

A Cost-Effectiveness Analysis of RAASi – enabling Patiromer for the treatment of Hyperkalemia in Austria

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Objectives

An increase in blood-serum-potassium levels is common in patients with renal impairment or heart failure (HF). Lifesaving RAAS-inhibitors (RAASI) such as ACE-inhibitors, AT1-receptor-antagonists and aldosterone-blockers lead to a further rise in potassium levels. Discontinuation and downtitration of RAASI result in increased morbidity, as RAASI prolong the time to complete renal insufficiency. The purpose of this study was to extend the results of an 8-week OPAL–HK RCT for Patiromer, a nonabsorbed potassium-binder, that showed significant reduction in hyperkalemia and RAASI dose maintenance in the Patiromer group (94%) compared to no Patiromer (placebo) arm (44%). The analysis was performed from the Austrian healthcare-systems perspective.

Methods

A model by Sutherland et al. (2017), composed of a decision-tree and a Markov process, was used to simulate the treatment pathway of patients with chronic-kidney-disease (CKD). The short-term decision-tree estimates the proportion of CKD patients (potassium level, ≥5.0mmol/L) that continued /discontinued RAASI medication after hyperkalemia. The endpoint of the decision-tree was linked with Markov model to simulate lifetime follow-up. The model includes 6 states (stable CKD, CKD disease-progression, cardiovascular (CV) events, post CV event, hyperkalemia and death). The cohort definition was adopted from the OPAL–HK trial. Monte-Carlo simulation accounted for uncertainty. Direct costs and life expectancy were obtained from local sources for 2018. QALYs and costs were discounted at 5% per year.

