Evidence Series: Research Article

Automated Remote Monitoring for Peritoneal Dialysis and Its Impact on Blood Pressure

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Cardio Renal Medicine DOI: 10.1159/000506699.
Published February 18, 2020

Sharesource

BACKGROUND

- The adherence of PD patients to their treatment cannot always be monitored by physicians.
- Remote monitoring automated peritoneal dialysis (RPM-APD) may affect patients' compliance with treatment and, thus, clinical outcomes.
- Remote monitoring technology integrated into APD systems makes it possible for their PD team to receive patient treatment data, allowing early detection of problems and their remote resolution.

OBJECTIVES

To evaluate the clinical outcomes of patients with a remote monitoring APD system.

ENDPOINTS

- Treatment adherence
- Dialysis adequacy
- Change in blood pressure control
- Sleep quality
- Health-related quality of life

METHODS

- Observational study
- 15 patients treated with traditional APD using the Homechoice Claria cycler were switched to RPM-APD (Claria with the Sharesource platform) and followed for a 6-month period.
- Patient data were checked in Sharesource daily and the following information was recorded:
  1. important alarms – total number of alarms and those related to adherence were calculated per patient monthly.
  2. ultrafiltration profile
  3. initial drainage volume
  4. blood pressure - recorded before the switch to RPM-APD at monthly clinic visits and then on a daily basis after the switch at home on a blood pressure device.
  5. body weight
- The medical outcome survey to measure health related quality of life short form 36 (SF-36) was used to measure health status and health-related quality of life at the beginning of RPM-APD and at 6 months of follow-up.
- The Pittsburg Sleep Quality Index (PSQI) questionnaire was used to assess patients' sleep dysfunction at the beginning of RPM-APD and at 6 months of follow-up.
- The hospital electronic medical records system was used for baseline information.
- The dialysis solutions of the patients were also recorded. Patients using icodextrin were determined and the average daily amount was calculated. Glucose weight was calculated as the sum of the products of the volume and glucose concentration for each exchange.
- The adequacy of dialysis was determined by measuring the total weekly creatinine clearance, normalized to 1.73 m^2 of the body surface area and total weekly urea clearance (Kt/V).

RESULTS

- Statistically significant decrease in Mean Arterial Blood Pressure (MABP) and increase in total Kt/V (99 ± 19 vs. 89 ± 11 mm Hg, p = 0.01).
- MAB in the sixth month of the RPM-APD switch was significantly lower when compared to baseline, 3, and 6 months before the device switch (p = 0.01, p = 0.01, and p = 0.03, respectively).
- Increase in Kt/V in the sixth month after the RPM-APD switch (2.11 ± 0.4 vs. 2.25 ± 0.5).

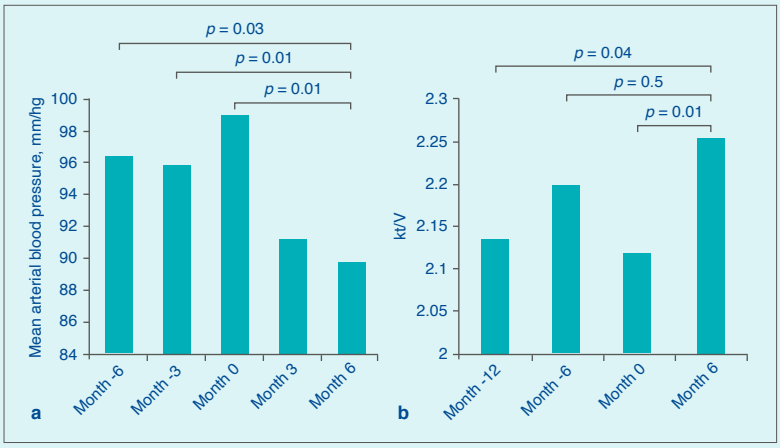

Fig. 1.a Comparison of mean arterial blood pressure of patients during 12 months of follow-up. Month 0 indicates the beginning of remote monitoring automated peritoneal dialysis (RPM-APD). **b** Comparison of mean Kt/V of the peritoneal equilibrium test during the 18 months of follow-up. Month 0 indicates the beginning of RPM-APD.

