Use of Sharesource in Remote Patient Management in Peritoneal Dialysis: A Canadian Nurse's Perspective

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Abstract

Remote patient management (RPM) via 2-way connectivity addresses many challenges that the peritoneal dialysis (PD) renal care team faces when treating home dialysis patients. It addresses psychological barriers and social determinants of health by permitting self-care, increased independence, and enabling patients to remain in their community. RPM lends opportunities for patient's empowerment in self-care and treatment decisions. AMIA cyclers with remote monitoring, step-by-step voice guidance, and graphic interface all contribute to patient engagement and empowerment in the Canadian home dialysis setting. **Objectives:** To describe a series of unique patient cases in the realm of PD and how adopting new technology has enabled patients and clinicians to rise above challenging circumstances to optimize home dialysis, especially in patients living in remote communities. **Methods:** With the introduction of RPM at Seven Oaks Hospital in Winnipeg, MB, nurses have tracked and documented examples of success on home dialysis. Despite obstacles, patients embraced self-care in the home setting with increased confidence. **Results:** Included are patients who were provided support to perform reliable home dialysis with AMIA cycler with Sharesource that offers voice guidance, graphic interface, and 2-way connectivity. Patients overcame the challenges of self-care in a remote setting with physical impairments, as well as enhanced acceptance of home dialysis. The utilization of RPM by the care team promoted patient independence and confidence in performing therapy at home. **Conclusions:** Our experience with this technology demonstrates an increase in patient confidence in training and RPM of home dialysis. We have provided specific case examples of patient engagement and empowerment leading to improved self-care. New technology can address psychological barriers and social determinants of health in home dialysis patients.

Background

The province of Manitoba has the highest rate of diabetes in Canada, twice the Canadian average, which contributes to the high rate of kidney disease. The Canadian Institute for Health Information published a report with statistics from the Canadian Organ Replacement Register in December 2017, reporting data from 2007 to 2016 on the state of organ transplants and the rate of kidney failure across Canada (excluding Quebec). According to the report Manitoba, is leading the country in the rates of prevalent end-stage kidney disease with 1,681.9 rate per million population, while the Canadian average is 1,346 rate per million population [1, 2]. Currently, we have more than 1,700 patients on various dialysis modalities.

Seven Oaks General Hospital is under the umbrella of the Manitoba Renal Program. We serve a large geographical area with more than 46 percent of our peritoneal dialysis (PD) population living in rural Manitoba. There are 2 PD units in southeastern Manitoba, both located in Winnipeg. As of October 5, 2018, St. Boniface General Hospital had 173 PD patients, while Seven Oaks General Hospital had 122 PD patients. Providing patient care in this type of setting without remote patient management (RPM) has its challenges such as language and physical barriers which make training and troubleshooting challenging. Patients living in remote communities do not have access to assisted PD. Assisted PD is only offered within Winnipeg city limits, whereby a nurse assists the patient to set up their cyclor, fluid assessments, changing cyclor programs as needed, ordering supplies, and choosing the Dianeal strengths for treatment. Rural, remote patients who require assistance must rely on family or friends for therapy support. Without this support, they may not have the option of choosing PD.

Additional nursing time is spent gathering information and following up with training. Troubleshooting over the phone with limited information can be very time consuming and challenging.

The PD unit at Seven Oaks General Hospital implemented the AMIA with Sharesource technology in October 2017. We were one of the first programs in Canada, and the first in the province of Manitoba to use this new innovative technology. The nurses in our clinic were excited about this implementation and the resultant significant benefits to our patient population. The technology enables “2-way, web-based connectivity” between the patient and the clinic. The RPM software allows the care team to view a patient’s daily treatment data directly from the clinic. It is usually available within 24 h after the treatment is completed. The software has “flag alerts” that can be set up by the clinic to alert the team when deviations from the prescribed program occur and allow remote programming of the cyclor to make any prescription adjustments. Envisioned

was a broader selection of PD candidates, although we were apprehensive about how this new technology was going to impact our clinic flow and our work load.

