A Cost-Effectiveness Analysis of Increasing Hepatitis C Virus Screening in People Who Inject Drugs in Switzerland Using Rapid Antibody Saliva and Dried Blood Spot Testing

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Objective

- To evaluate the cost-effectiveness of expanding hepatitis C virus (HCV) screening and treatment to all individuals who are currently, or have previously been, people who inject drugs (PWID), using rapid antibody saliva tests (Oraquick®; OraSure Technologies, Bethlehem, PA) and dried blood spot (DBS) tests (semi-quantitative viremia and viral genotype).

Background

- PWID are a key high-risk group for HCV infection due to the sharing of needles and drug-preparation equipment. However, only approximately 50% of PWID are currently screened for HCV in Switzerland.[1–3]
- Currently, screening occurs in general practice via venepuncture. Compared to venepuncture, screening via rapid antibody saliva and DBS tests is well adapted to PWID, who typically have poor venous capital.[4]
- Recent therapeutic advances, resulting in shorter treatment durations and higher cure rates,[5] offer the potential to improve the health outcomes of HCV positive PWID and reduce the risk of infection to other drug users.

Methods

- The costs and effects of a comprehensive strategy, offering annual screening to all PWID via rapid antibody saliva and DBS tests in specialised centers,[6] were compared to those for the current screening strategy over a 5-year time horizon.
- A decision tree simulated the progression of patients through the diagnosis pathway to determine their entry points to the treatment model **(Figure 1)**.
- Inputs were derived from clinical studies, literature reviews and expert opinion **(Table 1)**.[1–3,7–12]

Table 1. Key inputs used in the model

Input	Value	Reference
Population size	25,700	Cominetti F *et al.* 2015[1]
Male proportion	79.4%	Weighted mean calculated from Castro E *et al.* 2015 Moriggia A *et al.* 2016[2,3]
HCV prevalence	46.0%	Mean calculated from Cominetti F *et al.* 2015 Castro E *et al.* 2015 Moriggia A *et al.* 2016[1–3]
Spontaneous clearance rate	20%	Grebely 2014[9]
Pre-seroconversion window (years)	0.14	UK Gov Hep C Report 2015[12]
HCV incidence (infections per 100 person years of exposure)	1.95	Cominetti F *et al.* 2015[1]
Probability of cure for treated individuals	96.0%	ION-3 Gilead data on file[10]
Proportion who present for testing (current screening)	49.8%	Brunner 2015[8]
Initial HCV prevalence ratio (current screening compared to whole target population)	1.4	Expert opinion[7]
Test offer and voluntary counselling (regardless of uptake)	CHF 49.55	TARMED TM000010 + 3X TM000030[11]
Pre-test discussion	CHF 8.26	TARMED TM000030[11]
Cost of antibody test	CHF 9.00	Saliva rapid test (following oral swab)[7]
Cost of communicating results, HCV negative†	CHF 90.84	TARMED TM000010 + TM000020 + TM000030[11]
Cost of communicating results, HCV positive†	CHF 90.84	TARMED TM000010 + TM000020 + TM000030[11]
Cost of RNA test	CHF 183.00	Quantitative PCR (903 protein card saver 5 depots, following DBS capillary blood collection)[7]
Cost of FibroScan (including consultation)	CHF 83.62	TARMED TM393270 and TARMED TM000010 + 3x TM000030[11]
Confirmation of diagnosis if HCV positive	CHF 180.00	Quantitative PCR for HCV RNA[7]
Cost of GP visits to carry out tests	CHF 115.62	TARMED TM000010 + TM000020 + TM000030[11]
Cost of counselling and harm reduction advice		

