

## Evidence Series: Study

Automated Remote  
Monitoring for  
Peritoneal Dialysis  
and its impact on  
Blood Pressure

*Hasan Haci Yeter,  
Omer Faruk Akcay,  
Claudio Ronco, Ulver Derici*

## BACKGROUND

- The adherence of PD patients to their treatment cannot always be monitored by physicians.
- Remote monitoring automated peritoneal dialysis (RM-APD) can affect patients' compliance with treatment and, thus, clinical outcomes.
- Remote monitoring technology integrated into APD systems makes it possible 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 access program.

## ENDPOINTS

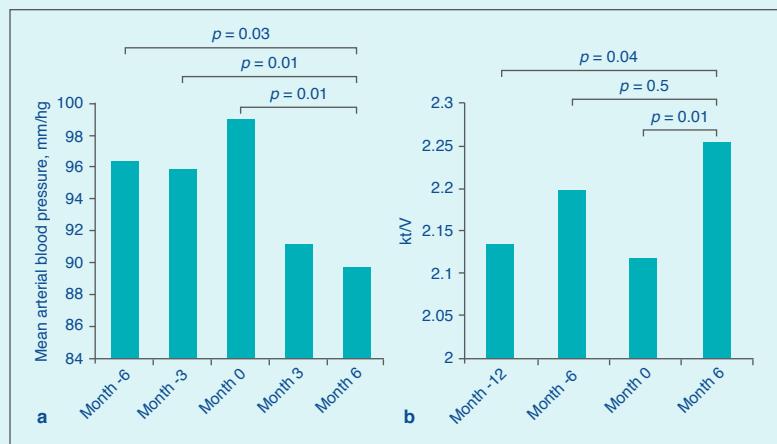
- Treatment adherence
- Dialysis adequacy
- Change in blood pressure control
- Sleep quality
- Health-related quality of life

## METHODS

- Observational study
- 15 patients all treated with traditional APD using the Claria Cycler were switched to RM-APD (Claria with the Sharesource platform) and followed for a 6-month period.
- Patient data was 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
  4. blood pressure – recorded before the switch to RM-APD and then on a daily basis after the switch. Mean arterial blood pressure (MAB) was calculated for all patients every month and drug dose adjustment was performed.
  5. body weight
- The medical outcome survey short form 36 (SF-36) was used to measure of health status and health-related quality of life at the beginning of RM-APD and at 6 months of follow-up.
- The Pittsburgh Sleep Quality Index (PSQI) questionnaire was used to assess patients' sleep dysfunction at the beginning of RM-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
- The adequacy of dialysis was determined by measuring the total weekly creatinine clearance, normalized to  $1.73 \text{ m}^2$  of the body surface area and total weekly urea clearance (Kt/V)

# RESULTS

- Statistically significant decrease in MAB ( $99 \pm 19$  vs.  $89 \pm 11$  mm Hg,  $p = 0.01$ )
- MAB in the sixth month of the RM-APD switch was significantly lower when compared to baseline, and 3, 6 months before the device switch ( $p = 0.01$ ,  $p = 0.01$ , and  $p = 0.03$ , respectively)
- Considerable increase in Kt/V in the sixth month after the RM-APD switch ( $2.11 \pm 0.4$  vs.  $2.25 \pm 0.5$ ).



**Figure 1.** 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 (RM-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 RM-APD.

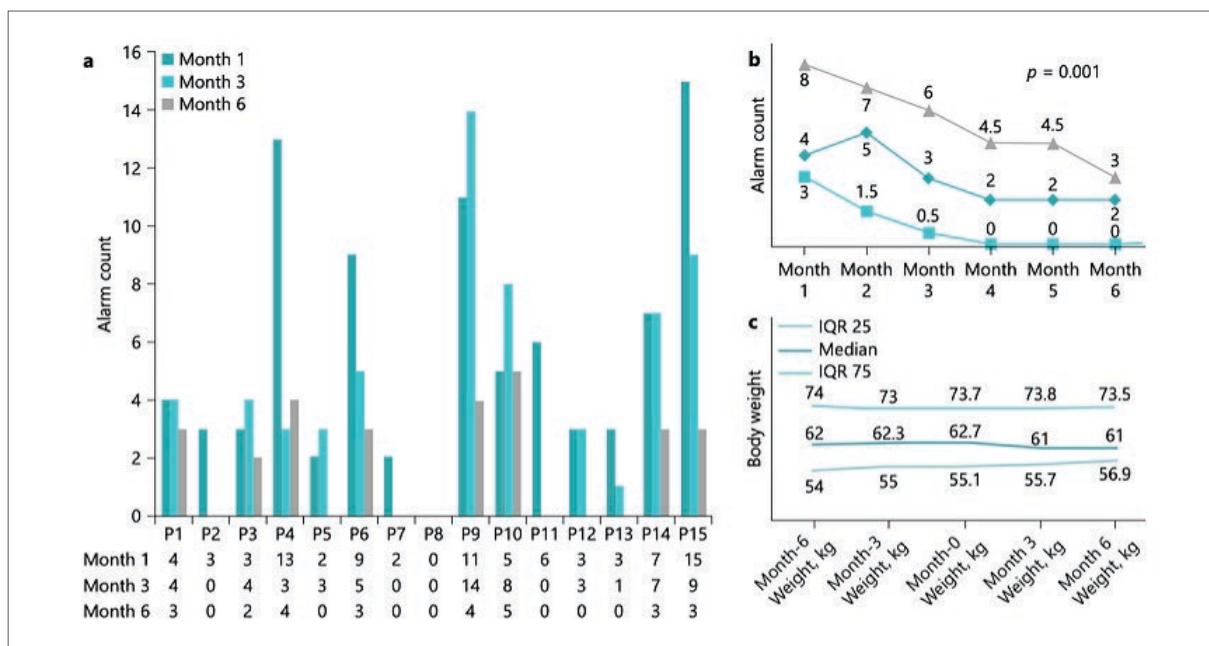
**Table 1.** Treatment and medical evaluation before and after RM-APD

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

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

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

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



**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 RM-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.

Sharesource is associated with APD patients achieving significantly greater blood pressure control compared to APD alone

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

APD with Sharesource is associated with significant increase in ultrafiltration

## CONCLUSIONS

- Long-term treatment adherence is an important problem in patients undergoing PD.
- Treatment non-adherence causes a decrease in dialysis efficiency and ultrafiltration and an increase in blood pressure, increasing pill burden
- With RM-APD, remote control 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

For safe and proper use if products mentioned herein refer to the operator manual

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