Evaluating and communicating Hepatitis C Cascades of Care data: A journey towards elimination in Tayside, Scotland

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Background: Hepatitis C Virus (HCV)

- One of the world’s **leading causes of liver cirrhosis** and **hepatocellular carcinoma** (1)
- Presents a significant burden to health systems across the globe and affects ~34,500 in Scotland (2)
- Transmitted through blood-to-blood contact, no vaccine, antibodies not protective?
- The World Health Organization (WHO) set **2030 Elimination Goals**
- Each health system to evaluate own epidemic
Background: Cascade of Care

Cascades of Care (CoC) are used to depict how infected cases move through disease control stages.

Methods of communicating HCV Cascade of Care data are debated (4)
Background: Data Communication Debate

Figure 3. – Basic Cascade (4)

2016 Cascade of Care, Australia

- Infected: 227,306
- Diagnosed: 180,599
- Treated: 32,550
- Cured: 30,434

Start of 2016

During 2016

79.5%
Background: Data Communication Debate

Figure 4. – Added Stages + Conversion Rates (6)
Background: Data Communication Debate

Figure 5. – Target Driven (4)

Cascade of care

Source: WHO estimates, conducted by the Center for Disease Analysis.
Objectives

- Produce a novel, systematic way of codifying HCV data and communicating it with a Cascade of Care
- Use the HCV data in Tayside, Scotland to provide examples of insights gained from communicating data in this way
Methodology: Sources and Cohort Selection

Tayside’s HCV database has information on over 3900 patients’ timeline

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Alive at any point from January 2015 – December 2018</td>
<td>▪ Any patient treated and cured prior to 2015</td>
</tr>
<tr>
<td>▪ In Tayside (including those in custody of Tayside HMP)</td>
<td>▪ Spontaneous resolvers (Antibody positive, PCR Negative)</td>
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<tr>
<td>▪ With at least one HCV infection (Antibody positive, PCR positive)</td>
<td>▪ Tayside residents still in custody of HMP outside of Tayside</td>
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<td><strong>Plus:</strong></td>
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<td>▪ Diagnosed and treated before 2015 without a successful SVR</td>
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<td>▪ A positive antibody test and no PCR data</td>
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<td>▪ 9 patients treated with DAAS starting in 2014 and ending in 2015</td>
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</tbody>
</table>

**Final cohort - 1164 cases**
Results

This study produced three results:

1. Standardised coding framework
2. Model stacked clustered bar chart
3. Model cumulative line graph
## Coding Framework

<table>
<thead>
<tr>
<th>Old Coding</th>
<th>New Coding</th>
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</thead>
<tbody>
<tr>
<td><strong>Diagnosis</strong></td>
<td><strong>New Diagnosis</strong></td>
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<tr>
<td></td>
<td><strong>Previous Diagnosis</strong></td>
</tr>
<tr>
<td></td>
<td><strong>New Diagnosis Can't Treat</strong></td>
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<tr>
<td></td>
<td><strong>Previous Diagnosis Can't Treat</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Diagnosis - Dead</strong></td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td><strong>New Diagnosis Treatment</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Previous Diagnosis Treatment</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Treatment Unsuccessful</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Treatment Incomplete</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Treatment - Dead</strong></td>
</tr>
<tr>
<td><strong>Cure</strong></td>
<td><strong>Cure</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Unknown SVR</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Cure - Dead</strong></td>
</tr>
</tbody>
</table>
Model Stacked Clustered Bar Chart

**Diagnosis**
- New Diagnosis
- Previous Diagnosis
- Diagnosis Can’t Treat
- Previous Diagnosis Can’t Treat
- Diagnosis - Dead

**Treatment**
- New Diagnosis Treatment
- Previous Diagnosis Treatment
- Treatment Unsuccessful
- Treatment Incomplete
- Treatment - Dead

**Cure**
- Cure
- Unknown SVR
- Cure - Dead

Tayside HCV Cascade of Care
January 2015 - December 2018

24.94% of Previously Diagnosed
34.31% of Newly Diagnosed
begin treatment each year

Unsuccessful → Need new drugs
Incomplete → Improve compliance
Progression towards target Diagnosis, Treatment, and Cure rates

- WHO 2030 Goals are: 90% of prevalent cases diagnosed, 80% of eligible diagnoses are treated
- Tayside has diagnosed 77.9%, treated 71.0% of those eligible, and cured 66.6%
Conclusions

- Novel way of communicating Cascades of Care data
- Coding framework standardises definitions
- Graphs offer insights to health care planners
- Providing a new option that the WHO could offer to track global infectious epidemics
- Improve local service evaluation and planning as well as knowledge exchange across global health systems
References


Questions & feedback 😊

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Background: Cascade of Care Data Communication Debate

![Tayside HCV Cascade of Care Chart]

- **Prevalence**: 1994 (alive) + 141 (deceased) = 2135
- **Diagnosis**: 1119 (alive) + 141 (deceased) = 1260
- **Treatment**: 862 (alive) + 10 (deceased) = 872
- **Cure**: 703 (alive) + 32 (deceased) = 735

Jan 2015 - July 2019
Background: Snapshot of Tayside, Scotland

- Maintains **up-to-date records** on all HCV cases and treatment journeys, offering a robust dataset for evaluation
- **Prevention**: provides sterile injecting equipment, opioid substitution therapy, risk reduction education, and destigmatisation
- **Testing**: 9 pathways
- **Treatment**: 5 pathways (Outreach, Pharmacy, Hospital, Prison, & IEPS)
  - Direct Acting Antivirals (DAAs) available to all that clinically require it
Methodology: Producing Outputs

- Variables like PCR Positive test dates, past medical histories, DAAs treatment start dates and statuses, cure dates, and death dates were analysed to create a coding framework

- The framework was used to code each patient’s Diagnosis, Treatment, and Cure status each year to produce a stacked clustered bar chart and cumulative line graph
- Overview of epidemic progression
- Conversion rates year-on-year
  - Tayside’s Diagnosis to Cure rate increased from 15.36% (2015) to 43.77% (2018)
- Detail within each stage of the Cascade
  - The portion of Diagnosed cases that cannot progress for clinical reasons
  - The portion of New vs Previously Diagnosed that start treatment each year
    - 34.31% of Newly Diagnosed cases and 24.94% of Previously Diagnosed cases begin treatment each year in Tayside
  - The portion of Treated cases that do not progress to Cure
  - Death rates at each stage
    - Tayside death rates dropped from 4.1% to 2.3% between 2015 and 2019