

Appropriateness of the dialysis modality selection process

A cross-sectional study

Karla Salas-Gama, MD^{a,b,c,d,*} , Juan-Manuel Díaz-Gómez, PhD^{e,f}, Ignasi Bolívar Ribas, PhD^{d,g,h}

Abstract

Studies that specifically quantify the appropriateness of the process of dialysis modality selection are lacking. Peritoneal dialysis (PD) offers clinical and social advantages over hemodialysis (HD), but may be underused. We aimed to determine the appropriateness of the process of dialysis modality selection and quantify the percentage of patients who could potentially have been PD candidates. We performed a cross-sectional study that included adult patients from a hospital Nephrology Department in Barcelona who started dialysis between 2014 and 2015. We assessed the appropriateness of dialysis modalities selection by defining 3 sequential domains based on 3 critical steps in choosing a dialysis modality: eligibility for either treatment, information about modalities, and shared decision-making. We obtained data using medical records and a patient questionnaire. The dialysis modality selection process was considered appropriate when patients had no contraindications for the selected option, received complete information about both modalities, and voluntarily chose the selected option. A total of 141 patients were included in this study. The median age was 72 years (interquartile range 63–82 years), and 65% of the patients were men. The dialysis modality selection process was potentially inappropriate in 22% of the participants because of problems related to information about dialysis modalities (15%) or shared decision-making (7%). Appropriate PD use can potentially increase from 17% to 38%. Patient age and lack of information regarding dialysis options were independently associated with the potential degree of inappropriate dialysis modality selection. Our findings indicate areas for improvement in the selection of dialysis modalities. With better education and shared decision-making, the number of patients with PD could potentially double. The analysis of appropriateness is a helpful approach for studying renal replacement treatment patterns and identifying strategies to optimize their use.

Abbreviations: CKD = chronic kidney disease, ESKD = end-stage kidney disease, HD = hemodialysis, KT = kidney transplantation, PD = peritoneal dialysis, RRT = renal replacement therapies.

Keywords: appropriateness, chronic kidney disease, peritoneal dialysis, renal replacement treatment, underuse.

1. Introduction

Chronic kidney disease (CKD) is a global health problem with a worldwide prevalence of 9%.^[1] Patients with end-stage kidney disease (ESKD) represent 1% to 6% of this group, and their treatment consumes 1% to 3% of all healthcare resources.^[2,3] Similar to hemodialysis (HD), peritoneal dialysis (PD) is an effective technique for the treatment of ESKD,^[4–9] but most economic evaluations indicate that it is more cost-effective.^[2,3,10,11] Authors of a recent systematic review suggested a more comprehensive cost-effectiveness approach that considers different

renal replacement therapy (RRTs) along the patient pathway since switching between dialysis modalities is often essential.^[11] According to expert opinion,^[12,13] PD should ideally reach 30% to 45% of patients starting RRT. However, the use of PD is considerably low in clinical practice. Figures for Europe in 2019 showed that 84% of patients with CKD started RRT with HD, 5% underwent kidney transplantation (KT), and only 11% started PD.^[14]

Most patients with ESKD are potential candidates for either modality of dialysis.^[15] The percentage of contraindications reported for PD varies between 17% and 28% of

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^a Quality, Process and Innovation Direction, Vall d'Hebron Hospital Universitari, Vall d'Hebron Barcelona Hospital Campus, Barcelona, Spain, ^b Health Services Research Group, Vall d'Hebron Institut de Recerca (VHIR), Vall d'Hebron Hospital Universitari, Vall d'Hebron Barcelona Hospital Campus, Barcelona, Spain, ^c PhD candidate at the Methodology of Biomedical Research and Public Health program, Universitat Autònoma de Barcelona (UAB), Barcelona, Spain, ^d Consortium for Biomedical Research in Epidemiology and Public Health-CIBERESP, Barcelona, Spain, ^e Nephrology Department, Fundación Puigvert, IIB Sant Pau, Barcelona, Spain, ^f Medicine Department, Universitat de Vic (UVic-UCC), Vic, Spain, ^g Department of Clinical Epidemiology and Public Health, Hospital de la Santa Creu i Sant Pau Biomedical Research Institute Sant Pau

(IIB Sant Pau), Barcelona, Spain, ^h Universitat Autònoma de Barcelona (UAB), Barcelona, Spain.

