

A comparison of the cost-effectiveness (CE) of high dose hemodialysis (HD) versus conventional in-center hemodialysis (ICHD) in the Netherlands, France, and the UK

Dilip Makhija¹; Suzanne Laplante¹; Xiaoqing Liu¹; Anna Trisia Beby²; Jean-Jacques Dumas³; Bronwyn Do Rego⁴

¹ Baxter Healthcare Corporation, Deerfield, IL, USA; ² Baxter B.V., Utrecht, the Netherlands; ³ Baxter Maurepas, France; ⁴ Baxter Healthcare Ltd, Berkshire, UK

Abstract

Background: Differences in demography, epidemiology of disease, clinical practice patterns, and relative prices often limit the transferability of the results of economic evaluation from one jurisdiction to another. This complicates the decision-making process for the healthcare payers, especially in countries where no resources are available to produce an economic evaluation. The objective of this analysis was to evaluate and compare the cost-effectiveness of high dose hemodialysis (HD) performed at home or in-center versus conventional in-center HD (ICHD) between 3 European countries (Netherlands, France, and the UK) from a healthcare payer perspective.

Methods: An Excel-based Markov model was constructed to compare costs and quality adjusted life years (QALYs) associated with high dose HD and ICHD using country-specific epidemiology, cost, utilities, complications and survival data obtained for the Netherlands, France, and UK healthcare systems. Model inputs included published articles, country specific official tariffs and renal registry annual reports. The incident adult dialysis population was modeled over a 10-year horizon from a payer's perspective. One-way and probabilistic sensitivity analyses explored the robustness of the results and conclusions.

Results: This analysis resulted in similar and comparable findings in spite of differences in model inputs. Using the latest available tariffs, high dose HD when performed at home was associated with lower total costs i.e. €41,490, €22,371, and €10,857 less per patient vs. ICHD over 10 years for Netherlands, France and the UK respectively. The estimated QALY gain varied from 0.562 in Netherlands, 0.634 in France to 0.835 per patient in the UK. As a reference, this is well above or equivalent to several treatments for cancer and infectious disorders. High dose home HD was found to be dominant, i.e., more effective and less expensive in all 3 countries. High dose home HD remained cost-effective over ICHD in all sensitivity analyses. However, high dose HD when performed in-center was not cost-effective in France and in the UK. In the Netherlands, high dose in-center HD was cost-effective with an ICER of €73,905, i.e., slightly under the willingness-to-pay threshold of €80,000 per QALY.

Conclusions: Despite differences in model inputs, high dose home HD was consistently dominant (i.e., more effective and less expensive) in the 3 European countries assessed. This suggests that adjustment of the current tariffs in view of the higher production costs associated with high dose home HD would not compromise the cost-effectiveness of this regimen in these countries.

Objective

To compare the cost-effectiveness analyses of high dose hemodialysis (HD) performed at home or in-center vs. conventional in-center HD (ICHD) conducted in 3 European countries (the Netherlands, France, and the UK) from a healthcare payer perspective.

Methods

- A Markov model was developed by Baxter and Abacus to estimate the CE of high dose HD vs. ICHD. The model was first described in detail in Liu et. al.⁴
- The Markov model, comprised of a number of discrete health states adopts 28-day cycles (Figure 1).
- The study cohort involved patients starting with high dose HD (at home and in-center), while the reference scenario involved patients starting dialysis on conventional ICHD in all 3 countries evaluated.

