


Barriers to Peritoneal Dialysis in Saskatchewan Canada: Results From a Province-Wide Survey

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Bhanu Prasad¹ , Maryam Jafari² , Sachin Shah³ ,
Connie McNaught⁴, and Lucas Diebel⁵

Abstract

Background: Peritoneal dialysis (PD) is an underutilized, therapeutic option to in-center hemodialysis (HD), given its similar survival and clinical efficacy but provides lifestyle benefits and cost savings. Despite these advantages, PD prevalence rates remains below 20% in many Canadian jurisdictions.

Objectives: The primary objective of this study was to identify and assess patient-perceived barriers to PD implementation in Saskatchewan. The secondary objectives were to examine variations in patient-perceived barriers to PD by dialysis units (main dialysis units vs satellite dialysis units) and specific challenges faced by First Nation patients residing on reserves.

Design: A cross-sectional observational survey study.

Setting: Two major centers (Regina and Saskatoon) and 5 associated satellite units attached to each center across the province of Saskatchewan.

Patients: We approached all prevalent in-center HD patients across Saskatchewan, 366 (49%) agreed to participate in the study.

Measurements: Self-reported barriers to PD were assessed using a 26-question survey which was created after engagement of our multidisciplinary team.

Methods: We conducted a cross-sectional survey of 740 prevalent in-center HD patients within the province of Saskatchewan, Canada, from June 2018 to January 2019. Around 366 (49%) patients agreed to participate in the study. The questionnaire was designed to capture patients' perceived barriers to PD. Descriptive statistics were used to present the data. Chi-square and Mann-Whitney *U*-test were used to compare the patients' responses (main dialysis units vs satellite dialysis units, and First Nation reserves vs nonreserves).

Results: Of the 366 patients who completed the survey, 284 met the eligibility criteria and were included in the analysis. Patient-reported satisfaction with current in-center HD care was the most common barrier to PD uptake (92%), followed by proximity to their HD unit (61%). A lack of understanding of the benefits/risks of PD, fear of family burden (54% each), and unwillingness to dialyze daily and to learn a new technique (51% each) were additional factors. Patients residing on reserves compared to nonreserve residents felt PD had a higher risk of infection compared to HD (54% vs 34%, $P = .005$), and felt PD led to suboptimal care (47% vs 31%, $P = .021$).

Limitations: We used a nonstandardized locally derived questionnaire to quantify barriers, and this prevents inclusion of additional barriers than individual patients may consider important. Cross-sectional data can only be used as a snapshot. Only 366 patients agreed to participate, and the results cannot be generalized to 740 prevalent HD patients. We did not capture data on demographics (age, income, and literacy level), comorbidities, and dialysis vintage, which would have been helpful in interpretation of the results. We did not involve patients, carers, or patients of First Nations heritage, in the design of the survey and the study.

Conclusions: The results of our survey indicate that the major patient-reported barrier to PD uptake in our province is clinical inertia in patients defaulted to in-center HD at the onset of dialysis. Lack of patient awareness and knowledge of PD as a viable treatment modality also figured prominently, as did fears/concerns surrounding the safety, efficacy, and perceived family burden with PD compared with in-center HD.

Trial Registration: The study was not registered on a publicly accessible registry because it did not involve any health care intervention on human participants.



Abrégé

Contexte: La dialyse péritonéale (DP) constitue une alternative à l'hémodialyse (HD) en center. Les deux modalités présentent une efficacité clinique et des taux de survie comparables, mais la DP s'avère plus économique, en plus d'offrir des avantages sur la qualité de vie. Malgré cela, la DP demeure sous-utilisée avec une prévalence qui demeure sous les 20 % dans plusieurs provinces canadiennes.

Objectifs: L'objectif principal était d'identifier et d'évaluer les obstacles perçus par les patients quant à l'adoption de la DP en Saskatchewan. L'étude visait également à examiner les différences de perception selon le service de dialyse fréquenté (service de dialyse principal vs service de dialyse satellite) et les défis spécifiques aux patients autochtones résidant dans les réserves.

Type d'étude: Une étude transversale et observationnelle sous forme d'enquête.

Cadre: Deux grands centers hospitaliers (Regina et Saskatoon) et cinq services de dialyse satellites rattachés à chacun, et répartis sur le territoire de la Saskatchewan.

Sujets: Nous avons approché tous les patients saskatchewanais prévalents pour l'HD en center, et 366 (49 %) ont accepté de participer à l'étude.

Mesures: Les obstacles autodéclarés à l'adoption de la DP ont été recensés par l'entremise d'un sondage en 26 questions créé à la suite de l'engagement d'une équipe multidisciplinaire.

Méthodologie: Une enquête transversale a été menée entre juin 2018 et janvier 2019 auprès de 740 patients prévalents hémodialysés en center partout en Saskatchewan (Canada), desquels 366 (49 %) ont accepté de participer à l'étude. Le questionnaire était conçu pour saisir les obstacles à l'adoption de la DP perçus par les patients. Des statistiques descriptives ont été utilisées pour présenter les données. Le test du Chi carré et le test U de Mann-Whitney ont servi à comparer les réponses (service de dialyse principal vs service de dialyse satellite, patients autochtones résidant ou non sur une réserve).