†Including appointment and post-test discussion if relevant

Figure 1. Screening decision tree

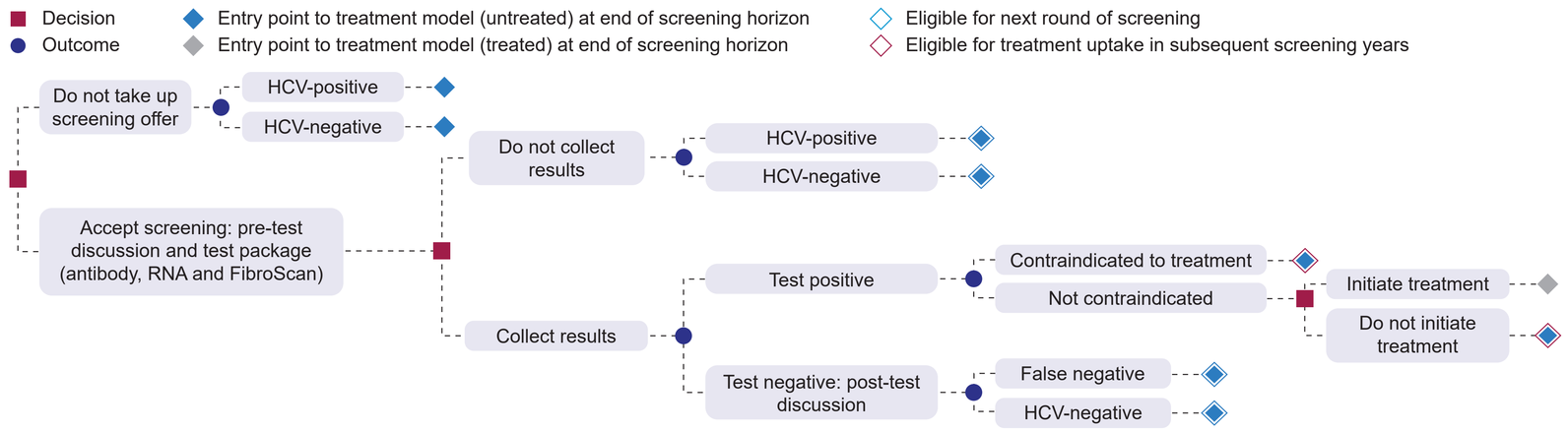
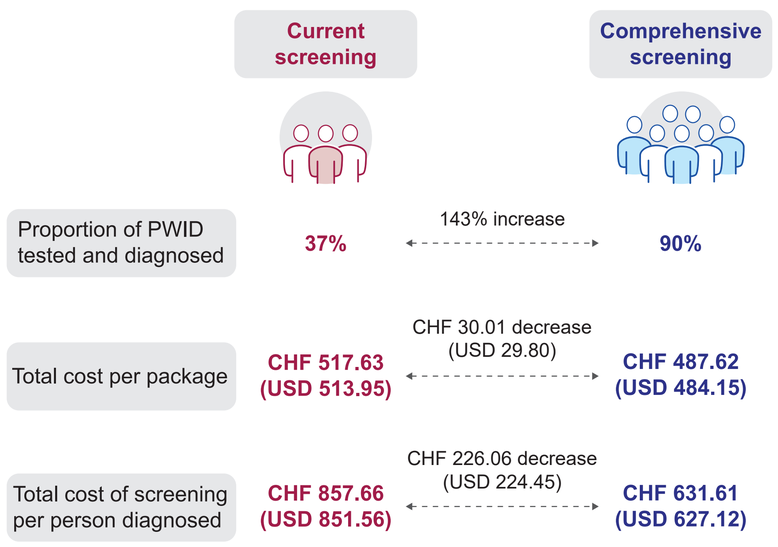


Figure 2. Comparative testing, diagnosis and treatment statistics



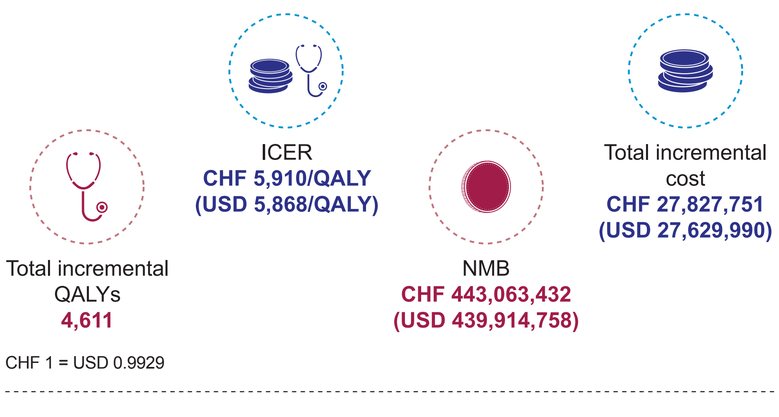
CHF 1 = USD 0.9929

- The model took the perspective of the Department of Employment, Social Affairs and Health over a lifetime time-horizon. Costs were measured in CHF and effects were measured in quality-adjusted life years (QALYs).
- Results calculated from the diagnosis model (decision tree) were combined with outputs of a treatment model (Markov) to incorporate treatment effects and natural progression and provide overall cost-effectiveness results. The net monetary benefit (NMB) and incremental cost-effectiveness ratio (ICER) were calculated.
- Scenario analyses examined the effects of differing prevalence and behaviour on secondary transmission rates. A deterministic sensitivity analysis (DSA) was conducted to identify the key drivers of the model, whilst a probabilistic sensitivity analysis (PSA) was employed to test the robustness and combined uncertainty of the model.

