td>14147</td>
<td>94.50</td>
<td>1293</td>
<td>9.67</td>
</tr>
<tr>
<td>2011</td>
<td>13101</td>
<td>97.62</td>
<td>1261</td>
<td>9.86</td>
</tr>
</tbody>
</table>

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6 Martin NK, Thornton A et al, under review
INCIDENCE OF HCV SEROCONVERSION AMONG HIV-POSITIVE MSM IN UK CHIC

<table>
<thead>
<tr>
<th>Year</th>
<th>Person years of follow-up of those HCV Ab negative</th>
<th>New infections</th>
<th>Incidence per 100 person years of follow-up (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1454</td>
<td>15</td>
<td>1.03 (0.58-1.70)</td>
</tr>
<tr>
<td>2005</td>
<td>4179</td>
<td>51</td>
<td>1.22 (0.91-1.60)</td>
</tr>
<tr>
<td>2006</td>
<td>6076</td>
<td>62</td>
<td>1.02 (0.78-1.31)</td>
</tr>
<tr>
<td>2007</td>
<td>7484</td>
<td>103</td>
<td>1.38 (1.12-1.67)</td>
</tr>
<tr>
<td>2008</td>
<td>8752</td>
<td>106</td>
<td>1.21 (0.99-1.46)</td>
</tr>
<tr>
<td>2009</td>
<td>9405</td>
<td>111</td>
<td>1.18 (0.97-1.42)</td>
</tr>
<tr>
<td>2010</td>
<td>9782</td>
<td>101</td>
<td>1.03 (0.84-1.25)</td>
</tr>
<tr>
<td>2011</td>
<td>7487</td>
<td>80</td>
<td>1.07 (0.85-1.33)</td>
</tr>
</tbody>
</table>

Martin NK, Thornton A et al, under review
TREATMENT AS PREVENTION AMONG MSM IN THE UK- MODELLING
MODELLING AIMS

- Develop a **dynamic** mathematical model of HCV transmission among diagnosed HIV+ MSM (but include additional infections from outside diagnosed HIV+ MSM population)

- Fit model to available UK data to
  - Assess the possible trajectory of the HCV epidemic among MSM with current levels of treatment
  - Predict the impact of scaled-up treatment with new DAAs among MSM to reduce transmission to low levels
Reinfection

Infection

HCV uninfected (Ab-/RNA-)

Acute HCV, spontaneous clearance (undiagnosed)

Early HCV (<1 yr from infection), undiagnosed

New diagnosed HIV-positive MSM

Chronic HCV (>1 yr from infection), undiagnosed

Susceptible, treatment naïve (Ab+/RNA-)

Early HCV (<1 yr from infection), Diagnosed

Diagnosed yr 1

Acute HCV, spontaneous clearance (undiagnosed)

Early (“acute”) treatment

Treatment failure

Susceptible, treatment experienced

Chronic, Diag yr 2+

Chronic treatment

Also stratify by treatment naïve, IFN experienced, DAA experienced and low/high risk

HIV and non-HIV death occurs from all states

Martin NK, Thornton A et al, under review
MODEL PARAMETERISATION AND CALIBRATION

- Parameters (means presented; varied from distributions)
  - 15% spontaneous clearance rate [UK CHIC]
  - 46%/22% treated within 1 year of an acute/chronic diagnosis, respectively, and 6%/yr thereafter [UK CHIC]
  - 80%/30% SVR in acute/chronic stage with IFN/RBV, 90% with DAAs

- Calibrated to UK data on
  - Size of HIV-diagnosed MSM population over time
  - Annual HCV prevalence and primary incidence among diagnosed HIV+ MSM 2004-2011 (UK CHIC)
  - HCV reinfection incidence among HIV+ MSM (7.8/100py 2004-2012)²
  - Proportion HCV treatment experienced (43%, UK CHIC)

1. Nakagawa et al. AIDS. 2012;26(3):335-43
MODEL FITS TO EPIDEMIOLOGICAL DATA
MODEL CALIBRATION: HCV PREVALENCE (AB+ OR RNA+) AMONG HIV-DIAGNOSED MSM IN UK

HCV prevalence (Ab+ or RNA+) among HIV-diagnosed MSM (%)

Black diamonds: UK CHIC data

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Martin NK et al EASL 2015
MODEL CALIBRATION: HCV PRIMARY INCIDENCE AMONG HIV-DIAGNOSED MSM IN UK

Black diamonds: UK CHIC data

HCV primary incidence among HIV-diagnosed MSM (per 100 person-years)

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Martin NK et al EASL 2015
POPULATION ATTRIBUTABLE RISK
IMPORTANCE OF THE HIGH RISK GROUP

• Over the next decade, **94% of infections** are attributable to high-risk individuals, comprising **7% of the population**.