Résultats: Parmi les 366 participants, 284 répondaient aux critères d'admissibilité et ont été inclus dans l'analyse. La satisfaction à l'égard des soins d'HD en center s'est avérée la principale raison de ne pas adopter la DP (92 %), suivie par la proximité du service de dialyse (61 %). Les autres facteurs incluaient une mauvaise compréhension des bienfaits/risques de la DP (54 %) et la crainte d'un fardeau pour la famille (54 %); ainsi que des réticences à pratiquer la dialyse quotidiennement (51 %) et à apprendre une nouvelle procédure (51 %). Enfin, la comparaison des patients autochtones résidant ou non sur une réserve a montré que les patients des réserves avaient davantage l'impression que la DP posait un risque accru d'infection (54 % vs 34 %, $P = 0,005$) et qu'elle menait à la prestation de soins sous-optimaux (47 % vs 31 %, $P = 0,021$).

Limites: Un questionnaire non standardisé et dérivé localement a été employé pour quantifier les obstacles, ce qui a empêché l'inclusion de facteurs supplémentaires qui pourraient être importants pour certains patients. Une étude transversale ne donne qu'un portrait ponctuel d'une situation. Seuls 366 patients des 740 approchés ont accepté de participer à l'étude, ce qui empêche la généralisation des résultats à l'ensemble des patients hémodialysés. Les données démographiques (âge, niveau de revenus, littéracie), les maladies concomitantes et le temps passé en dialyse n'ont pas été colligés, ces données auraient été utiles dans l'interprétation des résultats. Aucun soignant ni patient, autochtone ou allochtone, n'a participé à la conception du questionnaire et de l'étude.

Conclusion: Les résultats de cette enquête indiquent que l'inertie clinique constitue le principal obstacle au passage vers la dialyse péritonéale pour les patients saskatchewanais traités d'emblée par hémodialyse en center à l'amorce de la dialyse. D'autres facteurs occupent une place importante, soit le manque de sensibilisation auprès des patients, le manque de connaissance de la DP comme modalité viable, les craintes/inquiétudes concernant la sécurité et l'efficacité de la modalité, et la perception d'un fardeau plus lourd pour la famille que l'HD en center.

Enregistrement de l'essai: L'étude n'a pas été enregistrée dans un registre accessible au public puisqu'elle n'a impliqué aucune intervention de soins de santé sur les participants.

Keywords

barriers, end-stage renal disease, peritoneal dialysis, in-center hemodialysis

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¹Section of Nephrology, Department of Medicine, Regina General Hospital, Saskatchewan Health Authority, Regina, Canada

²Dr. T. Bhanu Prasad Medical Prof Corp, Regina, SK, Canada

³Section of Nephrology, Department of Medicine, St. Paul's Hospital, Saskatoon, SK, Canada

⁴Hemodialysis, Regina General Hospital, Saskatchewan Health Authority, Regina, Canada

⁵College of Medicine, University of Saskatchewan, Regina, Canada

Corresponding Author:

Bhanu Prasad, Section of Nephrology, Department of Medicine, Regina General Hospital, Saskatchewan Health Authority, 1440, 14th Avenue, Regina, SK, Canada S4P 0W5.

Email: bprasad@sasktel.net

What was known before

The uptake of peritoneal dialysis (PD) in Saskatchewan is identical with the national average (22%). With identifying barriers to using PD, we can better design center-specific programs to address the unique barriers to improve utilization of PD.

What this adds

Our findings add to evidence that lack of awareness and education, concerns surrounding the safety/efficacy, and concerns with family burnout (specifically in the satellite population and patients residing on reserves), will need to be addressed to exponentially increase the uptake of PD.

Introduction

In Canada and across the developed world, in-center hemodialysis (HD) is the most commonly used dialysis modality for end-stage renal disease (ESRD).¹ Studies adjusted for comorbidities have found either no mortality differences or better survival with peritoneal dialysis (PD) compared to in-center HD, particularly in the initial 2 years of starting dialysis.^{2,3} Peritoneal dialysis offers several advantages over HD, including better preservation of residual kidney function, improved hemodynamic stability, and averts the needs for vascular access.^{4,5} It has also been shown to be associated with better quality of life, permits greater autonomy, has the potential for preserving existing lifestyles, and allows increased flexibility in personal schedules.⁶

The province of Saskatchewan (SK), Canada, covers an area of 651,900 km² with a population of 1.17 million people. Dialysis care in our province follows a “hub and spoke model” with 2 major hubs (Regina and Saskatoon) and 5 satellite units attached to each hub. Patients frequently travel hundreds of kilometers to access dialysis facilities. Given the geographic isolation and the travel time required to receive dialysis care in SK, it is unfortunate that only 22.3% of our prevalent ESRD population were using PD in 2019.⁷ In addition to the clinical benefits associated with PD, it is also associated with less infrastructure costs and consequently lower taxpayer burden compared to in-center HD. A recent study suggested estimated annual maintenance expenses were \$64,124 (CAD) for in-center HD compared to \$38,658 (CAD) for PD.⁸

In spite of a plethora of benefits with PD, from a practical standpoint, the decision of choosing a home dialysis modality is dependent on demographics, accrued comorbidities, frailty, and presence of appropriate support at home, amongst other variables.⁹ As a result, many programs are actively evaluating potential barriers to home therapies. Against this background, we wished to explore patient-perceived barriers to the adoption of PD within our province. The primary objective of this study was to identify and assess prevalent

in-center HD patient-perceived barriers to PD implementation in SK. The secondary objectives were to examine variations in patient-perceived barriers to PD by dialysis units (main dialysis units vs satellite dialysis units) and specific challenges faced by First Nation patients residing on reserves.

