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Received for publication: 24.8.09; Accepted in revised form: 1.2.10

Nephrol Dial Transplant (2010) 25: 2737–2744
doi: 10.1093/ndt/gfq085
Advance Access publication 25 February 2010

Impact of contraindications, barriers to self-care and support on incident peritoneal dialysis utilization

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Abstract

Background. Targets for peritoneal dialysis (PD) utilization may be difficult to achieve because many older patients have contraindications to PD or barriers to self-care. The objectives of this study were to determine the impact that contraindications and barriers to self-care have on incident PD use, and to determine whether family support increased PD utilization when home care support is available.

Methods. Consecutive incident dialysis patients were assessed for PD eligibility, offered PD if eligible and followed up for PD use. All patients lived in regions where home care assistance was available.

Results. The average patient age was 66 years. One hundred and ten (22%) of the 497 patients had absolute medical or social contraindications to PD. Of the remaining 387 patients who were potentially eligible for PD, 245 (63%) had at least one physical or cognitive barrier to self-care PD. Patients with barriers were older, weighed less and were more likely to be female, start dialysis as an inpatient and have a history of vascular disease, cardiac disease and cancer. Family support was associated with an increase in PD eligibility from 63% to 80% (P = 0.003) and PD choice from 40% to 57% (P = 0.03) in patients with barriers to self-care. Family support increased incidence PD utilization from 23% to 39% among patients with barriers

to self-care (P = 0.009). When family support was available, 34% received family-assisted PD, 47% received home care-assisted PD, 12% received both family- and home care-assisted PD, and 7% performed only self-care PD. Incident PD use in an incident end-stage renal disease (ESRD) population was 30% (147 of the 497 patients).

Conclusions. Contraindications, barriers to self-care and the availability of family support are important drivers of PD utilization in the incident ESRD population even when home assistance is available. These factors should be considered when setting targets for PD.

Keywords: assisted peritoneal dialysis; chronic kidney disease; end-stage renal disease; peritoneal dialysis; self-care barriers

Introduction

End-stage renal disease (ESRD) care currently consumes 5–7% of health-care budgets in developed countries [1,2]. Because self-care peritoneal dialysis (PD) costs ~$24 000 (US dollar) less each patient-year than full-care haemodialysis, promoting PD may be an effective strategy to reduce the cost of ESRD care [3]. Policy makers in many regions around the world are now setting targets to maximize PD use [4–6]. For example, in the year 2005, the Government of Ontario, Canada set a target to increase prevalent PD use to 30% by the year 2010. However, prevalent PD use in Ontario has remained relatively unchanged at ~18% as of 2009 [5,7].

A major challenge to the growth of PD, and home dialysis in general, is the fact that the majority of dialysis patients in many regions are elderly and have barriers to self-care [8–12]. Decreased strength to lift PD bags was present in 37% of a dialysis population (median age of 73 years), while decreased vision, decreased hearing and immobility were present in 25%, 17% and 20% of the population, respectively [13]. Thus, support by family members may be required for many patients to perform PD. Previous studies have found marriage was associated with the increased use of PD, while living alone decreased the use of PD [9,14]. However, neither study quantified the impact of family support on PD utilization in a dialysis population, nor did they describe whether patients actually received family-assisted PD. The impact of family support has also not been studied in populations where home care assistance is available. Home care assistance has been demonstrated to increase PD eligibility so that its availability may mitigate the impact of family support [13].

The primary objectives of this study were to determine the impact that contraindications and barriers to self-care have on incident PD use, and to determine whether family support increased PD utilization when home care support is available.

Materials and methods

Study design

The study was a prospective cohort study of incident ESRD patients at four Canadian regional dialysis programmes [Sunnybrook Health Sciences Centre (Toronto, Ontario), Halton Healthcare (Oakville, Ontario), London Health Sciences Centre (London, Ontario) and the Manitoba Renal Program (Province of Manitoba)] between January 2004 and January 2009. The study protocol was reviewed and approved by the research ethics boards at each institution.