At Seven Oaks General Hospital PD unit, we have an excellent team, where we support each other through the learning processes. We started with identifying a Sharesource administrator and super user. Then we established and maintained consistent communication between staff members and the Baxter clinical consultants. One nurse was assigned to check Sharesource daily and this responsibility was rotated between all the PD nurses to enhance their experience and comfort levels. Frequent discussions were held regarding the treatment data being viewed, and whether an intervention was needed. In the beginning we chose not to set flags as we wanted to have the experience reviewing every treatment summary of all the patients on Sharesource. We discovered early on that it was important not to react to one abnormality; instead to take trending data into consideration to make relevant decisions around patient care.

As with any new technology or program change, there was a considerable initial investment of time. It took time for the nurses to learn how to use Sharesource and become confident and comfortable reading the treatment data, especially understanding when to intervene as it is important not to intervene too quickly on the things that are in the patients' control. Patients are taught to assess their fluid status based on their weight, blood pressure, and signs of edema and how they feel. They are then instructed how to choose the appropriate program to correct fluid overload and dehydration. Though Sharesource provides us access to the patient's treatment data, it is important to empower the patient by allowing them to assess themselves and make decisions to enhance their independence.

Our patients are taught that Sharesource is a tool to help troubleshoot if problems arise, but they should not rely on the nurses initiating communication. If they have any questions or concerns they are encouraged to initiate the contact with the PD unit for advice.

Case Study 1: Blind Patient Trained on the AMIA with Sharesource (December 2017)

Jeremy is a 45-year-old Indigenous living in a remote community with a history of diabetes and macular degenerative eye disease. With limited vision he started PD in 2015 on twin bag exchanges. In June 2016, he had a sudden loss of 99% of his vision. He and his family were unsuccessful training on the HOMECHOICE cyclor. Jeremy's PD regime was 5 2,500 mL twin bag exchanges per day and though he had expressed feeling burdened doing 5 exchanges per day he continued doing PD. He had a borderline Kt/v clearance and was encouraged to con-

sider hemodialysis. Jeremy did not want to relocate to Winnipeg as being blind he felt his safety would be jeopardized living in a city. He was familiar with the layout of his house and lives alone independently with his family living nearby.

When the AMIA with Sharesource was introduced, Jeremy was the first person that came to mind. Knowing how he was struggling on PD, and that the discussion was to convert him to hemodialysis. It was exciting to consider that with this new innovative technology, along with his motivation, it could have such a positive impact on the quality of Jeremys' life. This new cyclor with Sharesource allowed the potential to broaden the patient selection for PD therapy to include those who otherwise may not have been considered for this modality.

Sharesource gave us the confidence to consider training this blind patient on the AMIA. The reassurance that his treatments could be seen remotely was a big factor in considering this option for Jeremy. The PD program did not provide home visits and troubleshooting remotely would be timely. Having the knowledge that treatments are completed daily without any issues alleviated some of the concerns when taking on this responsibility.

During training some of Jeremys' comments were: "I can finally get my life back," "this has already started to lift my depression," "this will be a definite break in my day. When one twin bag runs into the other it is difficult to tell when it is day and when it is night" [3].

The training was accomplished in 3 days! Jeremy has been successfully dialyzing on the AMIA with Sharesource since December 2017. Being able to assist people to achieve their goal of independence is extremely rewarding. Embracing and utilizing this new innovative technology, RPM, enables patients to stay in their homes and communities.

A few months after Jeremy was dialyzing on the AMIA, he was interviewed by the Canadian Broadcasting Corporation, Aboriginal Peoples Television Network, and he was also featured in a video which can be seen on Kidneycampus.ca. This video clearly expresses the impact RPM has had on him. One of Jeremy's statements from the video was "it's almost as if I were in their care in the clinic with them monitoring me, but I'm here at home. So we have that constant communication, that's very comforting" [4].

Sharesource after 6 Months

We identified saving time on programming. It is quicker to "tweak" programs and make adjustments. We have adjusted drain times, UF goals, Dianeal strengths, and added last extra drain option to optimize dialysis.

There is an overall decrease in training time. It is no longer necessary to teach patients how to program the cyclor; they only need to be taught how to accept program changes sent to them through Sharesource by the clinician. Patients no

longer need to memorize steps to set up the cyclor, as there are step-by-step voice commands that assist with set up. This feature can positively support the potential patients who struggle with short-term memory. Patients, who may not have been candidates for PD with the previous cyclors, may have better success managing their therapy with the AMIA and Sharesource.