Methods

Study Design

This study is part of a larger project where we explored patients, dialysis nurses, and nephrologists' perceptions of home dialysis (home HD and PD). We conducted a cross-sectional survey of prevalent in-center HD patients within the Saskatchewan Health Authority, across the province of SK, from June 2018 to January 2019. We used the same methodology as our recently published article on patient-perceived barriers to home HD in SK.¹⁰ All prevalent patients from 2 main “hubs” (Regina General Hospital and St Pauls' Hospital), and 10 satellite units were approached. The patient survey used in this study was created collaboratively, as part of a provincial internal quality improvement initiative. A 26-question survey was developed after collaboration with our multidisciplinary team and was designed to capture perceived barriers to PD in our prevalent in-center HD patients in SK. Patients were recruited by the study coordinators at each of the dialysis units. The surveys were anonymous, and no individual participant information was requested. Verbal consent was obtained from each participant. The study was approved by the Research Ethics Board of the former Regina Qu'Appelle Health Region (REB-18-64).

Patients

All the 740 prevalent in-center HD patients in the aforementioned dialysis units were approached by the study coordinators while waiting for their dialysis session to complete the survey. Patients who agreed to participate in this study were enrolled after providing verbal consent. Inclusion criteria were aged ≥ 18 years, receiving in-center HD for at least 3 months, and had to be able to read and understand English. Exclusion criteria included patients receiving in-center HD with acute kidney injury, hybrid therapy (concurrent PD), PD treatment in the past, and those deemed to be unsuitable for PD as per care provider. A total of 366 patients agreed to participate in this study.

Data Collection

The questionnaire included 25 questions and comprised 2 sections; the first pertained to patients' characteristics and the second to patients' perceived barriers to PD. The 26th question was open-ended and required the respondent to give his/her opinion on barriers if they had additional comments that were not covered by the questionnaire. Demographic

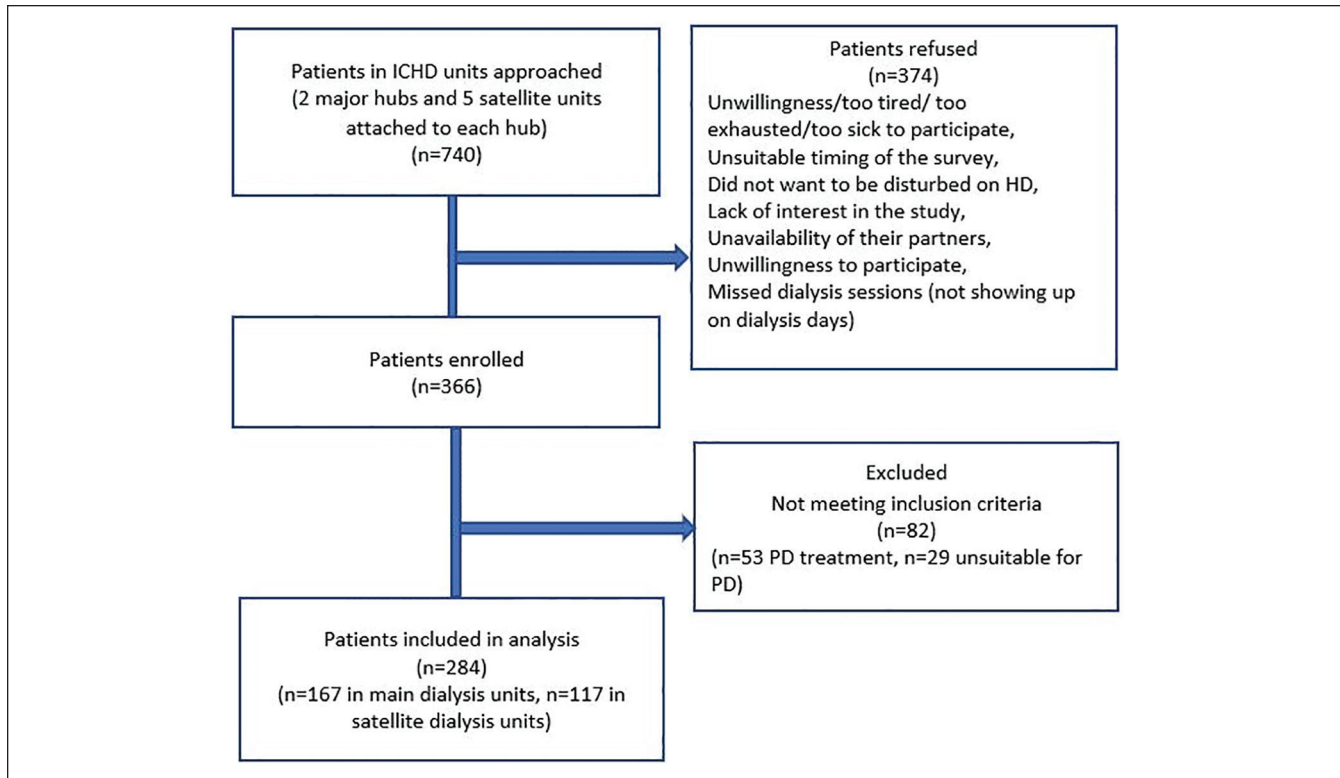


Figure 1. Study flowchart.