Study population

Consecutive patients starting dialysis at each centre were included if they (i) had a written diagnosis of ESRD by a nephrologist and received at least one dialysis treatment, (ii) had initiated outpatient chronic dialysis treatment or (iii) had acute or acute-on-chronic renal failure and received at least 4 weeks of uninterrupted dialysis (gap no longer than 7 days). Patients were required to complete a multidisciplinary modality assessment.

Assessments

A multidisciplinary team including a nephrologist, pre-dialysis nurse, PD nurse ± acute care nurse and social worker met every 2 weeks to review patients for contraindications to PD, barriers to self-care and availability of support in the home. Any previous modality education and modality choices were also reviewed. An absolute contraindication to PD was defined as a single medical or social condition that, independent of support, made the patient ineligible for PD (e.g. colostomy or residence in nursing home that does not permit PD). A barrier to self-care PD was defined as a physical or cognitive condition that would significantly interfere with the patient's ability to perform self-care PD in the opinion of the team. Family support was defined as spouse, son or daughter who was available, able and willing to provide regular assistance with PD. The availability of a paid caregiver to assist families was also noted. All patients lived in regions and residences where home care assistance was available. Home care assistance was defined as a visiting nurse or health-care aid who could assist patients with set up, connection and disconnection from PD machines or perform PD exchanges (maximum two visits per day).

At baseline, age, sex, weight, height, comorbid conditions, pre-dialysis care, hospitalization to start dialysis and the last available serum creatinine, urea, albumin and haemoglobin prior to starting dialysis were recorded.

Outcome measures

The primary outcome was PD eligibility (yes/no) as determined by the multidisciplinary team. Patients with complex medical conditions or social situations were often discussed at multiple meetings over time until a final decision regarding PD eligibility could be made. All eligible patients were provided modality education, offered the therapy and allowed to choose either PD or haemodialysis. Secondary outcomes included PD choice and PD use. PD choice was defined as an attempt or insertion of a PD catheter prior to starting dialysis or within 6 months of dialysis in a patient who was eligible for PD. The dialysis modality of each patient was followed prospectively every 3 months until the end of follow-up. Patients were considered to have received PD if they started PD treatments at any time during follow-up. The start of PD for hospitalized patients was defined as the first occurrence of a PD exchange with the intent of treating the patient for kidney failure. The start of PD for outpatients was defined as the last day of PD training. PD was categorized as self-care, family assisted or home care assisted.

Statistical analysis

All analyses were conducted using SAS version 9.1 (SAS Institute Inc., Cary, NC, USA). The total count and frequency of contraindications to PD were reported as a percentage of the total incident ESRD population. Patients with absolute contraindications were then removed from the analysis, leaving patients who were potentially eligible for PD (not contraindicated). Patients were first grouped into those with and without barriers to self-care PD, and then, patients with barriers to self-care were grouped into those with and without family support for PD. Differences between groups were compared using chi-square tests (or Fisher's exact test as appropriate) for categorical variables and independent sample *t*-tests for continuous variables.

For the primary analysis, the association of family support and PD eligibility was first compared using a chi-square test in the group of patients with barriers to self-care PD. A logistic model was then used to determine

the adjusted effect of family support on eligibility. The following variables were examined as covariates based on previous studies: age, sex, diabetes, coronary artery disease, congestive heart failure, pre-dialysis care, baseline estimated glomerular filtration rate (eGFR), baseline haemoglobin, baseline albumin and dialysis centre [8,11,12,14,15]. All covariates were screened for the presence of multicollinearity using the tol option of Proc Reg in SAS using a threshold of <0.4. Manual backward elimination was used, and the variables were retained if they were significantly associated with PD eligibility.

For the secondary analysis, similar methods were used to determine the association of family support with PD choice and with PD use. Chi-square tests were also used to examine the impact of family support on PD eligibility and choice across the subgroups of patients with physical barriers, cognitive barriers or both types of barriers. Patients were considered to have received self-care PD, family-assisted PD and home care-assisted PD if they received this modality at any point during follow-up. Differences were considered significant in all analyses if the two-sided P-value was <0.05.