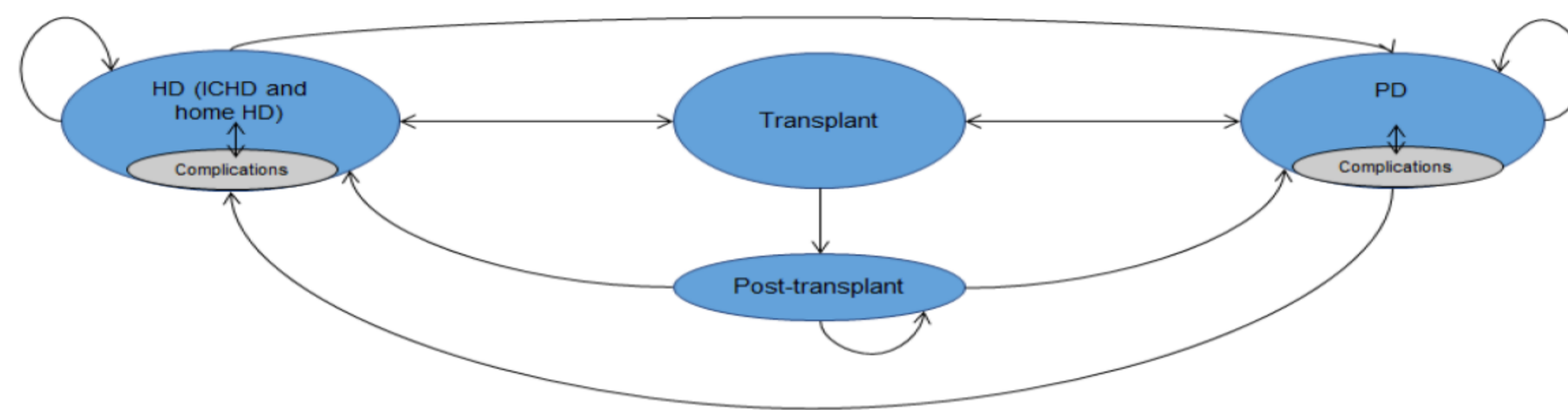
Methods (cont'd)

- Epidemiology, cost, utilities, complications and survival data were adapted locally for each country including the Netherlands, France, and UK.
- Model inputs across the 3 countries included published articles, country specific official tariffs and renal registry annual reports.⁷⁻¹¹
- The main outcome measure evaluated was the incremental cost-effectiveness ratio (ICER) of using high dose HD vs. ICHD and quality adjusted life-year (QALY) gained.
- UK costs were converted to euros at the rate of €1.30 per £1 (rate of exchange at the time of abstract submission).
- One way sensitivity analyses and probabilistic sensitivity analyses results were compared between the 3 countries to test the robustness of the model conclusion.

Results (cont'd)

- The ICER of high dose home HD vs. conventional ICHD was - €73,845, - €35,290 and - €13,002 per QALY, within the willingness-to-pay threshold of the Netherlands, France and the UK respectively.
- Negative cost-effectiveness values indicate that high dose home HD was dominant i.e. was cost saving and increased QALYs.
- Figures 2, 4 and 6 demonstrate the results for one way sensitivity analysis of high dose home HD vs. conventional ICHD in the Netherlands, France and UK.
- Overall, the tornado diagrams showed that home HD tariff had the highest impact on the associated net benefit.
- The cost-effectiveness acceptability curves (CEAC) (Figure 3, 5 and 7), consistently demonstrated that the probability for high dose home HD to be cost effective was 99.8%, at the WTP threshold ranging from €20,000 to €80,000 per QALY in the Netherlands, France and the UK respectively.
- However, high dose HD when performed in-center was not shown to cost-effective in France and in the UK.
- Despite differences in model inputs, high dose home HD was consistently dominant (i.e., more effective and less expensive) in the 3 European countries assessed.

Figure 1: Model flow diagram



Results

- High dose HD when performed at home was associated with lower total costs i.e. €41,490, €22,371, and €10,857 less per patient vs. ICHD over 10 years, in the Netherlands, France and UK (Table 1).
- Overall, across the 3 countries assessed, the model predicted that high dose home HD would be associated with an increase in QALY, with increases ranging from 0.562 – 0.835.