Note. HD = hemodialysis; PD = peritoneal dialysis.

information collected included living arrangement (town/city, First Nation reserve, farm), distance to the in-center HD (in km), resident of assisted living facility, level of education (\leq grade 12 vs $>$ grade 12) and being followed by a nephrologist ($>$ 6 months) before dialysis initiation. We did not collect any other demographic and dialysis-specific information. Questions addressing barriers to PD were categorized as knowledge deficits, accessibility, satisfaction with in-center HD units, and beliefs surrounding PD. This questionnaire contained a series of yes/no questions, along with questions rated using 5-point Likert scales with the following responses (strongly disagree, disagree, uncertain, agree and strongly agree, and not applicable; Supplemental Appendix 1).

Statistical Analysis

Descriptive statistics were used to present the data. Values were demonstrated as count (%) or median (interquartile range = IQR), as appropriate. Where the responses were scored on a 5-point Likert scale, frequency distribution of responses (strongly disagree, disagree, uncertain, agree, and strongly agree) was presented. For the 5-point Likert scale questions, the responses “agree” and “strongly agree” were merged and used in the statistical analysis. For comparison of responses between groups (main dialysis units vs satellite dialysis units, and First Nation reserves vs nonreserves) chi-square or Mann-Whitney *U*-test were used, as appropriate.

The significance level was set as $\alpha = 0.05$. Statistical analyses were performed with SPSS Statistics for Windows, version 22.0 (SPSS Inc., Chicago, IL).

Results

Patients Characteristics

Of all prevalent HD patients in the province ($n = 740$), a total of 374 refused and 366 (49%) agreed to participate in the study. The patients who refused to participate (ones who were hospitalized, recovering from recent admissions, requiring sedatives such as Gravol upon initiation of dialysis, long HD vintage [with no intent of changing] and the disengaged during dialysis). Of the 366 patients who agreed to take part in the project, 53 had prior PD treatment, and 29 had been deemed unsuitable for PD by the care provider (ie, as per response to Question 8 in the questionnaire), leaving 284 study patients (167 in main dialysis units, and 117 in the satellite dialysis units; Figure 1). The characteristics of the study patients are shown in Table 1. The majority (67%) self-reported living in a town or city, followed by First Nation reserve (22%) and farm (11%) (Table 1). Patient barriers to PD are shown in Table 2 and Figure 2.

Satisfaction with current in-center HD care was the most frequently reported barrier to PD (92%), followed by proximity to the in-center HD unit (61%), lack of understanding

Table 1. Patients Characteristics.

Patients characteristics	Total, <i>n</i> = 284	Main dialysis units, <i>n</i> = 167	Satellite dialysis units, <i>n</i> = 117	Main vs satellite dialysis units
	<i>n</i> (%), Median (IQR)	<i>n</i> (%), Median (IQR)	<i>n</i> (%), Median (IQR)	<i>P</i> value
Living location				<.001
Town/city	180/267 (67.4%)	120/151 (79.5%)	60/116 (51.7%)	
First Nation reserve	58/267 (21.7%)	25/151 (16.6%)	33/116 (28.4%)	
Farm	29/267 (10.9%)	6/151 (4%)	23/116 (19.8%)	
Distance of home to in-center hemodialysis (km)	<i>n</i> = 276, 10 (5-69.75)	<i>n</i> = 159, 10 (5-60)	<i>n</i> = 117, 20 (5-100)	.022
Resident of assisted living facility	59/284 (20.8%)	17/167 (10.2%)	42/117 (35.9%)	<.001
>Grade 12 education	107/284 (37.7%)	64/167 (38.3%)	43/117 (36.8%)	.072
> 6 months being under care of a nephrologist prior to starting dialysis	154/281 (54.8%)	103/164 (62.8%)	51/117 (43.6%)	.001

Note. IQR = interquartile range.

of the benefits and risks of PD (54%), a fear of imposing additional burden on the family (53%), disinclination to dialyze daily, and reluctance to learn a new technique (51% each). About 48% stated they would be unwilling to take “their disease home,” and 42% considered lack of space as a barrier to PD. About 39% of participants were never offered this modality by the medical care team. Other frequently reported barriers to PD uptake included concerns around body image (37%), misconceptions about PD (higher risk of infection and inadequate treatment compared to HD; 38 and 34%, respectively). About 29% of in-center HD patients did not choose PD because they lived alone and feared they would be unable to cope. About 29% of respondents believed that their physician should choose their modality (Table 2).

Patients Perspectives Toward PD in Main vs Satellite Dialysis Units

More patients in the satellite dialysis units, in contrast to the main units, were aware of PD as a treatment option (85% vs 73%, $P = .02$). Satellite patients were less likely to want to learn a new technique (67% vs 39%, $P < .001$), were more likely to fear that PD would be an additional burden to the family (67% vs 40%, $P < .001$), and felt that PD delivered suboptimal care (49% vs 23%, $P < .001$). Satellite patients were more likely to feel that their health care providers should determine treatment modality (44% vs 18%, $P < .001$), and were less likely to attend renal replacement therapy (RRT) class compared to patients from the main dialysis units (25% vs 47%, $P < .001$). Fewer satellite patients recalled being offered PD as an option (28% vs 46%, $P = .003$). Similarly, more satellite patients felt they had little to no understanding of the benefits and risks of PD (64% vs 47%, $P = .005$; Table 2). In contrast to the satellite units, patients in the main unit were more likely to choose HD as

their treatment modality because they did not want to “take their disease home with them” (58% vs 34%, $P < .001$), felt that they had smaller homes with space constraints (56% vs 23%, $P < .001$), and lived in close proximity to their dialysis center (67% vs 53%, $P < .015$, Table 2).

