Recombinant Zoster Vaccine for High-risk Ageing Adults in the Netherlands: Cost-effectiveness and Value of Information Analyses

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Introduction

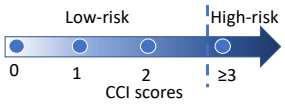
Ageing adults are at risk of Herpes zoster (HZ) and its complication, postherpetic neuralgia (PHN). The disease can be prevented by Recombinant Zoster Vaccine (RZV), but a large-scale RZV program is not advisable in the Netherlands mainly due to its unfavorable cost-effectiveness.

Aims

(1) to estimate cost-effectiveness of high-risk and overall-cohort vaccination strategies compared with non-vaccination in 70-year-old Dutch people, and
(2) to prioritize future research addressing the uncertainty of the decision model.

Methods

The high-risk group was identified by Charlson comorbidity index (CCI).



Cost-effectiveness analysis:

- A Markov model connected with a decision tree: 20 years horizon, healthcare perspective
- Probabilistic sensitivity analysis (PSA) was conducted to address uncertainty.
- Cost-effectiveness were considered at the willingness to pay (WTP) of €20,000 and €50,000/QALY (Quality adjusted life year)

***Tab 1**: Input parameters of the model*

Variable	Base case	SE	Distribution
Demography			
Cohort size: 70 years old	192332		
Proportion of CCI ≥ 3	10.4%	0.026	Beta
HZ epidemiology			
HZ incidence per 10^5 person-years	1190	16.58	Beta
Proportion of PHN (%)	5.30%	0.01	Beta
Incidence rate ratio in CCI ≥ 3 group (reference: CCI=0)			
HZ incidence	1.402	0.036	Lognormal
Proportion of PHN	1.733	0.168	Lognormal
HZ hospital visit incidence	1.402	0.018	Lognormal
HZ hospitalization incidence	2.273	0.205	Lognormal
Utility: Quality of life depends on levels of pain			
Costs			
Outpatient (€/case)	198	18	Gamma
Hospital admission (€/case)	3671	176	Gamma
Hospital visit (€/case)	282		
Vaccine price (€/dose)	175.04		
Administration cost (€/dose)	11.36		

SE: Standard error; HZ: herpes zoster; PHN: postherpetic neuralgia; CCI: Charlson comorbidity index

Value of information:

The PSA dataset was used to calculate over 20-year decision:

- Expected value of perfect information (EVPI) and
- Expected value of partial perfect information (EVPPI) for five groups of parameters: CCI-, incidence-, utility-, cost-, and vaccine efficacy-related groups.

Results

Cost-effectiveness analysis:

- In the base case, none of the vaccination strategies was cost-effective at the WTP=€20,000/QALY. Vaccinating high-risk group was cost-effective at the WTP=€50,000/QALY.

***Tab 2:** Cost-effectiveness results of the base case comparing vaccination and non-vaccination strategies in 70-year-old cohorts*

Base case	Overall cohort 70	High-risk cohort 70
Cost-effectiveness ratio	€ 59,261	€ 38,428

- PSA results showed that the decision changed at the WTP= €36,000/QALY. The probability of being cost-effective of vaccinating high-risk group was 75.5% at the WTP=€50,000/QALY.

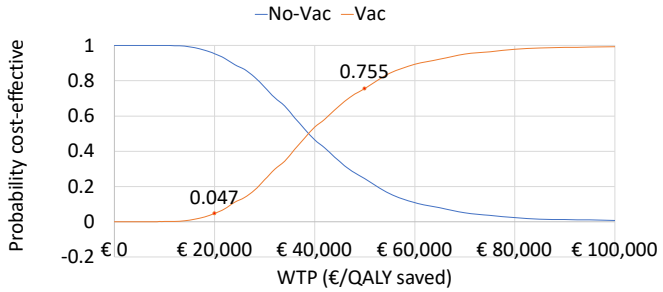


***Fig 1**: Cost-effectiveness acceptability curves of two strategies: non-vaccination (No-Vac) and vaccination (Vac) for the high-risk group of the 70-year-old cohort.*

Value of information:

- EVPI peaked of €10,704,243 at the WTP equal €36,000
- At this threshold, EVPPI was greatest for the set of parameters evaluating variables related to CCI. The value was roughly €800,000.

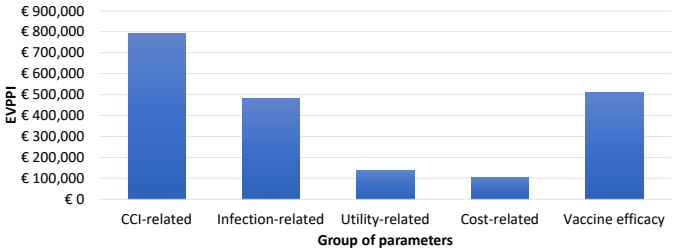


***Fig 2**: Expected value of partial perfect information (EVPPI) of five parameter groups at the WPT=€36000/QALY*

Conclusion

- Vaccinating high-risk group can be cost-effective when considering WTP threshold above €36,000/QALY;
- At that threshold, more information that can eliminate all uncertainty surrounding model parameters and costs less than €10 million is worth conducting;
- Among others, addressing uncertainty of CCI-related group of parameters should be prioritized due to its highest value of information.