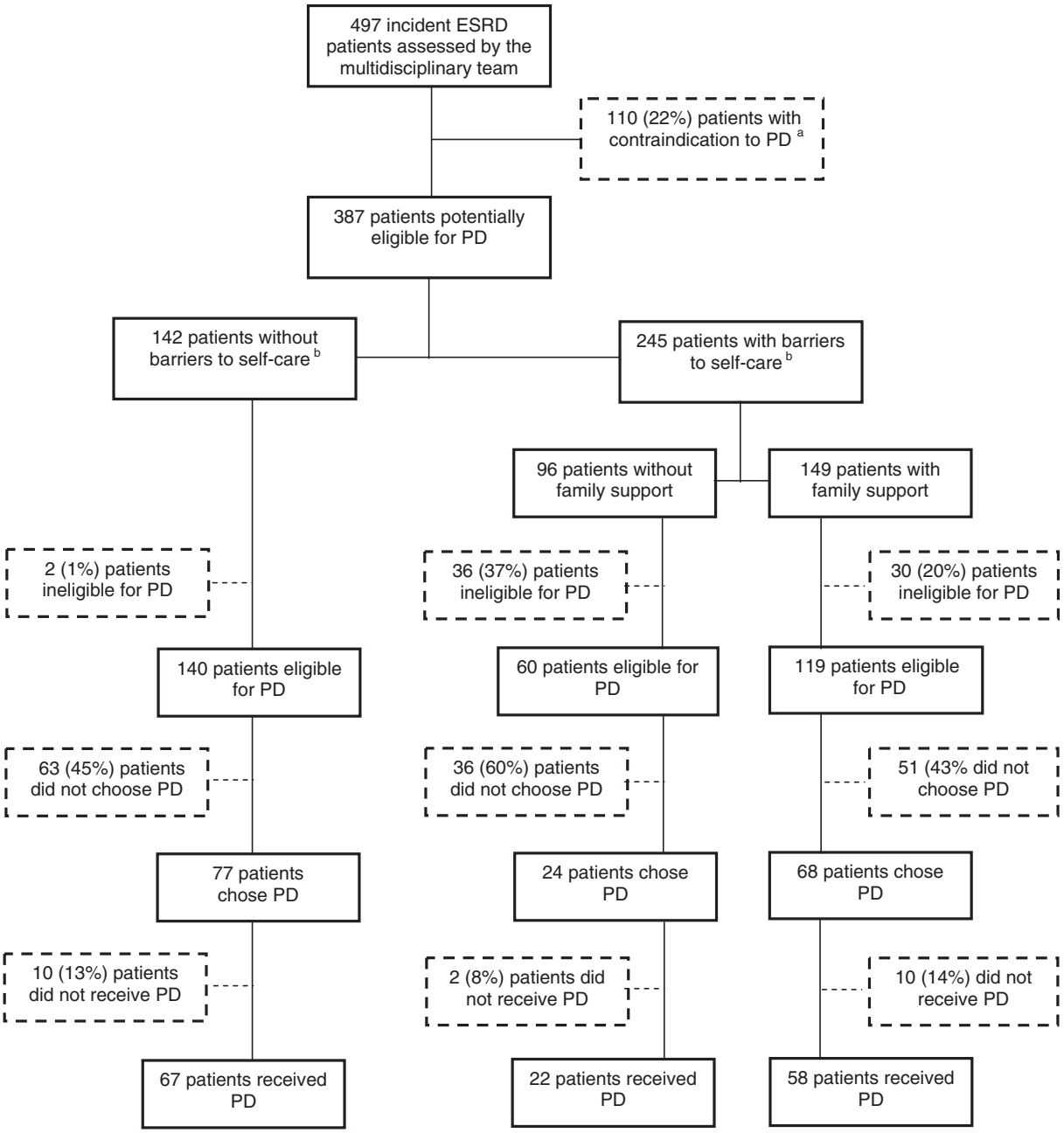

Fig. 1. Impact of contraindications, eligibility and choice on PD utilization in an incident ESRD population with and without barriers to self-care and family support. PD eligibility was determined in meetings of the multidisciplinary team. All patients who were considered eligible for PD were offered PD. PD choice was defined as a PD catheter attempt or successful insertion prior to start of dialysis or within the first 6 months of dialysis. The reasons that PD was not received for patients undergoing PD catheter attempt were failed PD catheter attempt (n = 7), patient changed their mind after insertion (n = 5), primary catheter malfunction (n = 2), catheter leak/malfunction (n = 1), catheter leak/changed mind (n = 1), exit-site infection (n = 1) and development of abdominal hernia during PD training (n = 1). Among patients with barriers to self-care, family support was associated with PD eligibility [63% without support *vs*. 80% with support (chi-square test, P = 0.003)] and choosing PD [40% chose PD without support *vs*. 57% with support (chi-square test, P = 0.03)]. The mean (median) follow-up for patients who received PD was 521 (376) days. [a]Contraindications to PD are listed in Table 1. [b]Barriers to self-care are listed in Table 2.

Table 1. Medical and social contraindications to PD

	Count (%)
Patients assessed for PD	497
Medical conditions	
Obesity	24 (4.8)
Abdominal scarring	22 (4.4)
Ascites	6 (1.2)
Diverticulitis	5 (1.0)
Abdominal hernia	5 (1.0)
Inflammatory bowel disease	4 (0.8)
Ileostomy	3 (0.6)
Colostomy	3 (0.6)
Abdominal aortic aneurysm	3 (0.6)
Abdominal surgery, planned in the future	3 (0.6)
Bowel cancer	3 (0.6)
Gastric tube	2 (0.4)
Ileal conduit	2 (0.4)
Polycystic kidneys	2 (0.4)
Ischaemic gut	2 (0.4)
Other	7 (1.4)
Social conditions	
Residence did not permit PD	13 (2.6)
Employment did not permit PD	1 (0.2)