Given that proportion of participants living in assisted living was much higher in the satellite units compared with main units, sensitivity analysis (chi-square or Mann-Whitney U -test) was performed with exclusion of assisted living to determine if differences between main and satellite units remain significant. The findings remained unchanged following the exclusion of participants in assisted living facilities except one question (I was not offered PD as an option by my care provider). Similar proportion of satellite patients (29.7%) and urban patients (40.8%) were not offered PD by the care provider ($P = .108$; Supplemental Tables 1 and 2).

Patients Perspectives Toward PD in Reserves vs Nonreserves

More patients residing on First Nation reserves felt PD led to additional burden on the family (70% vs 47%, $P = .002$), had concerns about body image (58% vs 31%, $P < .001$), and felt that lack of space at home were major barriers to PD uptake (54% vs 37%, $P = .023$). Similarly, more patients residing on reserves felt PD would carry a higher risk of infection compared to HD (54% vs 34%, $P = .005$), PD led to suboptimal care (47% vs 31%, $P = .021$), and that their health care providers should determine treatment modality (44% vs 26%, $P = .010$). Fewer patients on reserves had attended RRT class prior to starting dialysis (24% vs 41%, $P = .031$). In contrast, most nonreserve residents considered the close proximity to the dialysis unit as a barrier to uptake PD (76% vs 5%, $0 < .001$; Table 3). The median (IQR) distance of the home to in-center HD unit for patients residing

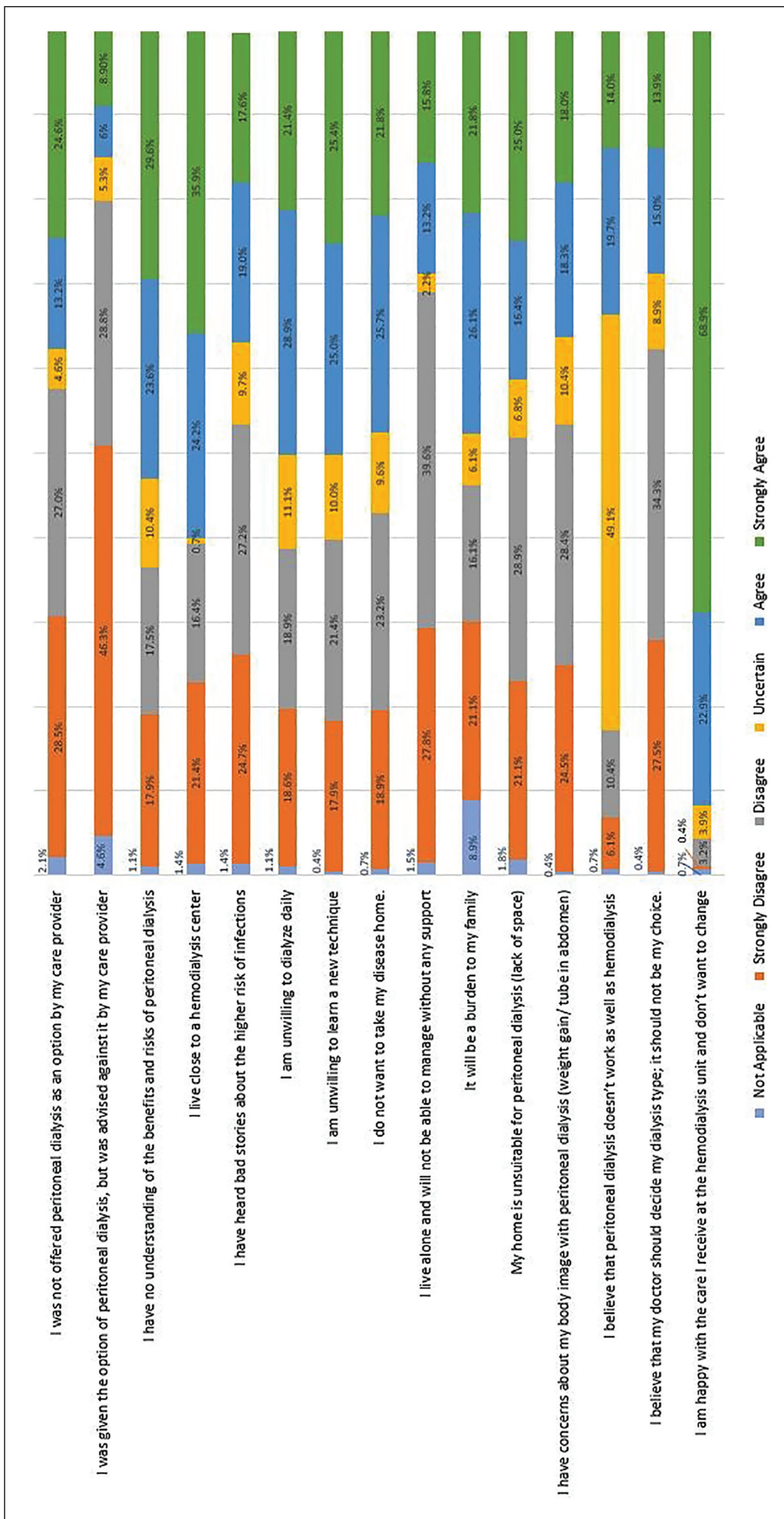


Figure 2. Patients' perceptions and perceived barriers to peritoneal dialysis (responses on a 5-point Likert scale).

Table 2. Perceptions and Perceived Barriers to Peritoneal Dialysis.