Table 1: Incremental cost effectiveness ratio of high dose home HD vs. conventional ICHD

	ICHD	High dose home HD	Difference
Netherlands			
Total costs (€)	€243,872	€202,382	-€41,490
QALYs	3.399	3.961	0.562
ICER			-€73,845*
France			
Total costs (€)	€341,581	€319,210	-€22,371
QALYs	2.221	2.855	0.634
ICER			-€35,290*
UK			
Total costs (€)	€164,612	€153,755	-€10,857
QALYs	3.123	3.958	0.835
ICER			-€13,002*

*A negative cost/QALY indicates that HHD is less expensive and more effective than ICHD

Figure 2. Tornado diagram (Netherlands)

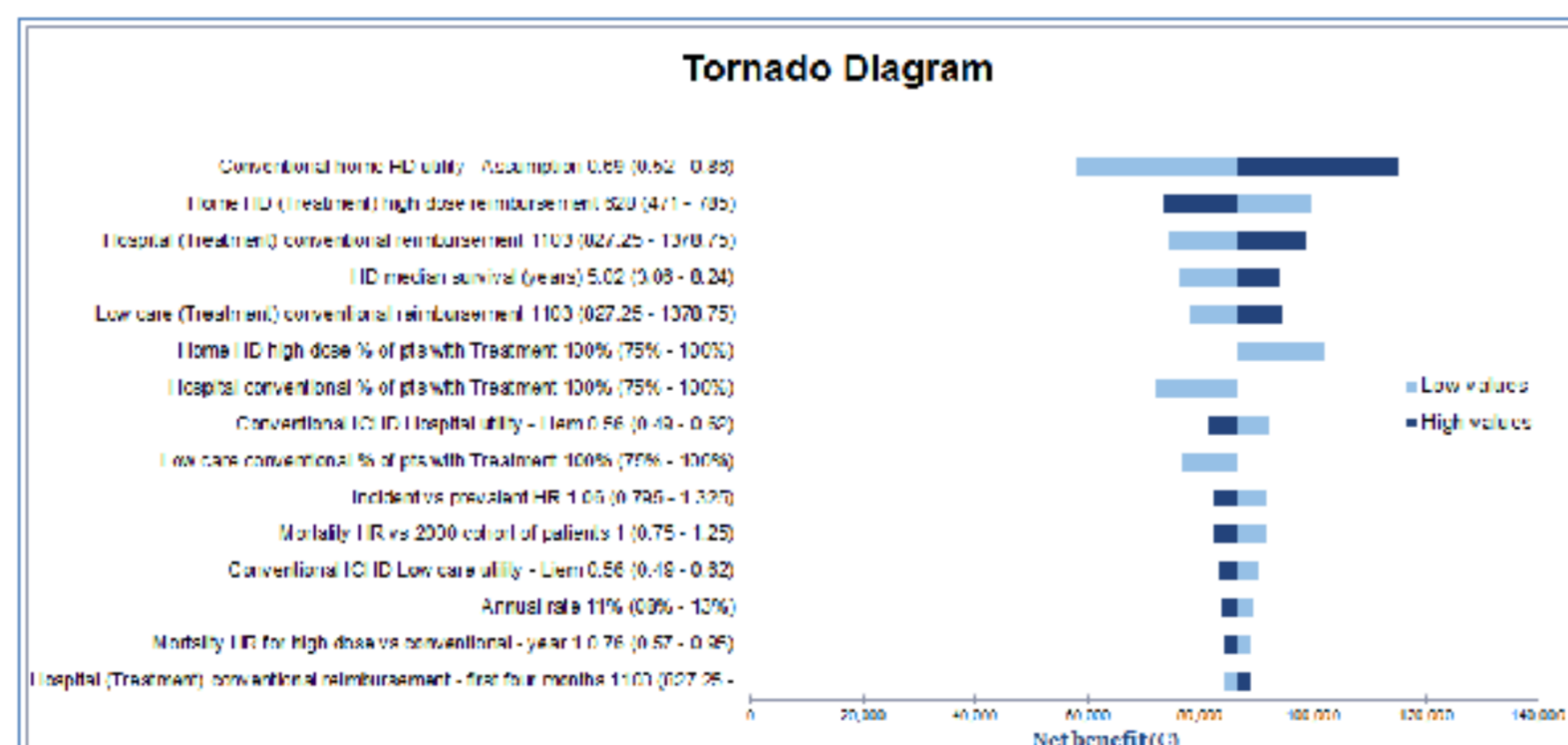


Figure 3. CEAC (Netherlands)