Total	110 (22)

Contraindications were in the opinion of the attending nephrologist and/or multidisciplinary team. Other medical conditions include one case each of chronic diarrhoea, gastric lymphoma, enlarged spleen, gastroparesis, purulent groin fistula, incontinence and nephrotic syndrome (concern *re*: protein loss).

Results

Patient population

A total of 497 patients met the inclusion criteria (Figure 1). The mean age was 66 years. Absolute contraindications to PD were identified in 110 (22%) patients (Table 1). The most common medical conditions were obesity (n = 24) and abdominal scarring (n = 22), followed by ascites (n = 6), diverticulitis (n = 5), active abdominal hernia (n = 5) and inflammatory bowel disease (n = 4). The mean body mass index (BMI) was 45.0 (range 34.9–72.8), and the mean weight was 129 kg (range 93–175 kg) in the patients who were contraindicated due to obesity. Thirteen patients lived in residences that did not support PD. Other

Table 2. Barriers to self-care PD among incident ESRD patients without contraindications to PD

	Count (%)
Patients assessed for barriers	245
Physical barriers to self-care	
Decreased strength	131 (53)
Decreased manual dexterity	105 (43)
Decreased vision	80 (33)
Decreased hearing	38 (16)
Immobility	62 (25)
Poor health/frailty	35 (14)
Poor hygiene	8 (3)
Cognitive barriers to self-care	
Language barrier	38 (15)
History of non-compliance	33 (13)
Psychiatric condition	19 (8)
Dementia/poor memory	19 (8)
Other[a]	20 (8)

A barrier to self-care PD was defined as a physical or cognitive condition that would significantly interfere with the patient's ability to perform self-care PD in the opinion of the multidisciplinary team. All barriers were discussed and documented at weekly team meetings.
[a]Other cognitive barriers were aphasia, learning disability, poor motivation and denial about ESRD.