With remote access to current data troubleshooting is easier. There is no need for patients' to explain the alarms/alerts, as this is readily available on Sharesource, and can be accessed on the internet with any computer. Ability to view 7 days of data on one page (patient snapshot) makes trending data more convenient. Printing and sharing this report with the team at the patient's clinic visit helps facilitate changes to their prescriptions and ensures they are on track.

There is less nursing time spent on the phone gathering information from the patient and following up with training. Prior to AMIA, the patients were asked to record their weight, blood pressure, pulse, and the Dianeal strength used each day in a log book. The cyclor now asks the patient to input their vital signs during every treatment. The Dianeal strengths are preprogrammed by the clinician, and are visible on every treatment summary along with all the objective data.

Patients express a sense of security and reassurance that they are being monitored and their needs are being addressed in a timely manner [5].

Sharesource after 1 Year

The next section includes treatment scenarios of patients who were provided support to perform home PD with a cyclor offering voice guidance, a graphic interface, and 2-way connectivity (RPM). All patients presented with similar treatment flags, lost dwell time, stemming from various root causes. With prompt troubleshooting support and patient education, further potential treatment complications were avoided! The patients were able to overcome the challenges of self-care in a remote setting, and gain further understanding of their therapy, thereby increasing acceptance of home dialysis. The utilization of RPM by the care team promoted patient confidence, independence, and facilitated the optimization of PD therapy as a whole.

In the past lost dwell time was often considered to be related to constipation or possible catheter malfunction. Without RPM, some other interesting causes of lost dwell time may not have been diagnosed. With Sharesource 2-way connectivity platform, it was easily and accurately diagnosed having objective data to refer to. With cycle by cycle visibility, clinicians are able to confidently explain to their patients what is happening during their PD treatment, and therefore make the patient feel more comfortable with their therapy [6].

Flag Symbol	Flag Description	
I	Lost Dwell Time: 227 minutes	

Prescribed Device Program		Actual Treatment Time	
Program Name	daily	Date	19 June 2018
Therapy Type	Time-Based APD	Start Time	03:37
Night Therapy Time	09 Hours 00 Minutes	Night Therapy Time	09 Hours 23 Minutes

Drugs	Applied	Data Type	Pre-Treatment	Post-Treatment
ESA	Not Surveyed	Weight	Not Surveyed	86.8 kg
Antibiotics	Not Surveyed	Blood Pressure	Not Surveyed	145/79 mmHg
Heparin	Not Surveyed	Pulse	Not Surveyed	94 beats/min
Vitamin D	Not Surveyed	Blood Glucose	Not Surveyed	Not Surveyed
		Temperature	Not Surveyed	Not Surveyed

Actual PD Solutions			Day Therapy UF	
Red Line	Dianeal PD-4, 2.50%	5,000 mL	Manual Exchange UF	---
White 1 Line	Dianeal PD-4, 2.50%	5,000 mL	Initial Drain UF	745 mL
White 2 Line	Dianeal PD-4, 2.50%	5,000 mL	Recovered Initial Drain UF	---
Blue Line	Extraneal, 7.50%	2,500 mL	Day Cycle UF	---
Solution Total	---	17,500 mL	Total Day UF	745 mL

Device Data		Night Therapy UF	
Device ID	27090118	Night Cycle UF	266 mL
Device Software Version	2.4.5-1	Recovered Last Drain UF	---
		Total Night UF	266 mL

Total Therapy UF	
Total UF	1,011 mL

Fig. 1. Case study 2: Sharesource treatment summary. Yellow flag, lost dwell time 227 min [7].

Case Study 2

A young man presented with Type 1 diabetes mellitus, a history of diabetic foot ulcer, hyperlipidemia, and hypertension. He is legally blind due to severe retinopathy; however, he is able to see PD connections. He lives in a rural area (1 h away from PD clinic) and struggles financially. In 2018, he started PD with the support of his family. The first month of continuous ambulatory PD (CAPD)

Fig. 2. Case study 2: Sharesource treatment summary indicating increased fill time on each cycle [7].

went well, then for several days it was difficult to contact the patient. He eventually contacted the clinic and it was determined that his family was under a high degree of stress. He was coping fairly well, but was encouraged to reach out to our staff for support. A consult to psychiatry was initiated and cycler training was booked.