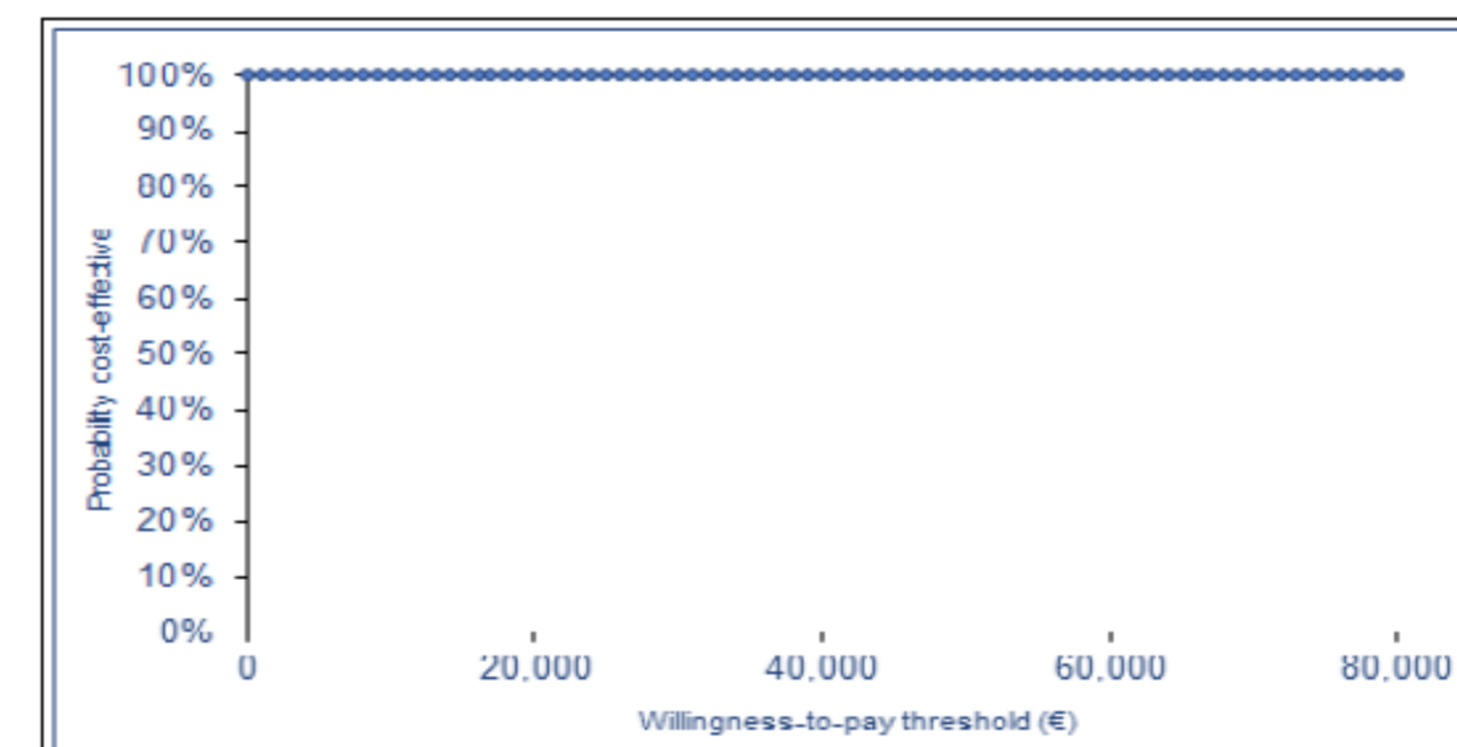


Figure 4. Tornado diagram (France)