Table 3. Baseline characteristics of patients with and without barriers to self-care PD

	No barriers (n = 142)	With barriers (n = 245)
Age, mean	58	70*
Male, %	65	55***
Weight (kg), mean	78	71*
Body mass index, mean	27.7	26.1***
Diabetes, %	49	51
Coronary artery disease, %	25	42*
Congestive heart failure, %	18	35*
Other cardiac, %	28	40***
Peripheral vascular disease, %	12	19
Cerebrovascular disease, %	7	20*
History/active cancer, %	12	24**
Pre-dialysis care[a], %	75	74
Started dialysis as an inpatient, %	35	46***
Albumin (g/L), mean	34.5	34.0
Haemoglobin (g/L), mean	99.1	102.8
eGFR at start (mL/min), mean	7.4	9.8*

Baseline characteristics were measured prior to the start of dialysis.
[a]Pre-dialysis care was defined as at least 4 months of care provide by a nephrologist with or without a multidisciplinary renal team.
*$P < 0.05$.
**$P < 0.01$.
***$P < 0.001$.

Table 4. Baseline characteristics of patients with and without family support among patients with barriers to self-care PD

	No family support (n = 96)	With family support (n = 149)
Age, mean	72	69
Male, %	51	57
Weight (kg), mean	70.1	71.9
Body mass index, mean	25.8	26.2
Diabetes, %	45	55
Coronary artery disease, %	38	44
Congestive heart failure, %	30	38
Other cardiac, %	38	41
Peripheral vascular disease, %	23	17
Cerebrovascular disease, %	20	19
History/active cancer, %	26	22
Pre-dialysis care[a], %	76	72
Started dialysis as an inpatient, %	39	50
Albumin (g/L), mean	34.8	33.6
Haemoglobin (g/L), mean	102.2	103.2
eGFR at start (mL/min), mean	9.7	9.9
Any physical barrier, %	86	84
Any cognitive barrier, %	43	47
Physical and cognitive barrier, %	29	31

None of the baseline characteristics were statistically different between patients with and without family support.
[a]Pre-dialysis care was defined as at least 4 months of care provided by a nephrologist with or without a multidisciplinary renal team.

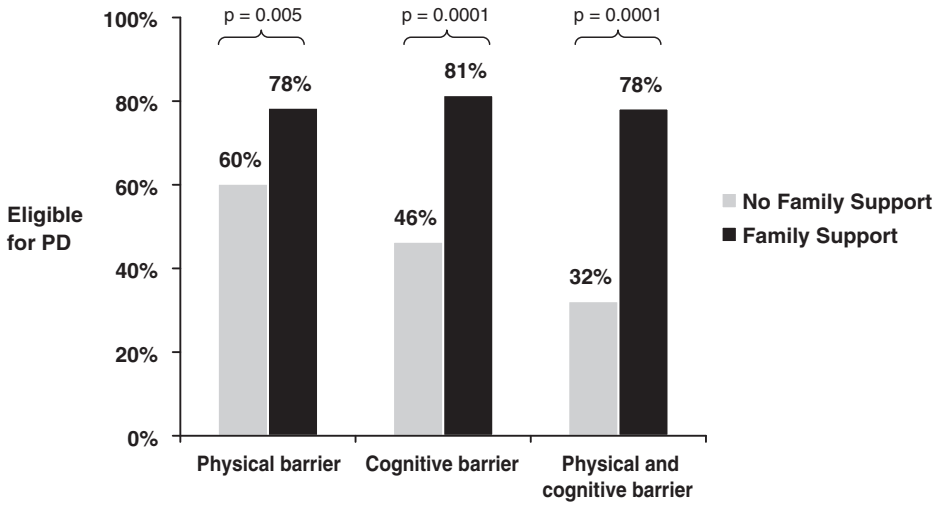

Fig. 2. The effect of family support on PD eligibility among 245 patients with physical (n = 208), cognitive (n = 111) or both types of barriers (n = 74) to self-care PD.

single medical and social conditions were infrequent but they accumulated; so, in total, over one-fifth of the population was contraindicated to PD. Removing the contraindicated patients left 387 patients (78%) of the original 497 patients who were potentially eligible for PD.