In light of the patient's lack of contact while on CAPD, we chose to utilize the AMIA with Sharesource. Having RPM of his daily treatments, the staff were reassured that he was completing his PD therapy on a regular basis.

Fig. 3. Case study 2: Sharesource treatment summary, numerous heater slow flow alerts [7].

In the following treatment summary (Fig. 1), the yellow flag indicates a lost dwell time of 227 min. What is the root cause of the lost dwell?

At a glance the cycle profiles in Figure 2 indicate a problem with the fills. Further review of the cycle by cycle data indicates increased fill times on every cycle. Drain times appear normal. An average fill time is 10 min and an average drain time is 20 min.

Looking further into the treatment summary, the Event Description log (Fig. 3) shows numerous Heater Slow Flow alerts. A kink in the tubing at the heater line guide is a possible cause.

In case study 2, the patient called the PD unit concerned about the lost dwell time and numerous alerts. The clinician logged into Sharesource at the clinic and reviewed the treatment summary data. It was noted that the lost dwell time

was due to an increased fill time. Numerous Heater Slow Flow alerts were noted, possibly due to a kink in the tubing at the heater line guide. This patient had been on the cyclor for 3 weeks at this point. Set up retraining was completed over the phone to correct the lost dwell.

Without RPM, the assumption might have been that the patient was having problems draining. Remote access to accurate, current data enabled pinpointing the root cause and promptly assisting the patient to correct the problem with set up retraining over the phone. A trip to the clinic was eliminated, the patient's confidence was increased, laxatives and unnecessary diagnostics were avoided, thereby being cost effective for both the patient and the healthcare system.

In this scenario, the patient's concerns were validated and positive feedback was given for initiating the phone call to PD unit. This situation provided an opportunity to reinforce previous teaching, provide emotional support, and maintain therapeutic relationship with patient.

Case Study 3

A 70-year-old presented with a history of diabetic nephropathy, type II diabetes, hypertension, and dyslipidemia. She started CAPD in January 2018 and was converted to cyclor in February 2018. Communication was difficult at times as

Flag Symbol		Flag Description		
!		Lost Dwell Time: 79 minutes		
!		Weight Not Within Target Range		

Prescribed Device Program		Actual Treatment Time		
Program Name	Daily	Date	18 April 2018	
Therapy Type	Time-Based APD	Start Time	22:54	
Night Therapy Time	09 Hours 00 Minutes	Night Therapy Time	09 Hours 00 Minutes	
Drugs	Applied	Data Type	Pre-Treatment	Post-Treatment
ESA	Not Surveyed	Weight	Not Surveyed	73.0 kg
Antibiotics	Not Surveyed	Blood Pressure	122/64 mmHg	Not Surveyed
Heparin	Not Surveyed	Pulse	81 beats/min	Not Surveyed
Vitamin D	Not Surveyed	Blood Glucose	Not Surveyed	Not Surveyed
		Temperature	Not Surveyed	Not Surveyed
Actual PD Solutions			Day Therapy UF	

Fig. 4. Case study 3: Sharesource treatment report, yellow flags, lost dwell time: 79 min and weight not within target range [7].

Therapy Details							
Time Stamp (HH:MM:SS)	Cycle	Fill Volume (mL)	Fill Time (H:MM)	Dwell Time (H:MM)	Drain Time (H:MM)	Drain Volume (mL)	UF/Cycle (mL)
22:54:46	Initial Drain	---	---	---	0:16	2,127	127
23:10:49	Night Cycle 1	2,200	0:10	1:12	0:28	2,448	248
01:01:04	Night Cycle 2	2,200	0:11	0:57	0:16	2,134	-66
02:24:10	Night Cycle 3	2,200	1:41	0:49	0:17	1,741	-459
05:10:18	Night Cycle 4	2,201	0:10	0:44	0:18	2,841	640
06:22:14	Night Cycle 5	2,199	0:10	0:56	0:16	2,317	118
07:43:57	Last Fill	2,000	0:11	---	---	---	---
Cycler Total	---	13,000	2:33	4:38	1:51	13,608	608

SEVEN OAKS GENERAL HOSPITAL: Amia Treatment Summary Report

Fig. 5. Case study 3: Sharesource treatment report one cycle with an increased fill time of 1 h and 41 min [7].