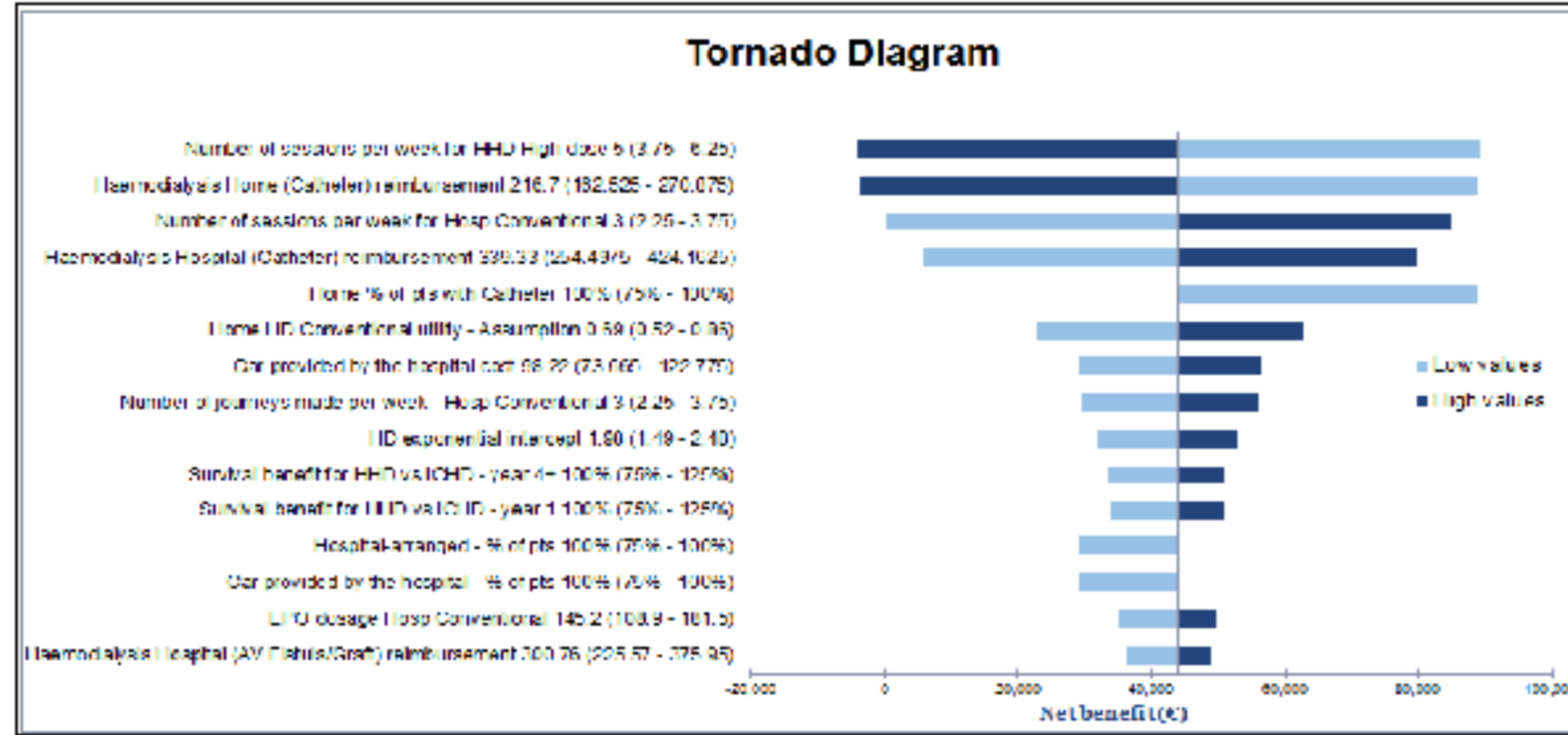


Figure 5. CEAC (France)