Barriers to self-care PD

Two hundred and forty-five (63%) of the 387 patients without contraindications to PD had at least one barrier to self-care PD (Table 2). Barriers were categorized into physical and cognitive with the former being more prevalent. The most common physical barriers were decreased strength to lift PD pages (n = 131), decreased manual dexterity (n = 105) and decreased vision (n = 80). Common cognitive barriers were language barriers (n = 38), history of non-compliance (n = 33), psychiatric conditions (n = 19) and dementia/poor memory (n = 19). Patients with barriers were older, weighed less and were more likely to be female, start dialysis as an inpatient and have a history of vascular disease, cardiac disease and cancer (Table 3). They also started dialysis at a higher eGFR.

Impact of family support on PD eligibility among patients with barriers to self-care PD

Family support was available to 149 patients with barriers to self-care PD from spouse alone (n = 79), spouses and paid caregivers (n = 1), children alone (n = 43), children with paid caregivers (n = 5), spouses and children (n = 6), or spouses, children and paid caregivers (n = 1). There were no significant differences in baseline characteristics between patients with and without family support (Table 4). Of the 96 patients with barriers to self-care without family support, 60 (63%) were considered eligible for PD compared with 119 (80%) of 149 patients with family support (chi-square test, P = 0.003). In the adjusted analysis, family support was associated with PD eligibility [odds ratio 3.1, 95% confidence interval (CI) 1.6–6.1, P = 0.001], as was the absence of congestive heart failure (odds ratio 2.5, 95% CI 1.3–5.2) and baseline haemoglobin (odds ratio 1.04 per gram per litre increase, 95% CI 1.013–1.058, P = 0.006). Dialysis centre was also a significant predictor of PD eligibility in an unadjusted (chi-square test, P < 0.0001) and adjusted analysis (minimum P-value = 0.004 for two-way centre comparisons). The increase in PD eligibility associated with family support was consistent across the subgroup of patients with physical barriers, cognitive barriers or both types of barriers (Figure 2).

Impact of family support on PD choice among patients with barriers to self-care PD

Of the 60 patients with barriers to self-care without family support that were offered PD, 24 (40%) chose PD compared with 68 (57%) of the 119 patients with family support (chi-square test, P = 0.03). In an adjusted analysis, family support was associated with choosing PD (odds ratio 2.3, 95% CI 1.2–4.7, P = 0.01), as was female sex (odds ratio 2.9, 95% CI 1.5–5.6, P = 0.002) and baseline haemoglobin (odds ratio 1.03 per gram per litre increase, 95% CI 1.008–1.049, P = 0.006). The increase in PD choice associated with family support was consistent across the subgroups of patients with physical barriers, cognitive barriers or both types of barriers (Figure 3).

Utilization of self-care and assisted PD

Among the 169 patients who choose PD and underwent a PD catheter attempt, only 147 (87%) actually received PD therapy (Figure 1). PD was not received because of the following: failed PD catheter attempt (n = 7), patients changed their mind after insertion (n = 5), primary catheter malfunction (n = 2), catheter leak/malfunction (n = 1), catheter leak/changed mind (n = 1), exit-site infection (n = 1) and development of abdominal hernia during PD training (n = 1).

The mean (median) follow-up for patients who received PD was 521 (376) days. Of the 58 patients with barriers to self-care and family support who received PD therapy, 20 (34%) received family-assisted PD, 27 received home

