# Cost-effectiveness of treating chronic hepatitis C virus with direct-acting antivirals in people who inject drugs

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## Introduction and aims

Reducing the burden of hepatitis C virus (HCV) related liver disease will require treating people who inject drugs (PWID), the group at most risk of infection and transmission.

**We aim to determine the cost-effectiveness of treating PWID with interferon-free direct-acting antiviral therapy in Australia.**

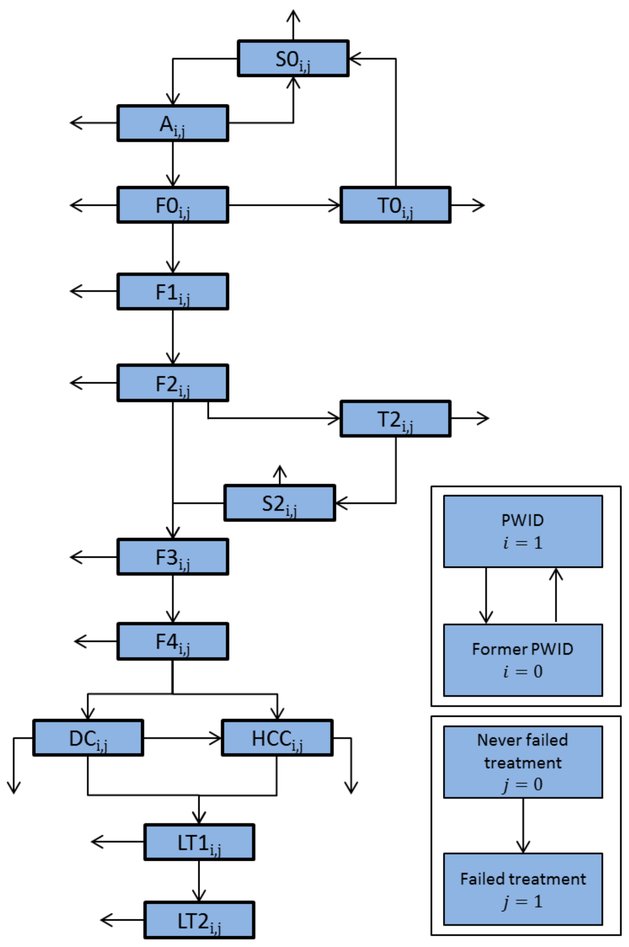
This study considered:

- Treatment after initial infection ('early-treatment'); and
- Treatment prior to developing liver fibrosis ('late-treatment').

## Method 2: Running the model

- **Start with:** 100 newly HCV-infected current injecting drug users in the F0 compartment.
- **Run the model** and calculate:
  - Total discounted quality-adjusted life years (QALYs);
  - Total discounted healthcare and treatment costs, assuming $50,000 per treatment course;
  - Number of liver related deaths; and
  - Average life expectancy.
- **Compare:** No treatment, early-treatment and late-treatment.
- **Calculate:** Incremental cost-effectiveness ratios (ICERs) across scenarios.
- **Conduct uncertainty analysis:** run multiple simulations with varying costs, health utilities and model parameters (Monte-Carlo uncertainty analysis) to get 95% confidence intervals.

## Method 1: Deterministic model of HCV transmission, treatment and liver disease progression




Infected individuals progress through liver disease stages and eventually leave compartments due to death (either all-cause or liver-related).

**Individuals were considered to be in one of the following compartments:**

- *S0*—susceptible (uninfected);
- *A*—acutely infected;
- *F0-F4*—chronically infected with METAVIR score indicating liver fibrosis in stage F0-F4;
- *DC*—decompensated cirrhosis;
- *HCC*—hepatocellular carcinoma;
- *LT1*—first year post liver transplant;
- *LT2*—two or more years post liver transplant;
- *T0/T2*—in treatment after either initial infection or prior to developing liver cirrhosis; or
- *S2*—susceptible after achieving sustained viral response from late-treatment.

