High dose haemodialysis and home dialysis increase life-year and quality-adjusted life-year gains in the United Kingdom

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Abstract

OBJECTIVES: Increasing evidence are showing that high dose haemodialysis (more frequent and/or longer duration hemodialysis (HD)) can improve clinical and humanistic outcomes. We compared the expected health gains (measured as life-years – LYs – and quality-adjusted life-years – QALYs – gained) if high dose HD and other home dialysis modalities were used in a greater proportion of the dialysis patients than currently observed.

METHODS: A Markov model was built for the UK environment. Various combinations of high dose HD (in-center or at home) and peritoneal dialysis (PD) were compared to the current usage (i.e., 83% conventional in-center HD; 14% PD; 3% conventional home HD; 0% high dose home HD). Inputs included: incidence, prevalence, transplant rates (UK renal registry); complications, utilities and transition between modalities (medical literature); survival (PD & conventional HD: ERA-EDTA registry; high dose HD: medical literature). The model was run for 5 years with the prevalent dialysis population and an incident cohort entering the model each year in years 2-5.

RESULTS: Over the 5-year period, the scenario where all patients received in-center conventional HD generated a loss of 678 LYs (-0.6%) and 838 QALYs (-1.2%) for the cohort. Treating all patients with high dose HD in-center or at home, although likely unrealistic, increased the cohort's LYs by 4.5-4.8% and QALYs by 10.7-26.7%. All other (less extreme) scenarios led to increasing LY and QALY gains with increasing usage of home modalities. A more realistic scenario where 10% of patients received high dose HD at home and PD usage was back to years 2005-2008 levels, i.e., 25%, generated 963 LY (+0.8%) and 1827 QALY (+2.6%) gains.

CONCLUSIONS: This analysis shows that high dose HD, especially when performed at home has the potential to significantly increase the health gains of the dialysis population. This analysis also shows that treating increasing the in-center HD patient population results in health losses.

Background

Increasing evidence are showing that high dose haemodialysis (more frequent and/or longer duration hemodialysis (HD)) can improve clinical (Fig 1) and humanistic outcomes.

Objectives

Compare the expected health gains (measured as life-years – LYs – and quality-adjusted life-years – QALYs – gained) in hypothetical scenarios where high dose HD and other home dialysis modalities are used in various proportions of the dialysis patient population.

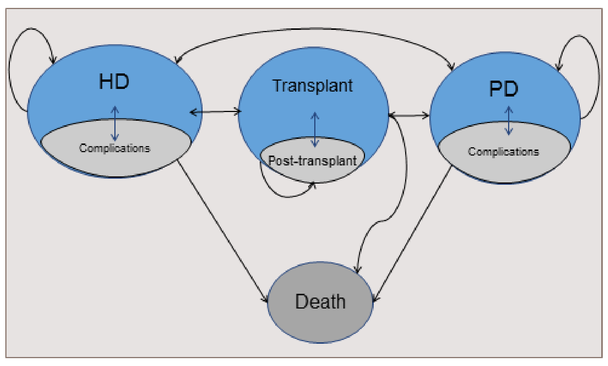
Methods

Model structure:

A Markov model (Fig 2) was built for the UK environment. Inputs included:

- Incidence
- Prevalence
- Transplant rates
- Complications
- Utilities
- Transition between modalities
- Survival.

Figure 2: Markov model structure



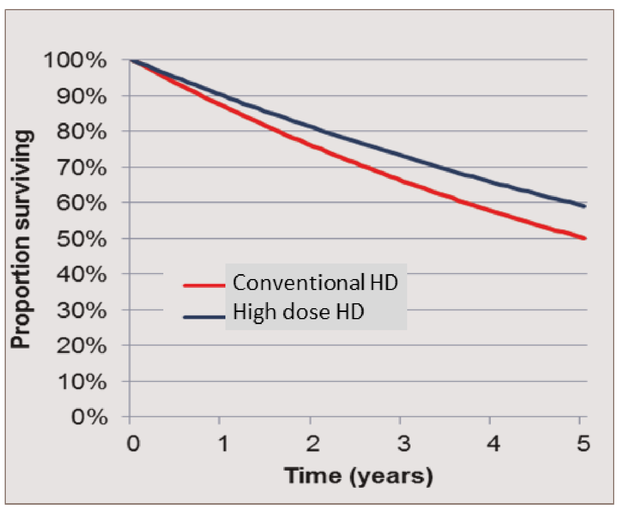
Model parameters:

The main model survival and utility parameters and their respective sources are described in Table 1.