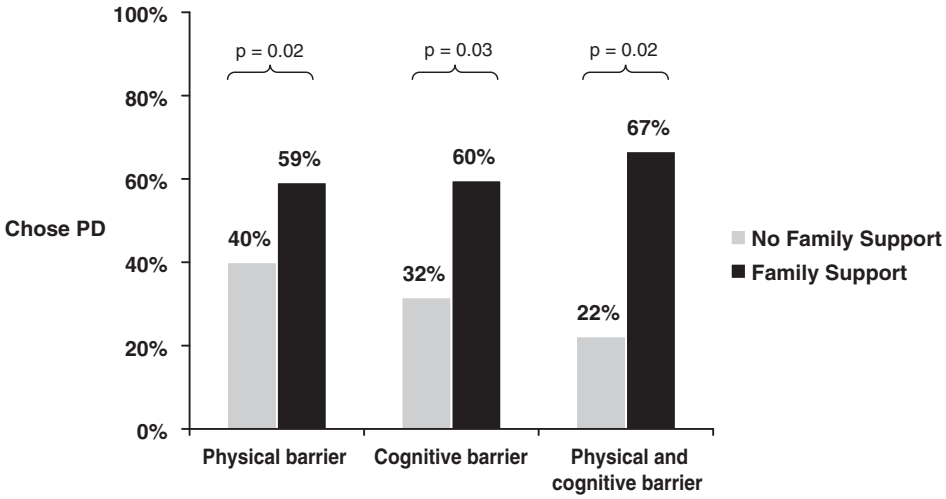

Fig. 3. The effect of family support on PD choice among 179 patients with barriers to self-care that were still considered eligible for PD and offered PD. One hundred and forty-eight patients had at least one physical barrier, 76 patients had at least one cognitive barrier and 45 patients had both types of barriers.

care-assisted PD (47%), 7 (12%) received both family- and home care-assisted PD, and 4 (7%) performed self-care PD. Of the 22 patients with barriers to self-care and no family support who received PD therapy, 2 (9%) performed self-care PD, 19 (86%) received home care-assisted PD and 1 (5%) received assisted PD by a friend. Of the 67 patients with no barriers to self-care PD identified at the time of initial modality assessment that received PD therapy, 50 (75%) performed self-care PD, 6 (9%) received family-assisted PD, 10 (15%) received home care-assisted PD (47%), and 1 (2%) received both family- and home care-assisted PD.

The combined effect of support on PD eligibility and choice increased PD utilization from 23% (22 of 96) to 39% (58 of 149) among patients with barriers to self-care PD (chi-square test, P = 0.009). Incident PD use in the original cohort of 497 patients was 30% (147 of the 497 patients).

Discussion

This study demonstrates that, even when home care assistance for PD is available, family support was an important driver of PD eligibility, choice and use among patients with barriers to self-care PD. Most patients were older, so the multidisciplinary team frequently detected physical and cognitive barriers to self-care. Having a spouse, son or daughter available to assist with PD in the home was an important consideration for the health-care team when PD eligibility was determined. Patients were also more comfortable choosing PD when a family member was available to help. The combined effect of support on eligibility and choice significantly increased PD use in the incident population with barriers to self-care PD. The vast majority of patients with barriers to self-care PD went on to receive assistance by family or home care nurses demonstrating that PD is no longer a self-care modality for many patients.

The prospective assessment of a large number of consecutive patients allowed us to develop a new framework for understanding PD utilization. Firstly, patients were screened for contraindications—primarily abdominal conditions or residences that did not permit PD. These contraindications created a 'hard cap' on PD use because they made patients ineligible for PD regardless of available support. Once these patients were excluded, barriers to self-care and available support were determined. Conditions directly related to self-care such as decreased strength, manual dexterity, vision and hearing were common, but other less obvious conditions such as frailty, poor general health, immobility and non-compliance were often cited. Previous studies have identified similar conditions such as non-compliance, language problems, psychiatric conditions, frailty, cognitive impairment and psychosocial problems but have generally classified them as contraindications to therapy [8,9,16,17]. In our framework, contraindications are separated from barriers because the latter are modifiable by support. For example, a patient with severe barriers to self-care could still receive PD if a son or daughter living with him or her performed the therapy. Many adult children of dialysis patients were willing to take on these responsibilities although home care nurses often provided additional help. A small proportion of families also had the financial means to employ private caregivers. These findings shed light on the actual amount of support some PD patients require today and the challenges of growing home dialysis in an elderly population.