Figure 1A: Short-term decision tree

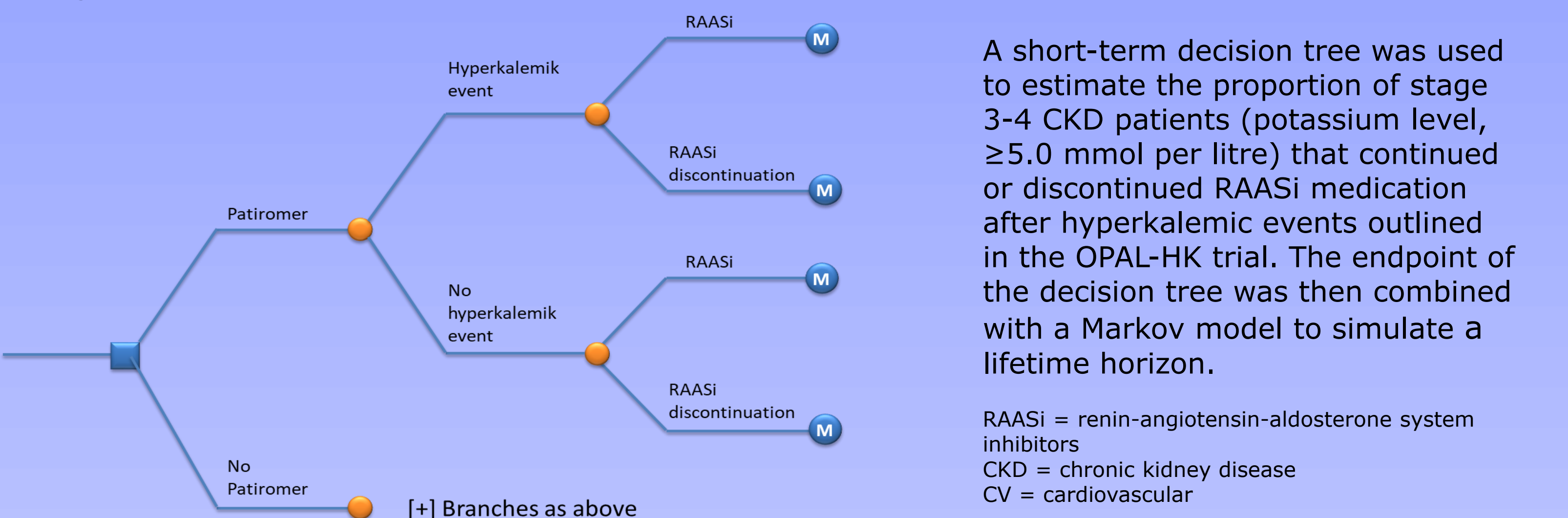
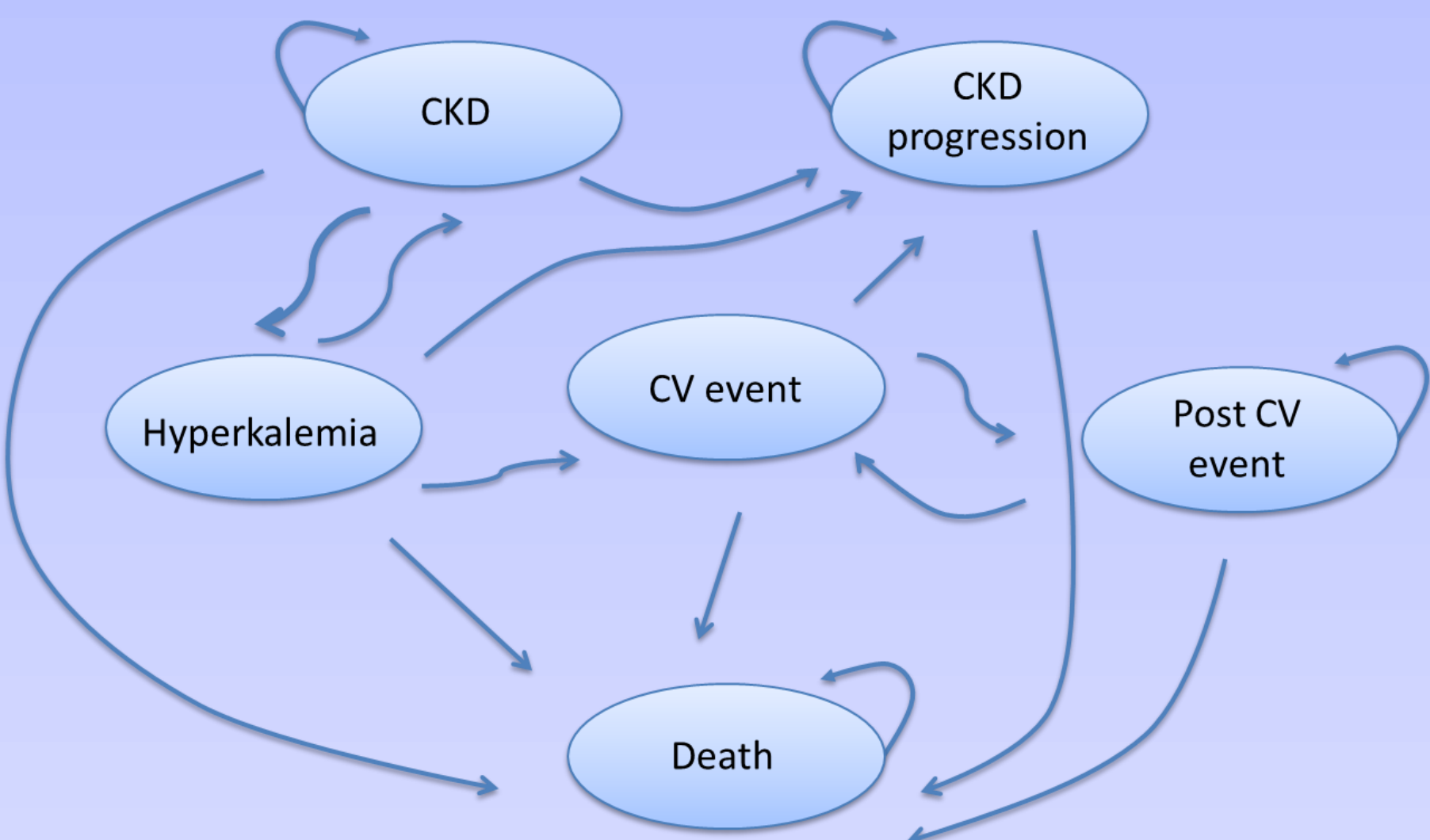


Figure 1B: Long-term Markov model

The current endpoints under evaluation include life years lived (LYs) as well as quality-adjusted life years (QALYs). It was assumed that the RAASI-enabling capacity would be maintained as long as the Patiromer treatment was given. The sources of data for annual clinical events in renal disease related to mortality and morbidity (with and without the use of RAASI) were taken from published literature.