Perceptions and perceived barriers to peritoneal dialysis	Total, n = 284	Main dialysis units, n = 167	Satellite dialysis units, n = 117	Main vs satellite dialysis units
	n (%) ^a	n (%) ^a	n (%) ^a	P value
PD Awareness				
I am aware of PD as treatment option	221/284 (77.8%)	122/167 (73.1%)	99/117 (84.6%)	.021
I attended renal replacement therapy class prior to starting dialysis	96/253 (37.9%)	71/151 (47%)	25/102 (24.5%)	<.001
Knowledge; I am not on PD because:				
I was not offered PD as an option by my care provider	106/275 (38.5%)	73/159 (45.9%)	33/116 (28.4%)	.003
I have no understanding of the benefits/risks of PD	149/277 (53.8%)	75/161 (46.6%)	74/116 (63.8%)	.005
Accessibility; I am not on PD because:				
I live close to a HD center	169/277 (61%)	108/161 (67.1%)	61/116 (52.6%)	.015
Risk/fear/belief; I am not on PD because:				
I have heard bad stories about the higher risk of infections	103/275 (37.5%)	54/159 (34%)	49/116 (42.2%)	.161
I am unwilling to dialyze daily	141/277 (50.9%)	85/161 (52.8%)	56/116 (48.3%)	.458
Risk/fear/belief; I am not on PD because:				
I am unwilling to learn a new technique	141/279 (50.5%)	63/163 (38.7%)	78/116 (67.2%)	<.001
I do not want to take my disease home	133/278 (47.8%)	94/162 (58%)	39/116 (33.6%)	<.001
I live alone and will not be able to manage without any support	79/269 (29.4%)	44/153 (28.8%)	35/116 (30.2%)	.801
It will be a burden to my family	134/255 (52.5%)	56/139 (40.3%)	78/116 (67.2%)	<.001
My home is unsuitable for PD (lack of space)	116/275 (42.2%)	89/159 (56%)	27/116 (23.3%)	<.001
I have concerns about my body image with PD (weight gain/ tube in abdomen)	101/277 (36.5%)	58/161 (36%)	43/116 (37.1%)	.859
I believe that PD does not work as well as HD	94/277 (33.9%)	37/161 (23%)	57/116 (49.1%)	<.001
I believe that my doctor should decide my dialysis type; it should not be my choice.	81/279 (29%)	30/163 (18.4%)	51/116 (44%)	<.001
I am happy with the care I receive at the HD unit and do not want to change	257/278 (92.4%)	146/162 (90.1%)	111/116 (95.7%)	.083

Note. PD = peritoneal dialysis; HD = hemodialysis.

^aFor 5-point Likert scale, the count (%) of patient who agreed or strongly agreed are shown.

on reserves (137 [57.5-262.5] km) was significantly higher than of those nonreserve residents (9 [5-20] km), ($P < .001$). Fewer patients living on reserves had more than 12 years of education (10% vs 46%, $P < .001$), and fewer had >6 months follow up by a nephrologist prior to starting dialysis (36% vs 61%, $P = .001$).

Discussion

The primary goal of this survey was to identify patient-perceived barriers to PD uptake in prevalent patients undergoing in-center HD. The current rate of PD penetration in our province is 22.3%, which, while higher than many Canadian jurisdictions, still lags behind jurisdictions such as Ontario¹¹ and countries such as New Zealand and Hong Kong.^{12,13} Fortunately, we feel that many of the patient-perceived barriers that were raised are indeed modifiable. Potential solutions to the perceived barriers are discussed in 4 sections:

obligatory attendance of a formal education program, creation of an urgent-start program for acutely ill late presentations, supporting elderly patients with assisted peritoneal dialysis (aPD), and adopting strategies to address unique challenges faced by patients on reserves.

There is substantive evidence that predialysis education programs lead to informed patient choice, which subsequently guides modality decisions.^{14,15} Patients should be encouraged to attend modality education sessions earlier in their journey to RRT to educate them on potential therapeutic options.¹⁶ Education should be often and repeated at different time points during their chronic kidney disease (CKD) journey. In a report from Hong Kong, 54% of patients who were reluctant to start PD, agreed to do so after predialysis counseling.¹⁷ Little et al reported from Birmingham, United Kingdom that close to 50% of patients who were offered education through predialysis counseling chose PD.¹⁸ Only 38% of all respondents in our survey recalled attending a

Table 3. Perceptions and Perceived Barriers to Peritoneal Dialysis (First Nation Reserves vs Nonreserves).