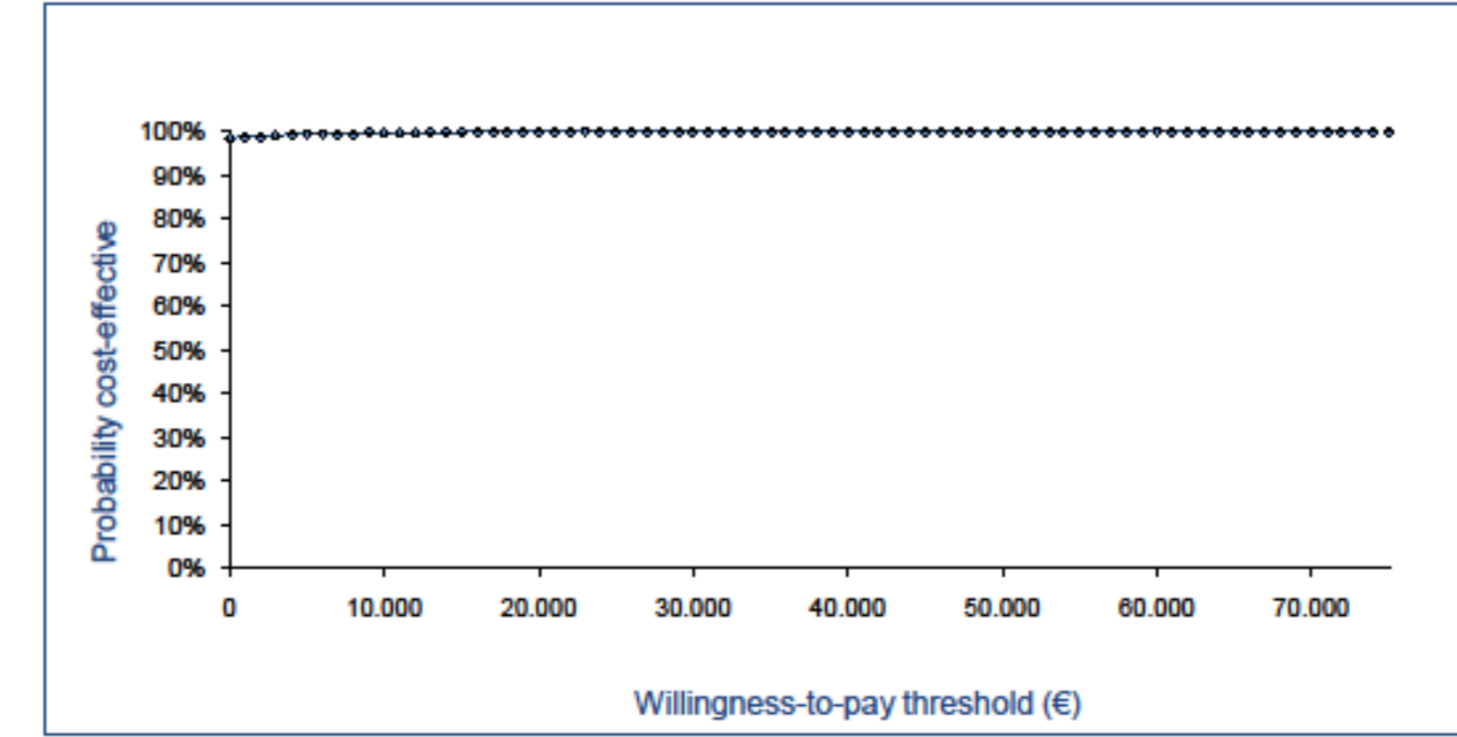


Figure 6. Tornado diagram (UK)