Table 1: Survival and utility parameters of the model

	Value (range)	Source
Mortality		
In-center conventional HD and PD	Digitized Figures A.6.2 and A.6.3	6
High dose HD vs in-center conventional HD HR	0.76 (0.57-0.95) (see Fig 3)	3, 4, 5
Utilities		
Health-related improvement (over conventional in-center HD) due to high dose HD	8.8% (6.6%-11.0%)	7
In-center conventional HD utility	0.56 (0.49-0.62)	8
PD utility	0.58 (0.50-0.67)	8

Figure 3: Relative survival High dose HD: conventional HD



Scenarios explored:

The impact on health, measured as life-year (LY) and quality-adjusted-life-year (QALY) gain, of various scenarios where the proportion of patients on high dose HD (in-center or at home) and peritoneal dialysis (PD) was varied, were compared to the current usage of dialysis modalities in the UK (i.e., 83% conventional in-center HD; 14% PD; 3% conventional home HD; 0% high dose home HD). Scenarios explored are described in Table 2.

Time horizon:

The model was run for 5 years.

Patient population:

UK prevalent dialysis population including an incident cohort entering the model each year in years 2-5.

Table 2: Scenarios – dialysis modality distribution (prevalent cohort)

	PD	Conventional in-center HD	High dose in-center HD	Conventional home HD	High dose HD at home
Base case	14.2	82.8	0	3	0
No home	0	100	0	0	0
100% high dose in-center HD	0	0	100	0	0
100% conventional home HD	0	0	0	100	0
100% high dose HD at home	0	0	0	0	100
20% PD	20	77	0	3	0
25% PD	25	72	0	3	0
10% high dose HD at home + 20% PD	20	67	0	3	10
10% high dose HD at home + 25% PD	25	62	0	3	10

Results

Over the 5-year period:

- The scenario where all patients received in-center conventional HD generated the greater health loss, i.e., 678 LYs (-0.6%) and 838 QALYs (-1.2%) for the cohort.
- Treating all patients with high dose HD in-center or at home, although likely unrealistic, increased the cohort's LYs by 4.5-4.8% and QALYs by 10.7-26.7%.
- All other (less extreme) scenarios led to increasing LY and QALY gains with increasing usage of home modalities.
- A more realistic scenario where 10% of patients received high dose HD at home and PD usage was back to years 2005-2008 levels, i.e., 25%, generated 963 LYs (+0.8%) and 1827 QALYs (+2.6%) gains.

Estimated LY and QALY gains with each scenario explored are shown in Figures 4a and 4b.