*Correspondence: Karla Salas-Gama, Quality, Process and Innovation Direction, Vall d'Hebron University Hospital, Passeig de la Vall d'Hebron, 119, 08035 Barcelona, Spain (email: karla.salas@vallhebron.cat).

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patients.^[10,16] This variability may be explained by the fact that some authors include non-clinical contraindications for PD in their calculations, whereas others consider such features as barriers, but no contraindications.^[17–19] There is still insufficient high-level evidence to recommend one therapy over another.^[15,18,20] When different therapeutic options are effective, but their practical characteristics differ and could potentially impact the patient's life, choosing a modality should focus on patients' values, preferences, and a voluntary and informed choice.^[15,21]

Appropriate care refers to high-quality care by offering the right service to the right patient at the right time and using effective and efficient resources that are consistent with the values and preferences of individuals.^[22] However, the dimension of the “right patient,” is not always considered in appropriateness analysis, with a notable absence of variables related to the extent of patient engagement in decision-making and decisional quality.^[23] When the decision-making process is facilitated, approximately 50% of the candidates choose PD.^[24,25]

Although the underuse of PD has been discussed in previous studies, none has explicitly quantified it.^[26–30] This study aimed to determine the appropriateness of dialysis modality selection process and quantify the percentage of patients who could potentially have been PD candidates.

2. Methods

We performed a cross-sectional study to analyze the appropriateness of dialysis modalities selection in the nephrology department of a third-level university hospital with a reference area of 404,672 inhabitants in Barcelona, Spain. The nephrology department provides all RRT modalities, conservative management, and a consultation unit in which nephrologists and nurses specifically focus on the management of ESKD. When patients with CKD reach a glomerular filtration rate <20 mL/min/1.73 m² they are referred to the counseling and predialysis education program performed entirely in the hospital setting. In our health system there is no ESKD counseling in primary care or long-term care facilities outside of the hospital. The predialysis education program does the necessary close follow-up to implement procedures and treatments for the control of the disease progression, such as control of blood pressure, lifestyle and diet modifications, and censoring some drugs that could worsen glomerular filtration rate. Patients will also receive information

about possible treatment options, and promptly prepare for HD or peritoneal treatment. Not all patients can enter the program, due to their clinical (CKD with acute deterioration that did not have the opportunity to go through predialysis counseling or complete the whole counseling follow-up) or care (new ESKD patients without previous visits at hospital) situation.

The inclusion criteria were patients aged 18 years or older who started HD or PD between January 1, 2014 and December 31, 2015. Exclusion criteria were conditions or circumstances in which signed consent could not be obtained, such as cognitive deterioration, mental disorders, severe hearing loss, language barrier, death, and inability to contact the patient, explicitly living outside the hospital reference area.

The average number of patients that initiated dialysis yearly at the nephrology department determined the sample size. We estimated a sample size of 143 participants based on an assumed percentage of appropriate use of 75%, confidence level of 95% and margin of error of 5%. We assumed an 18% loss based on the annual mortality rate described for dialysis patients.^[31]

We identified potential participants from the nephrology department register of incident patients on dialysis. We classified the patients according to the dialysis modality performed on day 90, allowing them to get to the modality they wanted. All participants voluntarily signed a written informed consent form before inclusion in the study and data collection.

The study outcome was the appropriateness of dialysis modality selection. We assessed this, according to the values and preferences of individuals, by defining 3 sequential domains based on 3 critical steps in the pathway for choosing a dialysis modality: eligibility for either treatment, information about modalities, and shared decision-making (Table 1, Supplemental Digital Content 2, <http://links.lww.com/MD/H565>).^[19] The first domain was related to PD and HD eligibility assessment by looking for contraindications or barriers for both modalities already defined in the medical literature.^[15–19] A research nephrologist (KS), independent of the nephrology department, reviewed and collected clinical and sociodemographic information from each participant's clinical records.

The second domain was related to the degree of information provided for both modalities. We defined: complete information when the patient received information about either dialysis modality and considered that this information was adequate, incomplete information when only one modality was provided to a patient potentially eligible for the 2 dialysis modalities, and absence of information when no information about the

Table 1

Domains for assessing the appropriateness of the dialysis modality selection process.