Source: own representation according to Sutherland et al. (2017)

Clinical Data

The decision tree used clinical data of the OPAL-HK study; i.e. 43% of patients in the Patiromer group experience hyperkalemia. Since a total of 94% continue RAASI therapy, this results in a percentage of 86% who remain adherent. In the placebo group, 38.5% of all patients with hyperkalemia continue RAASI (Weir et al., 2015). The model assumes that patients without hyperkalemia remain adherent. The transition probabilities of the Markov model were based on a systematic literature search.

Resource Use and Costs

Resource use of hyperkalemia therapy including drug-related side effects, monitoring (medical services and laboratory costs), RAASI use, treatment of underlying disease such as CKD and heart failure, CV events (ESRD, MI and stroke), inpatient stays due to hyperkalemia was collected in two steps. First, the medical resources derived by literature (e.g. disease specific guidelines). In a second step, this literature review was verified by experts. Direct medical-costs were calculated based on the year 2018 (€) presented from the payer’s perspective. Direct medical costs were derived from a number of publicly available sources like outpatient clinic catalogue as well as the DRG catalogue (LKF) and official price lists for the Austrian Health insurances funds. When necessary, prices were adjusted to 2018 prices using the consumer price index.

Results

Cost-effectiveness results were presented in table 1.

Table 1: Results, 2018

Strategy	Total costs (€) per patient	QALYs per patient	ICER per QALY gained	LYs per patient	ICER per LY gained
Patiromer	38,117.17	5.473	18,979.23	7.244	14,776.31
No Patiromer	27,157.66	4.895		6.502	
Difference	-10,959.51	-0.577		-0.742	

Source: own calculations

Over lifetime, costs and outcomes associated with Patiromer amounts to 38,117.17 € and achieve 5.48 QALYs. Costs with no Patiromer treatment are 27,157.66 € and obtain 4.90 QALYs. The results show that Patiromer is associated with a significant improvement in QALYs, namely 7 months in perfect health. The incremental-cost-effectiveness-ratio ICER amounts to 18,979.23 €.

