COST CONSEQUENCE ANALYSIS OF A REMOTE MONITORING PROGRAM FOR AUTOMATED PERITONEAL DIALYSIS IN THE USA

Ariza, JG[1], Berek S[2], Rivera A[3]

[1] Baxter Latin-America, Bogotá - Colombia; [2] Baxter Healthcare Corporation, Deerfield IL - USA; [3] Baxter Healthcare Corporation, Mississauga ON - Canada

**Susan Berek is currently reporting into the Baxter Renal Care Unit marketing vice-presidency*

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Background

- The Automated Peritoneal Dialysis (APD) is recognized as an effective renal replacement therapy (1)
- A remote patient monitoring (RPM) program based in *Sharesource* technology, in addition to APD, has demonstrated to improve adherence and health outcomes (2,3)
- There is a lack of economic evidence in the USA to demonstrate the association between the RPM and health care savings in APD patients

Objectives

To estimate from the payer perspective and different scenarios, the cost and clinical consequences of a RPM program, supported by *Sharesource* technology, to improve the clinical practice in APD in the USA.

Methods

A Markov type model was built for the cost consequence analysis using Excel (Excel 2016; Microsoft, Redmond WA) based on five health states (Figure 1). The model used monthly cycles to estimate costs and outcomes of a hypothetical cohort of incident APD patients, with and without a RPM program over a one year time horizon. The model structure was based on the results of a focus group conducted with seven experts made up of nephrologists and nurses. Lack of memory, constant probabilities and mutually exclusive health states were assumed in the model. The RPM program definition assumed in this study has been well described elsewhere in the medical literature (4)

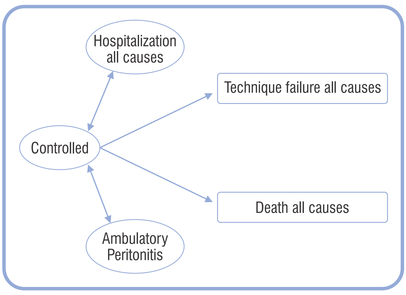


Figure 1: Markov model structure

The relative effectiveness of RPM in reducing the hospitalization rate, hospitalization days, APD technique failure and mortality was based on a propensity score matched observational study (3). APD technique failure and mortality were assumed to be equal with and without RPM as no statistical differences were found. An internal dataset analysis of the same matched sample were also used to estimate the incidence of peritonitis. (Table 1)

Table 1: Model inputs

	Base case	Lower	Higher
APD with RPM Hospitalization relative risk (RR)	0.61 (ref 3)	0.39	0.95
APD with RPM Hospitalization days relative risk (RR)	0.46 (ref 3)	0.23	0.92
APD with RPM Peritonitis relative risk (RR)	0.69 (ref 3)	0.28	1.67
Baseline APD peritonitis risk rate (patients year)	0.3 (ref 8)	0.24	0.36
APD bundle reimbursement fee per month (2018 $USD)	7,050 (ref 12)	4,444	8,252
Peritonitis episode cost (2018 $USD)	21,156 (ref 6)	16,925	25,387
Technique failure cost (2018 $USD)	29,946 (ref 5)	23,957	35,935

Baseline hospitalization rates, length of stay, complication rates and costs were estimated from different sources such as medical literature (3,5-8), 2019 of MedPAR DRG costs and episodes, the 2018 United States Renal Data System report (USRDS) and 2006 AHRQ report. Considering that the model results are highly influenced by baseline risks and costs assumptions, a scenario analysis was done considering low extreme, base case and high extreme scenario (see Table 2). Costs are reported in USA dollars and the inflation rate was applied up to December 2018. A discount rate was not required. Deterministic and probabilistic sensitivity analysis were performed for the base case scenario to analyze the effect of the parameter estimation uncertainty in the model.

Table 2: Model inputs for scenario analysis

	Low extreme	Base case	High extreme
Baseline hospitalization rate (patient year)	0.92 (ref 3)	1.66 (ref 10)	1.66 (ref 10)
Baseline hospitalization days per episode (days)	6.07 (ref 9)	7.34 (ref 10)	13.21 (ref 3)
Baseline hospitalization cost per episode (2018 $US)	2,122 (ref 9)	7,854 (ref 11)	7,854 (ref 11)

BASE CASE RESULTS (x 100 patients for 1 year)

Base case results are presented for 100 hypothetical APD patients (with and without RPM) followed for one year (table 3 and 4).

Table 3: Base case costs results x 100 patients for 1 year (2018 $USD)

	Overall cost	APD cost	Hospitalization cost	Peritonitis cost
APD without RPM	$ 16,578,963	$ 7,562,563	$ 8,322,951	$ 693,448
APD with *Sharesource* RPM	$ 11,229,616	$ 7,901,739	$ 2,826,026	$ 501,852
Net difference	-$ 5,349,347	$ 339,176	-$ 5,496,925	-$ 191,596

Table 4: Base case clinical results x 100 patients for 1 year

	Months free of complications	Hospitalization episodes	Hospitalization days	Peritonitis episodes
APD without RPM	1,073	129	944	25
APD with *Sharesource* RPM	1,121	84	284	18
Net difference	48	-45	-660	-7

SCENARIO ANALYSIS (x 100 patients for 1 year)

Table 5: Scenarios cost results x 100 patients for 1 year (2018 $USD)

	Low extreme	Base case	High extreme
Net difference in overall cost	-$870,349	-$5,349,347	-$6,926,454
Net difference in hospitalization cost	-$896,278	-$5,496,925	-$7,075,153

Table 6: Clinical scenario results x 100 patients for 1 year

	Low extreme	Base case	High extreme
Net difference in hospitalization episodes	-45	-28	-45
Net difference in hospitalization days	-660	-330	-861

SENSITIVITY ANALYSIS (x 100 patients for 1 year)

Figure 2: Deterministic sensitivity analysis (DSA)

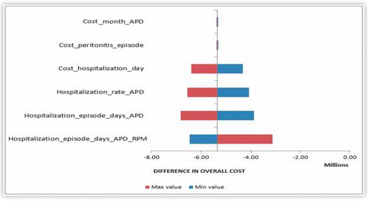
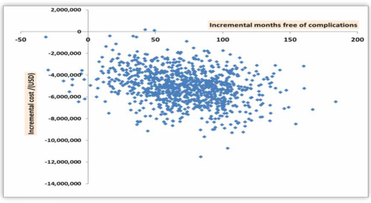


Figure 3: Probabilistic sensitivity analysis (PSA)



Model results were robust and sensitive to the change in the hospitalization rate, length of stay and daily hospitalization cost (Figure 2). In 99% of one thousand Montecarlo simulations, the APD with RPM was a cost-saving intervention (Figure 3).

Conclusions

From a payer perspective and with a time horizon of one year, the available evidence suggests that the RPM program implemented in the USA would likely be a cost saving intervention with the potential for enhancing time without complications and hospitalization risk reduction. This conclusion proved to be robust under different scenarios and sensitivity analysis. Further, the economic benefit of a RPM program could be even higher in environments with clinical indicators clearly in need of attention and settings where there are higher hospitalization costs. However, the external validity of these findings should be interpreted carefully and it will very much depend on how renal centers implement RPM.

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