Table 2. Treatment and medical evaluation before and after RPM-APD

	Before RPM-APD	After RPM-APD	p value
MAB, mm Hg	99±19	89±11	*0.01*
PET			
Kt/V	2.11±0.4	2.25±0.5	*0.03*
CrCl, mL/min	57 (42.8-120.3)	63.1 (46.4-141)	*0.1*
Urinary volume, mL	600 (0-2,600)	700 (0-2,400)	*0.5*
Urinary CrCl, mL/min	1.17 (0-15.8)	1.39 (0-14.3)	*0.7*
Permeability, n			
Slow	1(7%)	0	
Average	11 (73%)	11 (73%)	
Fast	3 (20%)	4 (27%)	
UF, mL			
-3 to 0 month vs. 0 to 6 months	800 (500-1,000)	824 (537-1,183)	*0.03*
-6 to 0 month vs. 0 to 6 months	752 (490-986)	824 (537-1,183)	*0.009*
Drugs			
EPO, n	8 (53%)	7 (47%)	*0.3*
Antihypertensive drug, n	10 (67%)	9 (60%)	*0.8*
Antihypertensive group	2 (0-4)	2 (0-4)	*0.3*
Antihypertensive drug count, daily	4 (0-7)	2 (0-6)	*0.05*
Phosphate binder, n	8 (53%)	8 (53%)	
Calcium-based phosphate binder, n	4 (27%)	2 (13%)	*0.3*
Sevalemer, n	5 (33%)	6 (40%)	*0.3*
Diuretic, n	10 (67%)	10 (67%)	
Total drug count, daily	11 (6-22)	8 (5-22)	*0.08*
Dialysis fluid			
Glucose weight, g/day[1]	123.87	124.9	*0.1*
Icodextrin			
n	10 (66%)	10 (66%)	
mL	1,610	1,610	

MAB, mean arterial pressure; PET, peritoneal equilibrium test; CrCl, creatinine clearance; UF, ultrafiltration; daily glucose load in the 6-month period before RPM-APD versus average daily glucose load in the 6-month period EPO, erythropoietin-stimulating agent; RPM-APD, remote management automated peritoneal dialysis during RPM-APD. Statistically significant p values are italicized.

Significant increase in ultrafiltration when comparing the 3-month and 6-month amounts before RPM-APD with the amount at 6-months after RPM-APD (800 mL [500–1,000] and 752 mL [490–986] vs. 824 mL [537–1,183]).

Need for daily antihypertensive medication was significantly reduced 4 [0–7] vs. 2 [0–6], p = 0.05) at the sixth month of device switch compared to baseline.