Figure 2: Per patient costs

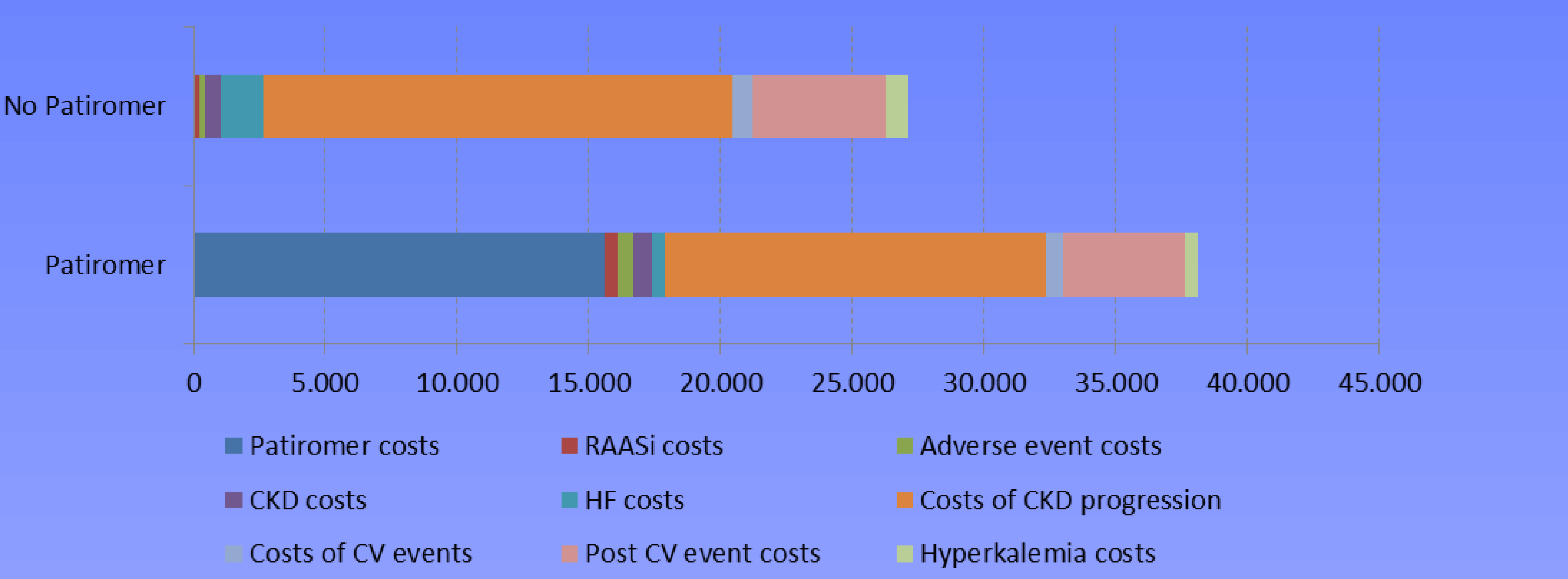
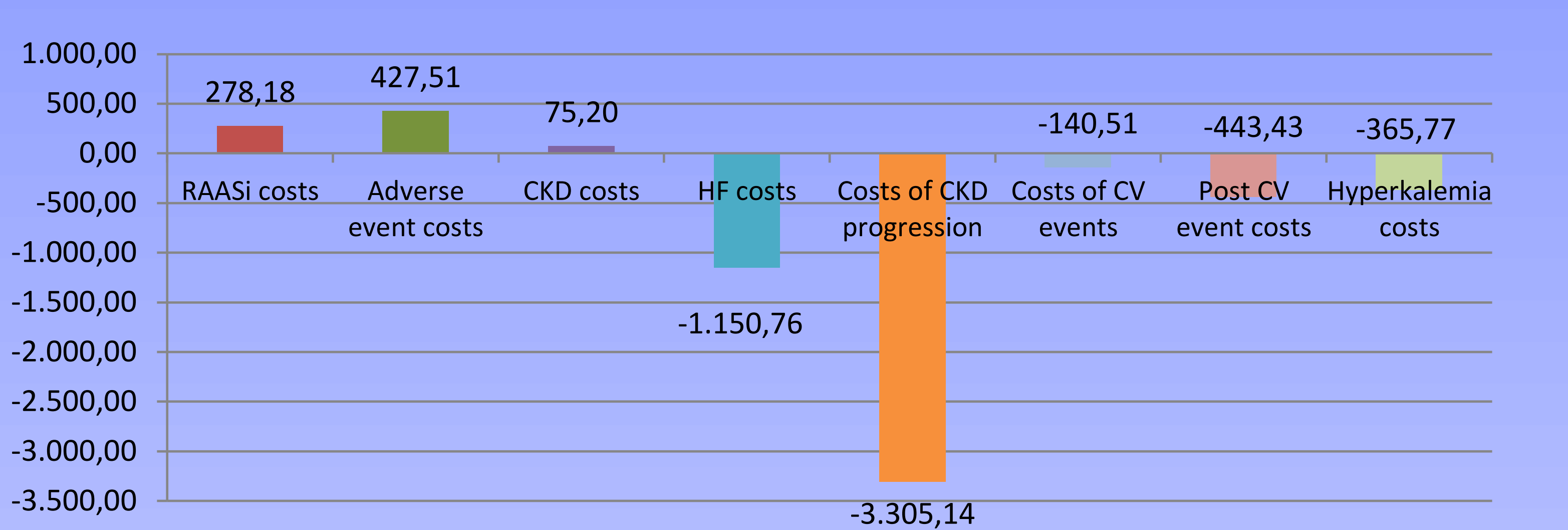


