Cost-effectiveness analysis of high-efficiency hemodiafiltration vs. low-flux hemodialysis based on the Canadian arm of the CONTRAST study

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Objective

To assess the cost-effectiveness of high-efficiency on-line hemodiafiltration (OL-HDF) compared to low-flux hemodialysis (LF-HD) for patients with end-stage renal disease (ESRD) based on the Canadian arm of a parallel-group randomized controlled trial (RCT), the Convective Transport Study (CONTRAST).

Methods

An economic evaluation was conducted for the period of the RCT (74 months) (Trial-based analysis). In addition, a Markov state transition model was constructed to simulate costs and health benefits over lifetime (Model-based analysis). The primary outcome was costs per quality-adjusted life year (QALY) gained. The analysis had the perspective of the Canadian public health care system.

Results

A total of 130 patients were randomly allocated to OL-HDF (n = 67) and LF-HD (n = 63). Table 1 shows the components of the cost effectiveness evaluation as estimated in the trial-based model. As shown in Table 2, the model-based incremental cost-effectiveness ratios (ICERs) are of comparable relative magnitude to those of the trial-based evaluation. The cost-utility ratio of OL-HDF vs. LF-HD was $CAN 53,270 per QALY gained over lifetime. Figure 2 shows a scatter plot of incremental costs and QALYs of OL-HDF compared to LF-HD. As displayed, the ratio of incremental QALYs to incremental costs is fairly robust as pairs of incremental costs and QALYs fall on a straight constant.

Conclusions

Based on the principle of weak dominance, high-efficiency OL-HDF can be considered a cost-effective treatment for ESRD in a Canadian setting. Further research is needed to assess cost-effectiveness in other settings and health care systems.

Table 1. Results of the trial-based analysis by arm. Costs are undiscounted, in 2013 Canadian dollars, and refer to one patient over the trial period of ~6.2 years. Standard errors of the mean are given in parentheses

Variable	On-line hemodiafiltration	Low-flux hemodialysis	P value
Treatment costs, $CAN	259,453*	247,398*	<0.001
Hospitalization costs, $CAN	70,717 (940)	70,219 (1013)	NS
Drug costs, $CAN	36,059 (112)	49,196 (190)	<0.001
Total costs, $CAN	366,229 (957)	366,813 (1057)	NS
EQ-5D-5L index score (UK value set)	0.72 (0.03)	0.64 (0.05)	NS
EQ-5D-5L index score (U.S. value set)	0.79 (0.02)	0.73 (0.03)	NS

*no uncertainty in estimates was assumed

Table 2. Discounted incremental costs, effects, and cost-effectiveness of on-line hemodiafiltration (OL-HDF) vs. low-flux hemodialysis (LF-HD). Costs are in 2013 Canadian dollars and are rounded

	Costs	Life years	QALYs	Incremental costs per life year gained (OL-HDF vs. LF-HD)	Incremental costs per QALY gained (OL-HDF vs. LF-HD)
Trial-based analysis					
OL-HDF	220,018	4.01	2.87	53,153	32,112
LF-HD	203,629	3.70	2.36		
Model-based analysis					
OL-HDF	368,177	6.21	4.45	58,840	53,270
LF-HD	306,826	5.17	3.30		

QALY = quality-adjusted life year

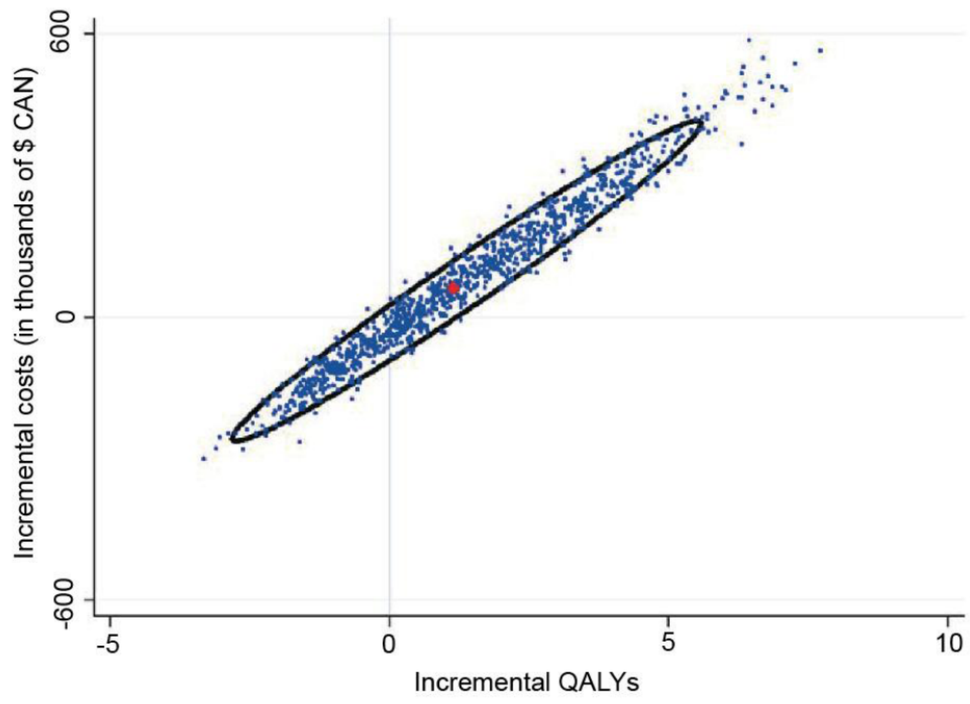

Figure 1. Scatter plot of incremental costs and quality-adjusted life years (QALYs) of on-line hemodiafiltration (OL-HDF) compared to low-flux hemodialysis (LF-HD). Plotted are a 95% confidence ellipse (black line) and the mean cost-effect pair (red dot)

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