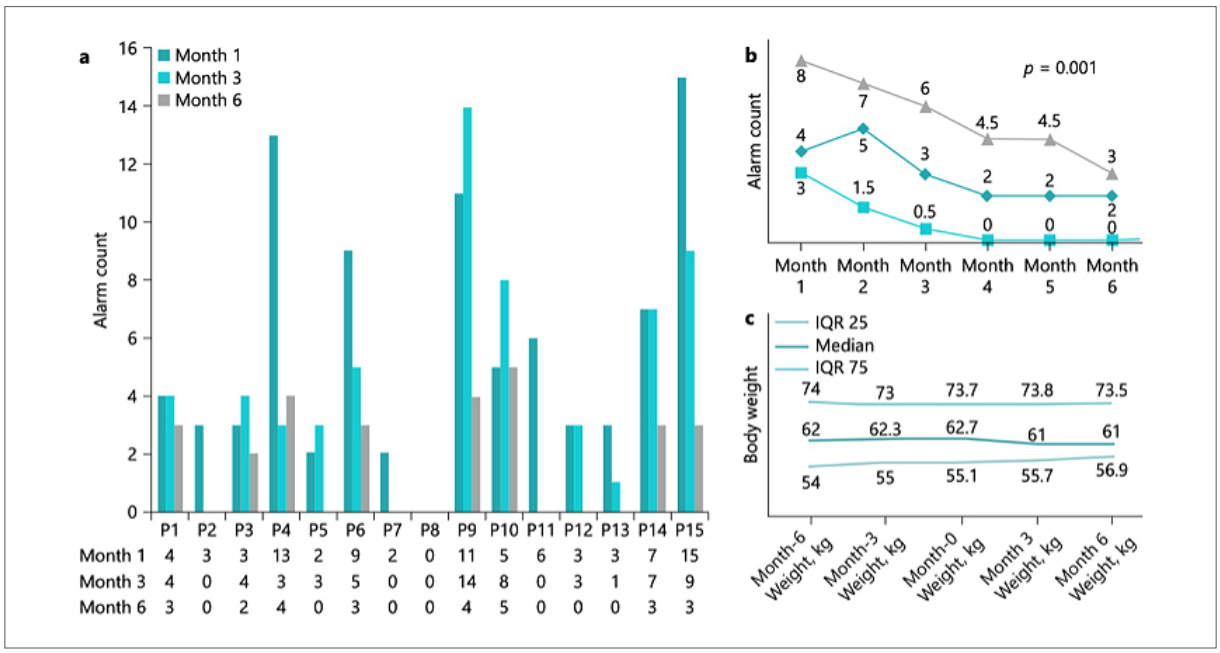

Fig. 2.a Change of important signals received during the peritoneal dialysis session. **b** Median and interquartile range (IQR) 25-75 values of the important alarms received from the device and treatment lost after remote monitoring automated peritoneal dialysis. The median number of the signal was statistically significant between month 6 and month 1 (p=0,001). **c** Median and interquartile range (IQR) 25-75 values of the weight of the patients during the 1-year follow-up.

- Patients' treatment adherence changed after switching to RPM-APD: Alarms received decreased and treatment adherence of patients increased (from 4 [3–8] to 2 [0–3], p = 0.001).
- Patient median body weight decreased from 62.7 to 61 kg within 6 months.

NO significant CHANGE IN SLEEP QUALITY and health-related **QUALITY OF LIFE**

Therapy and treatment changes as a result of the data from Sharesource is associated with APD patients achieving significantly greater blood pressure control compared to APD alone

Therapy and treatment changes as a result of the data from Sharesource is associated with significant increase in ultrafiltration in APD patients

CONCLUSIONS

- Long-term treatment adherence can be an important problem in patients undergoing PD.
- Non-adherence with APD therapy can result in lower small solute clearance and ultrafiltration and higher blood pressure, leading to increased pill burden.

BLOOD PRESSURE CONTROL IMPROVED

- With RPM-APD, remote control management of patients is ensured and patients are actively kept in treatment. As a result, ultrafiltration and dialysis efficiency of patients increase with improved treatment adherence, and blood pressure regulation can be achieved with fewer antihypertensive drugs.

Baxter's **Homechoice Claria** APD system is intended for automatic control of dialysis solution exchanges in the treatment of pediatric and adult renal failure patients undergoing peritoneal dialysis in the HOME HEALTHCARE ENVIRONMENT including comparable use in professional healthcare facilities.

The **Sharesource** portal is intended for use by healthcare professionals to remotely communicate new or modified treatment parameters with compatible dialysis instruments and transfer completed treatment data to a central database to aid in the review, analysis, and evaluation of patients' historical treatment results. This system is not intended to be a substitute for good clinical management practices, nor does its operation create decisions or treatment pathways.

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US-RC42-210039 v1.0 09/21

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