Figure 3: Cost difference per cost component



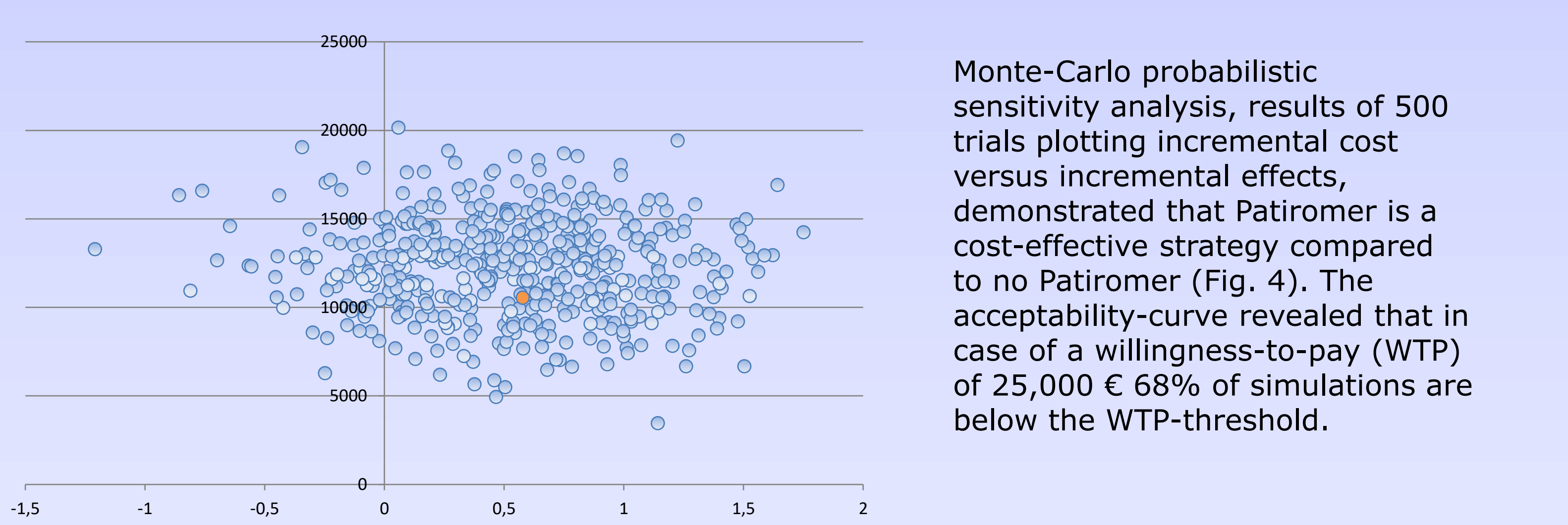
Source: own calculations

A closer examination of costs shows that Patiromer is associated with higher total costs. A savings potential is identified within the expenses for treating HF, CKD progression, CV events, post CV event and hyperkalemia (see Figure 3). Reduced event rates not only lead to lower disease related expenses but also to a better health outcome (see Table 1).