English was her second language. AMIA with Sharesource was chosen! The patient had a history of frequent constipation, did not like to take laxatives and often did not have a bowel movement for 2–3 days. She required reminding to take laxatives as frequent slow flow alerts were seen on Sharesource data.

The patient's treatment summary (Fig. 4) had yellow flags indicating a lost dwell time of 79 min and weight not within the target range. In this case, due to the patient's history, constipation may be the first thing that comes to mind as being the root cause. Further review of the treatment summary data will reveal the root cause.

Reviewing the cycle by cycle data (Fig. 5) indicates one abnormal fill time of 1:41 min. Cycle profiles indicate a pause in treatment after cycle 2. What is the root cause? One question might be; did the patient pause their treatment?

SEVEN OAKS GENERAL HOSPITAL: Amia Treatment Summary Report	
Deviations	
Lost Dwell	
Time Stamp (HH:MM:SS)	Event Description
00:47:27	Patient Slow Flow (30232)
00:49:38	Inadequate Drain Volume (30543)
00:53:29	Patient Slow Flow (30232)
02:54:10	AC Power Failure (30503)
03:24:42	AC Power Failure (30503)

Fig. 6. Case study 3: Sharesource treatment report event description indicating AC Power Failure [7].

In case study 3, the lost dwell was due to a power failure shown in the Event Description log (Fig. 6). The cyclor resumed treatment when the power was restored. Patient had initiated communication with the PD unit concerned about the lost dwell time. Having this objective data took guessing out of the equation; the root cause was quickly and accurately identified. Discussion with the patient confirmed that the power failure was due to a storm and the patient was given reassurance that continuing her therapy was her best option. Anxiety was reduced and her confidence increased.

It cannot be stressed enough not to make assumptions that it is the same issues that patient struggled with in the past. Alerts may stem from various root causes and Sharesource data allows for “zoning in” and accurately assessing and identifying the root cause.

Case Study 4

A 38-year-old Caucasian with a history of hypertension was on the cyclor for approximately 3 weeks. Yellow flags, one indicating 9 events and the other indicating 86 min of lost dwell time (Fig. 7) was observed. What is the root cause of the lost dwell?

In Figure 8, the cycle profiles indicate poor drains. A negative ultrafiltration (UF) on cycle 2 and cycle 5 the last drain.

Event Description log (Fig. 9) shows numerous Patient Slow Flow alerts and Inadequate Drain Volume alerts. The question to ask is: Is it catheter malfunction or constipation? This patient lives in a remote community and to eliminate

Flag Symbol	Flag Description	
1	Events During Treatment: 9	
1	Lost Dwell Time: 86 minutes	

Prescribed Device Program		Actual Treatment Time	
Program Name	daily	Date	15 February 2018
Therapy Type	Time-Based APD	Start Time	22:04
Night Therapy Time	09 Hours 00 Minutes	Night Therapy Time	09 Hours 00 Minutes

Drugs	Applied	Data Type	Pre-Treatment	Post-Treatment
ESA	Not Surveyed	Weight	85.0 kg	Not Surveyed
Antibiotics	Not Surveyed	Blood Pressure	147/74 mmHg	Not Surveyed
Heparin	Not Surveyed	Pulse	56 beats/min	Not Surveyed
Vitamin D	Not Surveyed	Blood Glucose	Not Surveyed	Not Surveyed
		Temperature	Not Surveyed	Not Surveyed

Actual PD Solutions			Day Therapy UF	
Red Line	Dianeal PD-4, 2.50%	5,000 mL	Manual Exchange UF	---
White 1 Line	Dianeal PD-4, 2.50%	5,000 mL	Initial Drain UF	482 mL
White 2 Line	Dianeal PD-4, 2.50%	3,000 mL	Recovered Initial Drain UF	---
Blue Line	Extraneal, 7.50%	2,500 mL	Day Cycle UF	---
Solution Total	---	15,500 mL	Total Day UF	482 mL

Device Data		Night Therapy UF	
Device ID	27070023	Night Cycle UF	0 mL
Device Software Version	2.4.5-1	Recovered Last Drain UF	---
		Total Night UF	0 mL

Total Therapy UF	
Total UF	482 mL

Fig. 7. Case study 4: Sharesource treatment summary indicating 9 events during treatment and lost dwell time of 86 min [7].