• Consistent with the proportion of HIV-positive MSM in the UK reporting injecting drug use or methamphetamine use in the previous 4 weeks.

• These high-risk individuals contribute **over one-third of prevalent and incident infections in 2015**.

Martin NK, Thornton A et al, under review
MODEL PROJECTIONS TO 2025
STATUS QUO (CURRENT TREATMENT RATES AND SVR WITH IFN/RBV)- MEAN MODEL FIT SHOWN

CHRONIC PREVALENCE

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM(%)

HCV primary incidence among HIV-diagnosed MSM (/100py)

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Martin NK et al EASL 2015
NO HISTORIC TREATMENT IN UK

CHRONIC PREVALENCE

PRIMARY INCIDENCE

No historic treatment

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM (%)

HCV primary incidence among HIV-diagnosed MSM (/100py)

Martin NK, Thornton A et al, under review
Martin NK et al EASL 2015
CURRENT TREATMENT RATE WITH DAAS (90% SVR) FROM 2015

CHRONIC PREVALENCE

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM(%)

Current treatment with DAAs

CURRENT TREATMENT RATE WITH DAAS (90% SVR) FROM 2015

HCV primary incidence among HIV-diagnosed MSM (/100py)

Current treatment with DAAs

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Martin NK et al EASL 2015
SCALE-UP TREATMENT FOR RECENT (80%) DIAGNOSES WITH DAAS FROM 2015

CHRONIC PREVALENCE

PRIMARY INCIDENCE

Scale-up treatment for recent diagnoses

Martin NK, Thornton A et al, under review
Martin NK et al EASL 2015
SCALE-UP TREATMENT FOR RECENT (80%) & NONRECENT DIAGNOSES (20%/YR) WITH DAAS FROM 2015

CHRONIC PREVALENCE

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM (%)

Scale-up treatment for recent AND nonrecent diagnoses

PRIMARY INCIDENCE

HCV primary incidence among HIV-diagnosed MSM (/100py)

Scale-up treatment for recent AND nonrecent diagnoses

Martin NK, Thornton A et al, under review
Martin NK et al EASL 2015
SCALE-UP TREATMENT FOR RECENT & NONRECENT DIAGNOSES AND 20% BEHAVIOURAL RISK REDUCTION FROM 2015

CHRONIC PREVALENCE

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM (%)


Scale-up treatment AND behaviour change

PRIMARY INCIDENCE

HCV primary incidence among HIV-diagnosed MSM (/100py)


Scale-up treatment AND behaviour change

Martin NK, Thornton A et al, under review
Martin NK et al EASL 2015
SUSTAINED INCIDENCE EVEN IF TREAT ALL CIRRHOTICS (NO ACUTES)

CHRONIC PREVALENCE

HCV chronic (RNA+) prevalence among HIV-diagnosed MSM (%)

PRIMARY INCIDENCE

HCV primary incidence among HIV-diagnosed MSM (100py)
INCREASING TREATMENT NUMBERS OVER TIME DUE TO EXPANDING EPIDEMIC, EVEN WITH STABLE TREATMENT RATES

Mean number HCV treatments for HIV-infected MSM per year

- Current treatment rate with IFN/RBV SVR
- Current treatment rate with DAAs (90% SVR) from 2015

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HIGHER TREATMENT RATES ONLY RESULT IN GREATER TREATMENT NUMBERS FOR 5-7 YEARS

Higher treatment numbers in beginning

Lower treatment numbers in 5-7 yrs

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TREATMENT AS PREVENTION AMONG MSM IN SWITZERLAND- MODELLING
HCV AMONG HIV+ MSM IN SWITZERLAND: ELIMINATION REQUIRES BEHAVIOUR CHANGE

HCV incidence: data

Model projected HCV incidence: behaviour change scenarios

Salazar L et al. CROI 2015
HCV AMONG HIV+ MSM IN SWITZERLAND: ELIMINATION REQUIRES BEHAVIOUR CHANGE

HCV incidence: data

Model projected HCV incidence: behaviour change scenarios

Salazar L et al. CROI 2015
HCV AMONG HIV+ MSM IN SWITZERLAND: ELIMINATION REQUIRES BEHAVIOUR CHANGE

HCV incidence: data

Model projected HCV incidence: behaviour change scenarios

Salazar L et al. CROI 2015
CONCLUSIONS:
HCV TREATMENT AS PREVENTION AMONG MSM IN EUROPE

• Expanding epidemic of HCV among HIV+ MSM in UK and Switzerland

• Continued expansion or at best stabilization with current levels of treatment, even with DAAs

• Substantial reductions in incidence/prevalence with achievable scale-up, especially with behaviour change

• Limitations:
  • Neglect network effects and migration/travel; need better epidemiological and behavioural data
  • Modelling studies- need empirical studies evaluating HCV treatment as prevention (which incorporate modelling for design and evaluation)!
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