Sensitivity Analysis

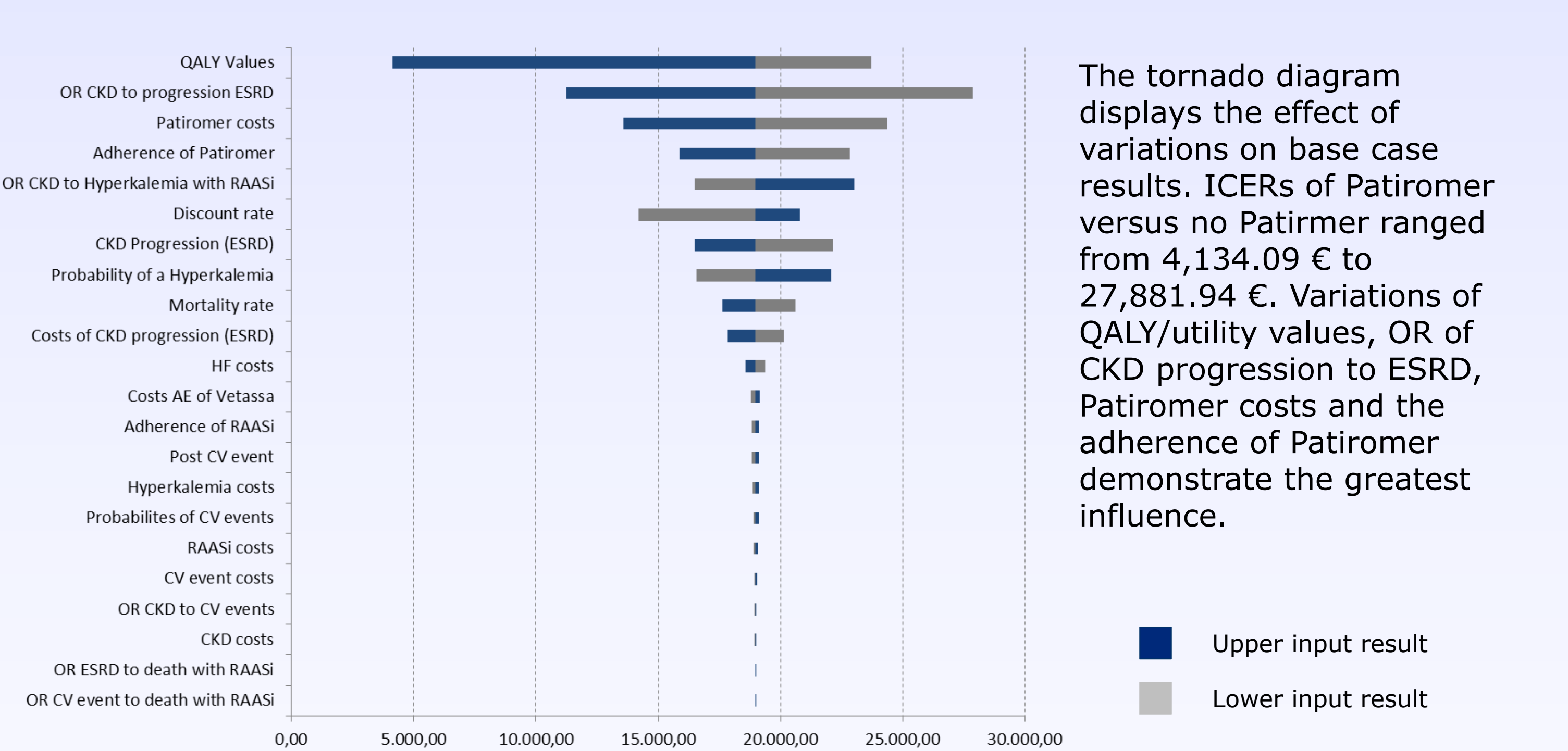
Probabilistic and deterministic sensitivity analysis were carried out to examine the robustness of the model.

Figure 4: Probabilistic Sensitivity Analysis



Monte-Carlo probabilistic sensitivity analysis, results of 500 trials plotting incremental cost versus incremental effects, demonstrated that Patiromer is a cost-effective strategy compared to no Patiromer (Fig. 4). The acceptability-curve revealed that in case of a willingness-to-pay (WTP) of 25,000 € 68% of simulations are below the WTP-threshold.

Figure 5: Deterministic Sensitivity Analysis



The tornado diagram displays the effect of variations on base case results. ICERs of Patiromer versus no Patirmer ranged from 4,134.09 € to 27,881.94 €. Variations of QALY/utility values, OR of CKD progression to ESRD, Patiromer costs and the adherence of Patiromer demonstrate the greatest influence.

Source: own calculations

Conclusion

In addition to enabling RAASI continuation, the results indicate that treatment with Patiromer vs. no Patiromer is a cost-effective intervention for the treatment of hyperkalemia in patients with CKD stages 3-4 in Austria.

References

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Additional Literature with the author