

A FLEXIBLE OPEN-SOURCE COST-EFFECTIVENESS MODEL FOR METASTATIC EGFR+ NON-SMALL CELL LUNG CANCER

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Background

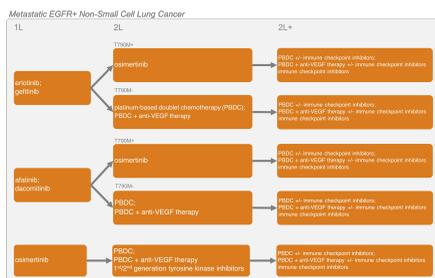
- > With the Open-Source Value Project (OSVP), the Innovation & Value Initiative (IVI) strives to maximize both the relevance and credibility of value assessment in the context of the United States' decentralized decision-making environment by developing and providing access to flexible open-source decision models for value assessment.
- > These interactive models have two primary objectives
 - > (i) to enable a more constructive dialogue regarding value assessment between stakeholders with different beliefs about relevant clinical data, modeling approaches, and value perspectives;
 - > (ii) to provide local decision-makers with credible value assessments that reflect the local setting and are based on the latest evidence while accounting for all scientific uncertainty.
- > OSVP facilitates iterative development and collaboration between multiple clinical and methodological experts, and evolves as new clinical evidence and scientific insights become available.

The IVI Non-Small Cell Lung Cancer Model

Purpose

- > A flexible open-source simulation model was developed that can be used to estimate the value of alternative sequential treatment strategies for patients with metastatic EGFR+ non-small cell lung cancer (NSCLC) (Figure 1).
- > The IVI-NSCLC(egfr+) model is accessible to both technical and non-technical end-users and allows them to evaluate the impact of uncertainty in clinical evidence, alternative model structures, the decision framework of choice (i.e. cost-effectiveness analysis [CEA]) or multi-criteria decision analysis [MCDA]), novel concepts of value, and perspective (healthcare or limited societal) on the estimates of value.

Figure 1: Treatment sequences of interest that can be evaluated with the IVI-NSCLC model



Open-source Components

- > To facilitate transparency, understanding, debate and collaboration among diverse stakeholders, the IVI-NSCLC(egfr+) model consists of multiple components available in the public domain (Figure 2).

Figure 2: Open-source components of the IVI-NSCLC Model



Model Structure

- > The IVI-NSCLC(egfr+) is an individual-level continuous-time state transition model (CTSTM) in which patients can either have stable disease, progressed disease, or have died.
- > Two alternative model structures can be selected describing the development of disease over time for a sequence starting with 1L, followed by 2L, and 2L+ treatment (Figure 3 and 4).
- > Extrapolation of treatment effects over time beyond the available data can be modeled according to 3 alternative survival functions (Weibull, Gompertz, 2nd order fractional polynomials).

Figure 3: Model structure with 3 states describing development of disease over time

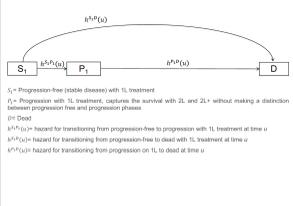
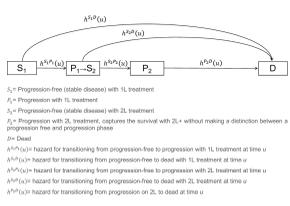


Figure 4: Model structure with 4 states describing development of disease over time



Model Output

- > An overview of all model outcomes is shown in Table 1.
- > Parameter uncertainty is quantified using probabilistic sensitivity analysis.

Table 1: model outcomes

Category	Outcomes
Health outcomes	Health state probabilities, survival curves, life expectancy, life-years, quality-adjusted life-years
Risks	Adverse events (e.g., fatigue, hair loss, nausea/vomiting, diarrhea, neutropenia)
Health care sector costs	Drug acquisition and administration costs, adverse event costs, costs from inpatient hospital stays, costs from hospital outpatient or doctor office visits
Non-health care sector costs	Productivity losses
Value assessment	CEA-based net-monetary benefit, MCDA-based "total value" score

Source Data

- > Key parameters for the model relate to: (i) the treatment effects of the interventions used for the different lines of treatment in terms of PFS and OS; (ii) utilities; (iii) healthcare resource use; and (iv) productivity. Estimates for these parameters were based on currently available published evidence identified by means of a systematic literature review and synthesized with (network) meta-analysis techniques where appropriate.

Conclusions

- > In order for a cost-effectiveness model to remain relevant over time it needs to evolve along with the clinical evidence and scientific insights.
- > The IVI-NSCLC model, and IVI's OSVP more generally, facilitates iterative development and collaboration between multiple clinical and methodological experts with the ultimate aim of having a transparent model useful and acceptable for many stakeholders.

Disclosure

This research was funded by the Innovation and Value Initiative, a 501c3 non-profit multi-stakeholder research organization. JPJ, DI, and JS are employees of Precision Medicine Group (PMG), which completed this research on behalf of IVI.

Novel Aspects of the IVI-NSCLC Model

- > Completely open-source
- > Modeling sequential treatment strategies
- > Cost-effectiveness analysis and multi-criteria decision-analysis
- > Explicitly capturing parameter and structural uncertainty
- > Accommodating different levels of expertise among end-users

Get started using the IVI-NSCLC Model

Want a user-friendly interface for experts or one for non-experts? Or access to the source code? Whether you are new to modeling or an expert programmer, you can easily jump into the IVI-NSCLC model

- > For online tools and interfaces:

<https://www.thevalueinitiative.org/ivi-nsclc-value-model/>

- > For the iviNSCLC R package, tutorial, source code, and detailed documentation

<https://innovationvalueinitiative.github.io/IVI-NSCLC/>

Figure 5: Example screenshot of web-based advanced user interface