**Each compartment was stratified by:**

- *Injecting drug use status:*
  People were able to cease from or relapse into current injecting drug use.
- *Treatment failure:*
  Re-treatment was not available for people who had previously failed to achieve sustained viral response.

## Results

- **Compared to no treatment:**
  - Late-treatment was the most cost-effective option, with an ICER of $5,078 (95%CI $2,847-5,295) per QALY gained; however
  - Early-treatment was also cost-effective with an ICER of $10,272 (95%CI $5,689–13,690) per QALY gained.
- If treatments cost $10,000 per course, both early- and late-treatment were more effective and less costly than no treatment.
- If treatments cost $100,000 per course, early- and late-treatment were still cost-effective with ICERs of $23,854 and $13,259 per QALY gained respectively.

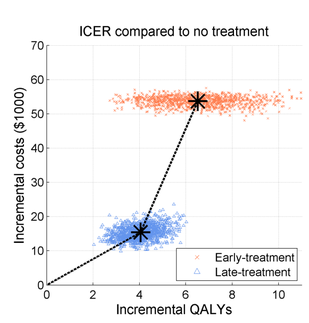
Both early- and late-treatment **prevented a significant number of liver-related deaths** and **extended the life expectancy** of newly infected PWID.

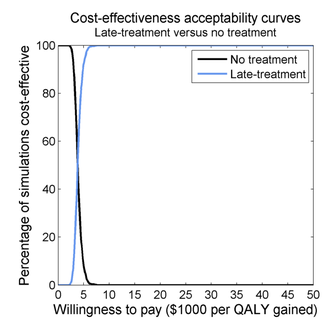
| Best estimates (95% confidence interval) | Average discounted cost per infected person | Average discounted QALYs per infected person | Life expectancy of an infected person | ICER compared to no treatment | ICER compared to next best case | Liver related deaths expected per 100 newly infected PWID |
|---|---|---|---|---|---|---|
| **Base case (no antiviral treatment)** | $21,877 ($20,618-27,294) | 16.45 (11.19-18.13) | 67.97 (63.55-68.27) | Reference case | | 40 (39-56) |
| **Early-treatment** | $75,803 ($75,410-79,335) | 21.70 (20.58-22.09) | 74.47 (73.58-74.56) | $10,272 ($5,689-13,690) | Early v late-treatment $17,090 ($7,926–63,282) | 7 (6-11) |
| **Late-treatment** | $37,009 ($34,754-43,772) | 19.43 (15.84-21.44) | 74.14 (73.11-74.44) | $5,078 ($2,847-5,295) | No treatment v late-treatment $5,078 ($2,847-5,295) | 8 (7-13) |

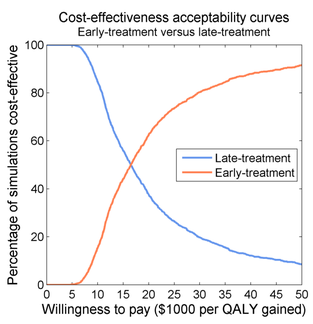
## Uncertainty analysis

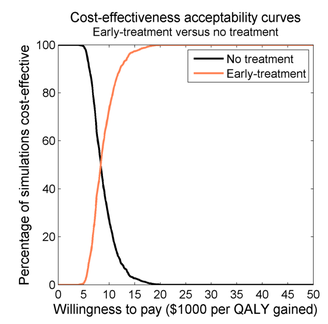
**For a willingness-to-pay threshold of $50,000 per QALY gained:**

- Early-treatment and late-treatment were cost-effective compared to no treatment in all simulations.
- Early-treatment was cost-effective compared to late-treatment in more than 90% of simulations, with an ICER of $17,090 (95%CI $2,847-63,282) per QALY gained.




## Conclusions

- **Treating HCV-infected PWID with new therapies is cost-effective in Australia**, and could prevent a significant number of liver related deaths.
- Although late-treatment was more cost-effective than early-treatment, **the cost per QALY gained for early-treatment was below unofficial Australian willingness to pay thresholds**.

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