Perceptions and perceived barriers to peritoneal dialysis (First Nation reserves vs nonreserves)	Total, n = 267	First nation reserves, n = 58	Nonreserves, n = 209	First nation reserves vs nonreserves
	n (%) ^a	n (%) ^a	n (%) ^a	P value
PD Awareness				
I am aware of PD as treatment option	212/267 (79.4%)	46/58 (79.3%)	166/209 (79.4%)	.985
I attended renal replacement therapy class prior to starting dialysis	89/240 (37.1%)	12/50 (24%)	77/190 (40.5%)	.031
Knowledge; I am not on PD because:				
I was not offered PD as an option by my care provider	95/259 (36.7%)	17/56 (30.4%)	78/203 (38.4%)	.267
I have no understanding of the benefits/risks of PD	138/261 (52.9%)	31/58 (53.4%)	107/203 (52.7%)	.921
Accessibility; I am not on PD because:				
I live close to a HD center	158/262 (60.3%)	3/58 (5.2%)	155/204 (76%)	<.001
Risk/fear/belief; I am not on PD because:				
I have heard bad stories about the higher risk of infections	100/260 (38.5%)	31/57 (54.4%)	69/203 (34%)	.005
I am unwilling to dialyze daily	128/261 (49%)	33/56 (58.9%)	95/205 (46.3%)	.095
Risk/fear/belief; I am not on PD because:				
I am unwilling to learn a new technique	131/263 (49.8%)	32/57 (56.1%)	99/206 (48.1%)	.280
I do not want to take my disease home	122/262 (46.6%)	31/57 (54.4%)	91/205 (44.4%)	.181
I live alone and will not be able to manage without any support	76/254 (29.9%)	21/55 (38.2%)	55/199 (27.6%)	.131
It will be a burden to my family	126/243 (51.9%)	39/56 (69.6%)	87/187 (46.5%)	.002
My home is unsuitable for PD (lack of space)	105/260 (40.4%)	30/56 (53.6%)	75/204 (36.8%)	.023
I have concerns about my body image with PD (weight gain/ tube in abdomen)	96/262 (36.6%)	33/57 (57.9%)	63/205 (30.7%)	<.001
I believe that PD does not work as well as HD	90/261 (34.5%)	27/57 (47.4%)	63/204 (30.9%)	.021
I believe that my doctor should decide my dialysis type; it should not be my choice.	79/263 (30%)	25/57 (43.9%)	54/206 (26.2%)	.010
I am happy with the care I receive at the HD unit and do not want to change	243/262 (92.7%)	55/57 (96.5%)	188/205 (91.7%)	.384

Note. PD = peritoneal dialysis; HD = hemodialysis.

^aFor 5-point Likert scale, the count (%) of patient who agreed or strongly agreed are shown.

comprehensive education program prior to initiation of RRT. Our recall rate was similar to a survey conducted by Mehrotra et al.¹⁹ Around 54% of our respondents had no understanding of the benefits and risks of PD. Furthermore, 46% of respondents from the main units stated that they were not offered PD as an option by their physicians. A recently published National Kidney Foundation-Kidney Disease Outcomes Quality Initiative (NKF-KDOQI) document stated that while education was a prerequisite for “home first” approach, there was significant variability in patient awareness of home dialysis.²⁰ The advice offered was to identify existing access to RRT education resources and to evaluate the effectiveness of education programs.²⁰ At one of the hubs in SK, a review of the predialysis education program revealed that content had not been updated for more than a decade and was heavily biased toward HD. We have since made substantive changes

to the content of our sessions and intend to conduct qualitative evaluation of the offered education at timed intervals. At the other hub, the predialysis education classes have been updated and are now offered one-on-one rather than in a group setting, with the information spread out over a few classes. Doing so should help provide education that is tailored to the needs of each individual patient, and hopefully will allow for better comprehension and retention.

The high rates of satisfaction with current in-center HD (92%) may generate clinical inertia when attempting to transition patients to PD. Time spent on dialysis, travel times, and frequent admissions interferes with participation at work and home. It impacts social interactions and frays interpersonal relationships.²¹ Dialysis by its very nature (scheduled days with consistent times) enables people to socialize with others in the waiting room or adjacent pods and allows

an opportunity to form strong bonds with health care providers.²¹ This bond is the strongest in satellite units with smaller numbers and primary nursing. However, it also enables them to get into a state of learned helplessness.²¹ The introduction of transition units has been seen as a way to reduce this crucial barrier to adoption to home HD utilization. Transition units, where patients are treated in a separate part of the dialysis unit for the first 30 to 60 days postinitiation, focus on education and are staffed by dedicated nurses with the intent of promoting and grooming self-care and home therapies.²² The goals of the program are to improve the education deficits, increase home therapy uptake, and reduce hospitalizations in the first 90 days.²²

We were aware of a geographic and facility variability in PD utilization. The northern site covers a large geographic area with sparsely populated towns and includes 42/71 reserves in SK. These far flung areas have poor access to health care facilities with infrequent physician and NP presence. As a result, patients present late in the course of CKD and are initiated on dialysis via a catheter and after 6 treatments are transferred to the closest satellite unit, where they often do not receive sufficient education regarding modality choice. Hence, we wanted to evaluate any differences between the main unit and the satellite units for both hubs to help design center/site-specific solutions to help optimize PD usage. Currently, all our incident PD patients are planned-starts and initiate therapy 4 to 6 weeks after placement of a catheter and undergoing sufficient one-on-one training. Our provincial data suggest that 55% of patients presented to their nephrologist within 6 months of needing dialysis. The majority of the emergent-starts typically initiate RRT via a dialysis catheter. Urgent-start PD describes placement of PD catheters in a time-sensitive manner and supporting the patients with sufficient education and adequate training to continue the modality. It has been shown that urgent-start PD obviates the need to initiate patients on HD, and enable patients to receive sufficient training and support during their index hospitalization²³⁻²⁵ and has been found to be safe, feasible and effective.^{26,27} Creation of a successful program requires close collaboration between the primary nephrologist, interventional radiologist/nephrologist, general surgeon, PD nurses, access co-ordinator, and other allied health members. Both the hubs have experienced some initial success with a few patients and are considering a formal structure to adequately support urgent-starts.