X-rays and a potential unnecessary trip to Winnipeg; the decision was to rule out constipation first. Instructions were given to take laxatives aggressively for 2 days.

Figure 10 depicts the cycle profiles after the laxatives were taken. The root cause was determined to be constipation and hence there was no need for further testing. The patient was encouraged to continue regular use of laxatives.

Also shown in Figure 8 is the patient's poor last drain with a negative UF. Previous treatment summaries were reviewed and they revealed several treatments

Fig. 8. Case study 4: Sharesource treatment summary depicting poor drains and a negative UF on night cycle 2 and 5 (last drain) [7]. UF, ultrafiltration.

with negative UF on cycle 5. To correct the inadequate last drain, the Extra Last Drain Mode with a UF limit of 85% was chosen. One treatment summary, the Extra Last Drain Mode was activated and the patient sat up to continue draining; he drained a total of 721 mL on his last drain, thereby optimizing his dialysis. This option would be similar to the last manual drain on the HOMECHOICE cycler; not a common practice in our program. Having the data visible and the ease of program adjustments made utilizing the available option of the Extra Last Drain Mode convenient, benefited the patients' dialysis therapy.

Time Stamp (HH:MM:SS)	Event Description
01:33:08	Patient Slow Flow (30232)
01:35:14	Inadequate Drain Volume (30543)
01:39:14	Patient Slow Flow (30232)
01:44:45	Patient Slow Flow (30232)
01:46:55	Inadequate Drain Volume (30543)
01:51:08	Patient Slow Flow (30232)
01:53:34	Inadequate Drain Volume (30543)
02:54:21	Patient Slow Flow (30232)
02:56:31	Inadequate Drain Volume (30543)
03:08:37	Patient Slow Flow (30232)
03:11:01	Inadequate Drain Volume (30543)
03:15:53	Patient Slow Flow (30232)
04:47:42	Patient Slow Flow (30232)
04:49:49	Inadequate Drain Volume (30543)
06:24:46	Patient Slow Flow (30232)
06:27:07	Patient Slow Flow (30233)
06:37:06	Patient Slow Flow (30232)
06:39:10	Patient Slow Flow (30233)
06:46:37	Patient Slow Flow (30232)
06:48:51	Patient Slow Flow (30233)

To mark this treatment as reviewed click the Treatment Reviewed button on the right.

Treatment Reviewed

Fig. 9. Case study 4: Final section of Sharesource treatment summary, event description lists numerous patient slow flow, and inadequate drain volume alerts [7].

Conclusion

Our local experience utilizing RPM technology demonstrates a significant opportunity to engage in an “open” dialogue with patients as there is increased visibility of therapy efficiency. Specific treatment scenarios have been discussed that depict how RPM facilitates early intervention and potential complication avoidance.

Our experience utilizing RPM technology demonstrates that proactive patient support and prompt troubleshooting using RPM assists in efficient dialysis, avoids unscheduled clinic visits, unnecessary diagnostic testing, and medications. Without these interventions, increased therapy burden, dialysis complications, and decreased confidence could be risk factors. Access to timely Sharesource data to clinicians allows early clinical interventions to address identified treatment challenges, enhances education, and enables rapid pinpointing to the root cause and “zoning-in” on the issue at hand, thereby optimizing the patient’s dialysis experience.

Therapy Details							
Time Stamp (HH:MM:SS)	Cycle	Fill Volume (mL)	Fill Time (H:MM)	Dwell Time (H:MM)	Drain Time (H:MM)	Drain Volume (mL)	UF/Cycle (mL)
01:20:54	Initial Drain	---	---	---	0:17	1,992	-8
01:38:04	Night Cycle 1	2,399	0:14	1:04	0:20	2,959	560
03:16:46	Night Cycle 2	2,401	0:14	1:12	0:23	3,168	767
05:04:24	Night Cycle 3	2,400	0:13	1:11	0:18	2,483	83
06:46:37	Night Cycle 4	2,399	0:14	1:09	0:20	2,522	123
08:29:44	Night Cycle 5	2,400	0:13	1:10	0:19	2,641	241
10:11:50	Last Fill	2,000	0:14	---	---	---	---
Cycler Total	---	13,999	1:22	5:46	1:57	15,765	1,766

Cycle profiles

Fig. 10. Case study 4: Sharesource treatment summary, cycle profiles after laxatives [7].

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