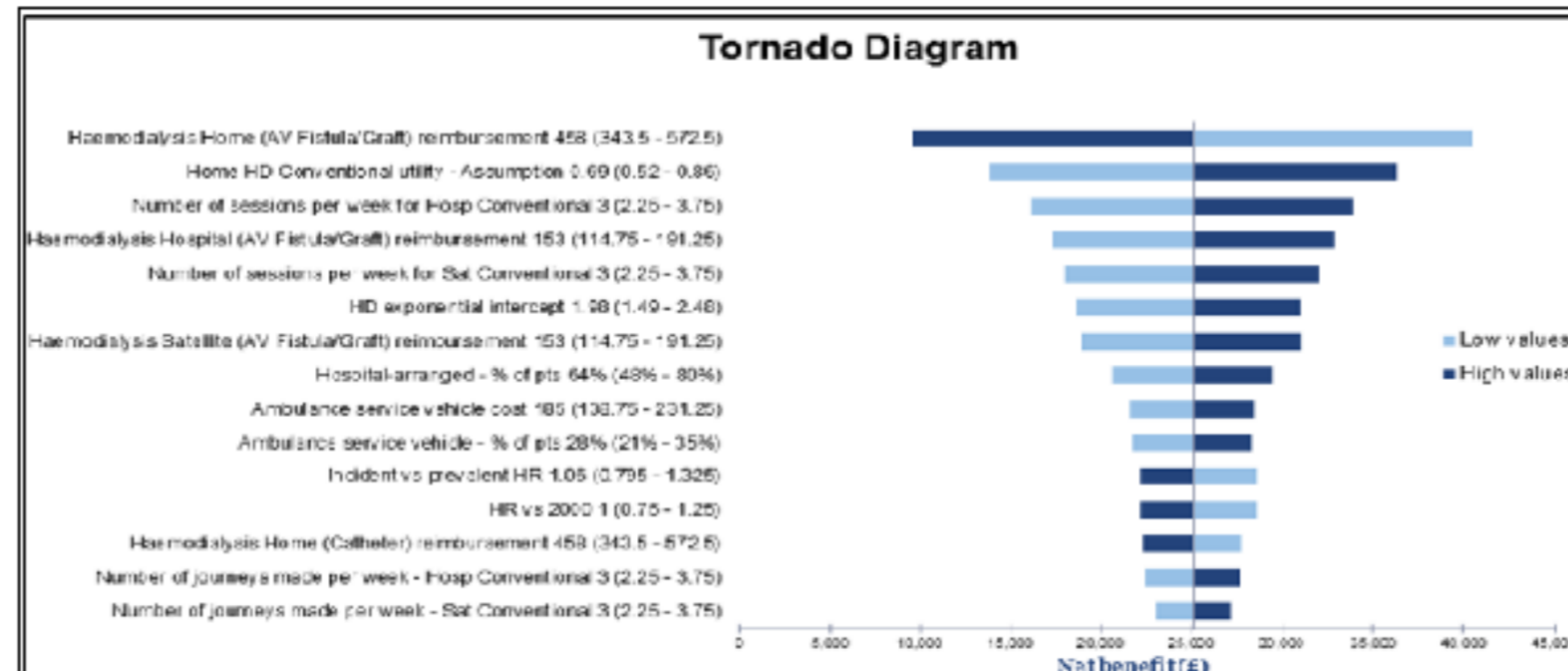
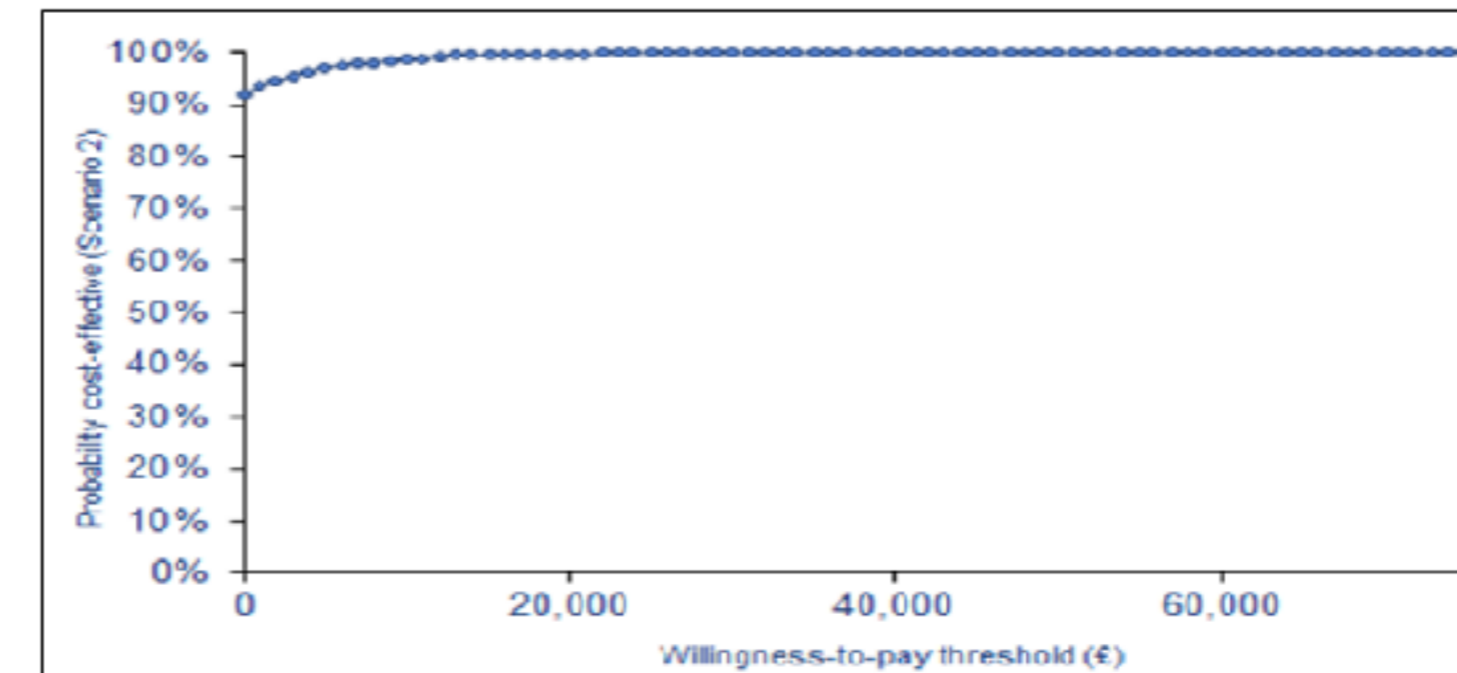