Figure 4a: Estimated health gains in extreme scenarios

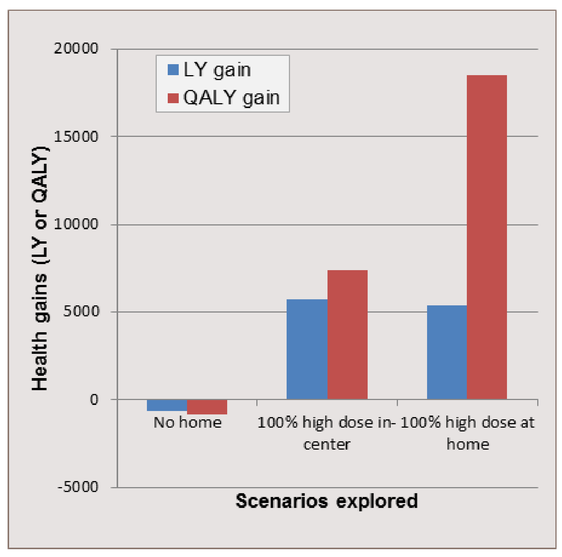


Figure 4b: Estimated health gains in realistic scenarios

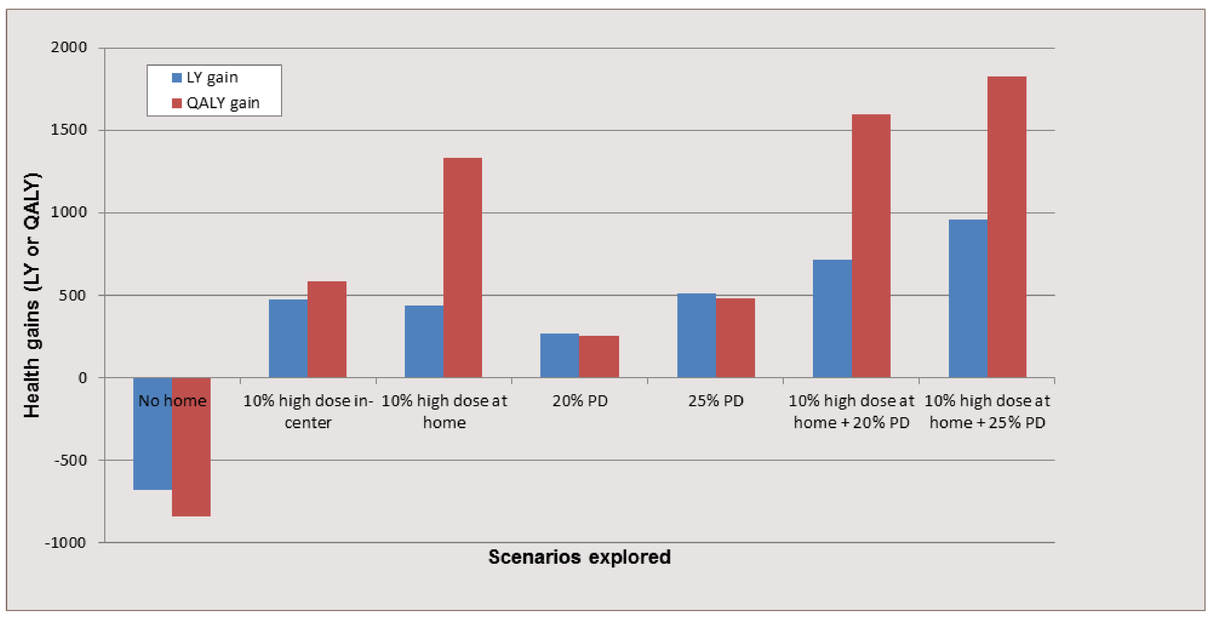
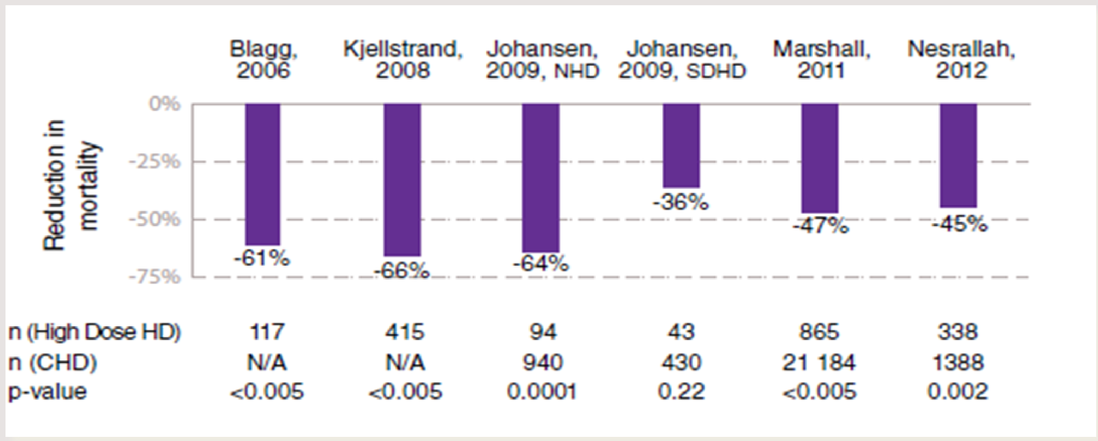


Figure 1: Impact of high dose HD on survival of dialysis patients [1-5]



Conclusions

This analysis shows that high dose HD, especially when performed at home has the potential to offer significant health gains to the dialysis population. This analysis also shows that treating an increasing proportion of patients with in-center HD results in health losses.

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