This study has important implications for PD utilization targets. First, 22% of consecutive, incident dialysis patients were considered contraindicated to PD. Second, 13% were ineligible because of barriers to self-care that could not be overcome with available support (1% were ineligible without barriers). This left 64% of the original cohort who could be offered PD. This PD eligibility percentage was on the low end of previous estimates which range between 64% and 83% [8,9,16,17], but our population was older

(mean age in previous studies was 59–62 years old compared with 66 years old in this study). Interestingly, older age was not associated with lower PD eligibility in the adjusted analyses after accounting for barriers to self-care and family support. This finding suggests that the consistent association between older age and low PD utilization in the literature occurs because older patients have barriers to self-care and are therefore not offered or do not choose PD. [8,9,11,12,14]. The significant association between dialysis centre and PD eligibility also suggests that some centres were more aggressive about offering PD than others even after accounting for the detection of barriers and support. Third, between 40% and 57% of patients, depending on the presence of barriers and family support, chose PD. This range is greater than previous studies that found between 45% and 50% of patients chose PD when offered. Finally, only 87% of the patients who chose PD (PD catheter attempt or insertion) received therapy. The end result was PD use of 30% in an incident ESRD population that was rigorously assessed and had significant support available to them. This amount of PD utilization sets a reasonable target but may not be appropriate for other regions if the baseline characteristics of their population or available support differ substantially from the one in this study.

One limitation of this study is that, although contraindications and barriers were identified prospectively, they were based on the judgment of the multidisciplinary team. This process reflected actual decision-making in everyday practice, but future research could test whether modality assessments could be made more objective. Standardizing contraindications across dialysis programmes or using validated tools to assess physical and cognitive barriers might help. For example, ascites contraindicated six patients from PD despite it being successfully used to treat PD patients in the literature [18]. PD choice was also measured by PD catheter attempt or insertion among eligible patients, which was objective, but may not have reflected the initial decision of the patient during modality education. Using the latter approach would better reflect clinical practice but also may increase the discrepancy between patients who 'choose' PD and those who actually receive it (13% in this study). This study also focused on the relationship between family support and incident PD use—not prevalent use. The relationship between incident and prevalent PD use requires further study because many PD targets are set for prevalence.

In summary, reducing the cost of ESRD care is a laudable goal for society, and setting targets is not an unreasonable approach to stimulate PD growth. However, before targets are set, we should clearly understand the complex factors that drive PD utilization and home dialysis in general. This study demonstrates that contraindications to PD, barriers to self-care and a lack of support are legitimate concerns for caregivers and patients considering home dialysis. However, 30% incident use of PD was achieved when patients were rigorously assessed, provided support, encouraged to consider PD and allowed to choose PD if it was right for them. This amount of PD utilization is higher than many dialysis programmes achieve; thus, there are likely significant opportunities to increase home dialysis and lower the cost of ESRD care without restricting patient choice.

Acknowledgements. This research was supported by grants from the Change Foundation of Ontario, the Physician Services Incorporated Foundation, the Canadian Institutes of Health Research (CIHR) and the Ministry of Health and Long-term Care of Ontario.M.J.O. was supported by a Sunnybrook Health Sciences Centre, Department of Medicine research award. A.X.G. was supported by a CIHR Clinician Scientist award. R.R.Q. was supported by a CIHR Institute for Health Services and Policy Research fellowship award. The authors would like to thank the patients and the following individuals for assisting with this study: Sunnybrook Health Sciences Centre: Susan Flanagan, Thuy Pham, Gillian Brunier, Amy Canter, Raquel Bersamira, Winnie Chan, Juanita Ng, Cora Kalpakis, Shirley Drayton, Eleanor Ravenscroft and Lois Fillion; London Health Sciences Centre: Lenora Perry, Michelle Ivanouski, Rebecca Thomas, Sandra Bartlett, Theresa McCallum, Douglas Parsons, Marlene Rees Newton, Deborah Bezaire and Sharon White; Manitoba Renal Program: Irmy Friesen, Wil Dirks, Melanie Zarrillo, Bienvenida Dizon, Julie Evans, Joanne Plamondon, Lauren Matsyk and Betty Lou Burke; Halton Healthcare: Marilyn Stirling, Vanessa Deck, Nabila Lowe and Desa Hobbs.

Conflict of interest statement. None declared.

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Received for publication: 18.11.09; Accepted in revised form: 4.1.10