Figure 7. CEAC (UK)



Discussion and Conclusion

- Our analysis resulted in similar and comparable findings in spite of differences in model inputs.
- Under the current home HD tariff, high dose home HD provides better outcomes with lower costs per patient compared to conventional ICHD.
- This analysis is subject to the usual limitations of cost-effectiveness models, which combine assumptions and data from multiple sources.
- Second, the quality of life benefits associated with high dose home HD vs. conventional ICHD were obtained from a small clinical trial.
- Third, the current model conclusions only applies to adult patients who are clinically appropriate for both dialysis modalities.
- Despite differences in model inputs, high dose home HD was consistently dominant (i.e., more effective and less expensive) in the 3 European countries assessed.
- This analysis shows that reimbursement could be increased to compensate providers for the increased costs and still maintain the efficiency to the healthcare systems.

References

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Background

- Globally, end stage renal disease (ESRD) poses a substantial and challenging health and economic burden.^{1,2}
- The two main types of dialysis modalities available are hemodialysis (HD) and peritoneal dialysis (PD). HD is generally performed in a hospital or satellite unit but can be performed at home in suitable patients (home hemodialysis [home HD]).
- The results of economic evaluations are location dependent.
- Differences in demography, epidemiology of disease, clinical practice patterns, and relative prices often limit the generalizability of studies.³
- Recently published economic evaluation indicates that high dose hemodialysis (HD), is cost-effective (CE) when conducted at home from a UK payer perspective.⁴
- This analysis has subsequently been adapted and used by Baxter affiliates in the Netherlands and France.^{5,6}

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