Around 17% of total in-center HD patients at the northern sites and 21% at the southern sites were >65 years of age. Older patients with CKD invariably have reduced strength, diminished dexterity and vision.^{18,28} About 30% of all the respondents felt that living alone was a barrier to accepting PD. Almost 56% of the respondents from the main unit felt that space constraints (storage of supplies) was a major barrier. Elderly patients usually downsize to smaller houses/apartments or transition to retirement homes and long-term care facilities that currently do not permit PD. Indeed, 36%

of the respondents from satellite units in our study were residing in a care home. Assisted PD with the care of community nursing or health care assistants is being adopted in many jurisdictions to enable patients with frailty, comorbidities, lack of family support, or living alone to receive RRT at home.²⁹⁻³¹ Despite a mean age of 75 years and a high disease burden in their cohort, Oliver et al found that if home care was available to administer PD, up to 80% of dialysis patients would be eligible for PD, compared to 65% of patients in areas where such supports did not exist.³² Assisted PD has the potential to reduce the sizable capital investment required to expand and add HD capacity.³² France has the most experience with aPD, with 48% of all PD patients being offered assistance to manage their own care.³³ Iyasere et al found that while quality of life and physical functioning was comparable between aPD and in-center HD, treatment satisfaction was higher with aPD.³⁴ This is supported by quality-of-life assessment in elderly patients where aPD was associated with less illness and treatment intrusion compared to in-center HD.³⁵ Unlike mainland Europe, our patients reside in a geographically dispersed landscape with 20% of satellite patients living on farms. Canadian Agency for Drugs and Technology in Health (CADTH) has acknowledged that aPD even when delivered in a noncontinuous fashion, such as during illness, respite or initiation of dialysis, may have cost savings over full time in-centre HD.^{36,37} Training home care staff in the community to perform PD will be logistically challenging and will require additional funding and policy-level changes.

About 12.1% of SK population is of First Nation heritage, a population known to face a high burden of illness,^{38,39} lower socioeconomic status and geographic isolation.⁴⁰ About 22% of the total and 28% of the satellite respondents to our survey were of First Nation origin and living on a reserve. Compared to non-First Nation counterparts, patients of First Nation heritage are more likely to suffer from diabetes, obesity, and poorer social circumstances.⁴¹ There are 70 First Nation reserves in SK, and several are located hundreds of kilometers away from the closest satellite HD unit. In our study, the respondents from reserves traveled a median (IQR = 137 [57.5-262.5 km]) to access HD, yet they expressed satisfaction with the current care at the HD unit and did not want to change the status quo. This is extremely surprising as 8 patients traveled more than 400 kms one way to receive therapy. Respondents from reserves further indicated that they perceived PD to be associated with a higher rate of infections and was inferior to HD. Ten of the respondents further claimed that our efforts to transition from in-center HD to PD was an additional attempt by the government to oppress them and shorten their life span. As documented in a publication by Jansen et al, there is a need for respectful inclusion of traditional knowledge tools to assist indigenous health care decision-making.⁴² These perceptual challenges in our jurisdiction will have to be addressed proactively by collaboration between First Nation leaders, senior

health region administrators, and by an education program with Indigenous teaching tools tailored toward the patients, families, and communities.⁴³

In a single-payer health care system such as Canada, there is a role for regional and provincial governments to expand utilization of use of home therapies. Peritoneal dialysis's first initiatives in Hong Kong and Thailand have improved utilization rates to 76% and 46%, respectively.⁴⁴ In 2006, Ontario Ministry of Health and long-term care successfully initiated a PD initiative to enhance use from 18% in 2006 to 30% in 2010. In the United States, similar policy changes led to an increase in new patients from 5.9% in 2009 to 9.3% in 2014.⁴⁵

Study Limitations

This study has several limitations and should be viewed with caution. We used locally derived nonstandardized questionnaires to quantify known barriers to PD uptake, and while we did leave space for a comment section, we may have missed barriers that patients indeed felt were important. Only 366 patients of the prevalent 740 patients agreed to participate, and so our results do not necessarily reflect the views of our entire HD population. Many of our questions required patients to recollect their experiences prior to dialysis initiation (ie, CKD care) and thus recall bias may have impacted responses. The data was anonymous, and we did not collect detailed demographic information (age, income, and literacy level) and hence patient-specific micro solutions cannot be proposed based on this survey. We also did not involve patients, carers, or patients of First Nations heritage, in the design of the survey and the study.

Conclusions

The results of our survey indicate that the challenges to growing our PD program are multilayered and differ between satellite and central locations. In addition, patients from First Nation reserves are overrepresented in in-center HD units and their unique challenges will have to be addressed proactively. Some of these issues can be addressed as a program (education and awareness), but others will require policy-level changes (aPD, urgent-start PD, and coordinated response between First Nation elders and provincial programs). Future work in this area could usefully include patients and carers, explicit consultation with First Nation stakeholders on the design of the study.

Ethics Approval and Consent to Participate

The study was approved by the Research Ethics Board of the former Regina Qu'Appelle Health Region (REB-18-64).

Consent for Publication

Not applicable because there is no patient identifying information in this manuscript.

Availability of Data and Materials

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author Contributions

B.P. conceived and designed the study and assisted with the drafts and edited the final manuscript. L.D. wrote the initial draft. M.J. assisted with manuscript drafts and performed the statistical analysis. S.S. and C.M. assisted with manuscript drafts. All authors read and approved the final manuscript.




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ORCID iDs

Bhanu Prasad  <https://orcid.org/0000-0002-1139-4821>
 Maryam Jafari  <https://orcid.org/0000-0002-7261-2191>
 Sachin Shah  <https://orcid.org/0000-0003-2809-1023>

Supplemental Material

Supplemental material for this article is available online.

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