Results

- The ICER for comprehensive screening vs the current strategy was CHF 5,910/QALY (USD 5,868/QALY), whilst other key results are shown in **Figures 2 and 3**.
- When the behavioural and prevalence effects on reinfection were included in the model, the ICER reduced to CHF 2,114/QALY (USD 2,099/QALY).
- In the prevalence scenario analysis, the cost-effectiveness of comprehensive screening increased with the underlying population prevalence. The NMB was consistently positive at the chosen willingness to pay (WTP) threshold of CHF 100,000 (USD 99,289) per QALY, including when the prevalence was below the base case value.

Figure 3. Incremental results of the comprehensive compared to the current screening program



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- The DSA showed that results were most sensitive to the QALY gain estimated from treatment, the HCV prevalence ratio between the current and whole target screening populations, and testing uptake rates **(Figure 4)**.
- PSA results indicated that the comprehensive screening strategy had a 91% probability of being cost-effective at the chosen WTP threshold.

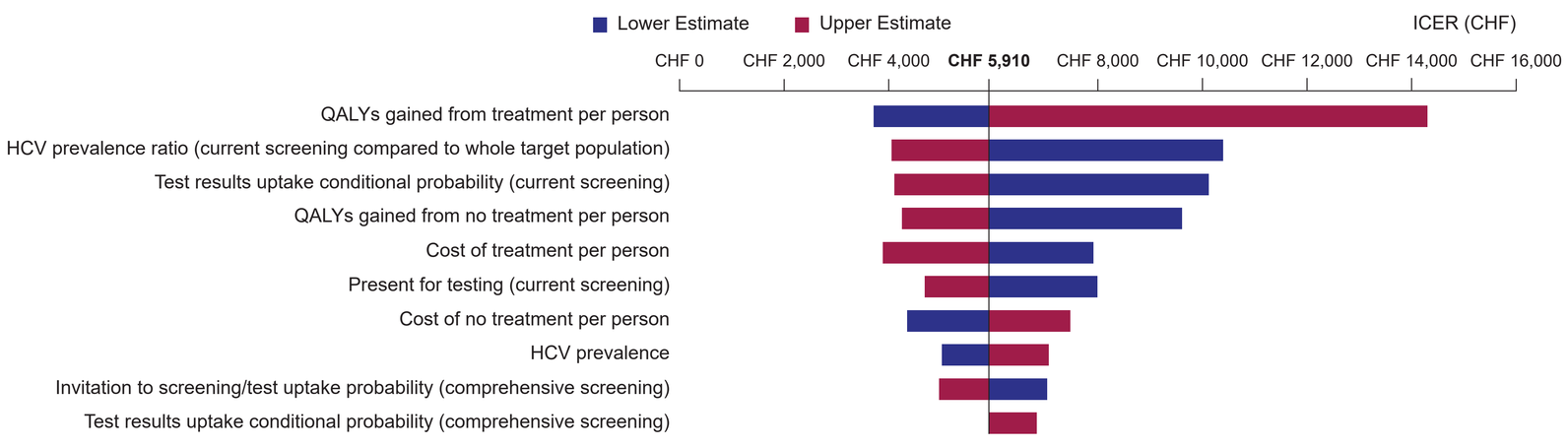
Strengths and Limitations

- Strengths of the model included the sensitivity analyses, which enabled investigation of a range of parameter values and allowed realistic interpretation of key results. In addition, model inputs were informed by expert opinion of clinicians working closely with current Swiss HCV screening programs.
- The simulation of HCV treatment was a limitation of the model, as the Markov model of treatment and natural disease progression did not exactly align with the country and patient populations examined in the screening model. However, when varying the costs and QALYs associated with treatment in scenario analyses, all ICERs were well below the chosen WTP threshold.

Conclusions

- Comprehensive screening is likely to be cost-effective due to the increased screening uptake via rapid saliva and DBS testing instead of venepuncture, and because the proposed test package is less expensive than venepuncture.
- Comprehensive screening would likely increase the number of diagnoses and result in a greater number of PWID initiating treatment, and could be effective in addressing HCV prevalence, and reducing transmission, in the high-risk population of PWID.

Figure 4. Tornado plot showing results of the DSA for multiple screening rounds



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