Domain 1: Assessment of the presence of the clinical contraindications or barriers to dialysis modalities (*)

Contraindications or barriers for HD

1. Inability to secure vascular access
2. Presence of relative contraindications: poor cardiac condition, needle phobia, and coagulopathy

Contraindications or barriers for PD

1. Presence of abdominal-peritoneal pathology.
2. Presence of relative contraindications (hiatal hernia with severe reflux esophagitis, severe diabetic gastroparesis, severe chronic obstructive pulmonary disease, severe malnutrition, giant polycystic kidney disease, severe spine disease, morbid obesity).
3. Inability to perform peritoneal dialysis at home: *Problems in self-care*: limitation in functional status (Karnofsky Scale <60) without the support of carers; *Problems related to home characteristics*: after an adequate process of information, the patient declares not to have the requirements at home to perform peritoneal dialysis.

Domain 2: Degree of information received about both dialysis modalities

1. *Complete information*: the patient considered that the information received about either dialysis modalities (or information of one modality in those patients who only have the option for one of the 2 treatments) was: highly adequate, adequate, or neither adequate nor inadequate.
2. *Incomplete information*: only one modality was provided when a patient was a candidate for the 2-dialysis modalities.
3. *Absence of information*: no information about dialysis modalities was provided.

Domain 3: Patients' perception of the shared decision-making process of the dialysis modality

1. *Shared decision*: patient perception of choice made voluntarily after receiving complete information and advice about dialysis modalities.
2. *Lack of shared decision*: a patient who received complete information but had the perception of not participating in the decision-making process about the dialysis modality.

*Bibliographic references.^[15–19]

HD = hemodialysis, PD = peritoneal dialysis.

modalities was provided. The third domain was related to patients' perceptions of the shared decision-making process of the dialysis modality. We defined a shared decision as the patient's perception of a voluntary decision after receiving complete information and advice, and a lack of shared decision as a patient who received complete information but had the perception that they did not actively participate in the decision process.

To collect data related to the second and third domains, we designed a semi-structured questionnaire to assess the appropriate use according to the patient's perspective (see Supplemental Digital Content 1, <http://links.lww.com/MD/H564>). It was pilot-tested before starting the study with 6 patients who began dialysis. The feedback from these patients allowed us to evaluate their comprehension of the questions and make corrections to improve their understanding. The questionnaire was repeated with the same 6 patients 6 weeks later to assess the consistency and reproducibility of their answers, obtaining a kappa index >0.6, indicating good concordance.

We assessed the second domain related to the degree of information with items 5, 6, and 7 of the questionnaire, and the third domain related to voluntary choice and decision process with items 8 to 15, and 19 (see Supplemental Digital Content 1, <http://links.lww.com/MD/H564>). We administered the questionnaire face-to-face to patients living in the city. Patients living outside the city area were invited to participate by their usual healthcare team. After signing the informed consent form, they completed the questionnaire by telephone.

We defined appropriate dialysis modality selection when patients ended up on the proper modality by voluntarily choosing one option after receiving complete information about either modality or ending up on the only viable option because of contraindications to the other modality. We considered potentially inappropriate dialysis modality selection in the following situations: incomplete or no information about the 2 modalities of dialysis; complete information given but patients' perception of lack of shared decision-making; and non-prescription of the modality chosen voluntarily by the patient.

The statistical analysis was mainly descriptive, with frequencies and proportions for qualitative variables and central tendency and dispersion measures for quantitative variables. We used basic bivariate tests to determine the association between the appropriate dialysis modality selection and patient characteristics. The association was further analyzed by multivariate logistic regression using the backward stepwise procedure to select predictive variables of appropriateness. The significance level for the inclusion of variables was 5%, and we used STATA V.14.0. software for statistical analysis.

The Clinical Research Ethics Committee of the Nephrology Department approved the study, and we followed the Strengthening the Reporting of Observational Studies in Epidemiology statement.^[32]

3. Results

During the 2 years of the study, 237 patients started RRT with either HD or PD. We excluded patients who died at the time of the study, those who were unable to contact (most of whom lived outside the city of Barcelona), and those whose clinical situation prevented them from answering the questionnaire (see Supplemental Digital Content 3, <http://links.lww.com/MD/H566>, which shows the flowchart of patients). The study group consisted of 141 patients: 24 (17%) who underwent PD and 117 (83%) who underwent HD at day 90. The excluded patients did not differ significantly from the included patients in terms of age, sex, educational level, functional status, comorbidities, etiology of kidney disease, CKD presentation, information on RRT modalities provided, dialysis modality, and inclusion on the waiting list for kidney transplant.

Table 2 summarizes the participants' main characteristics, distributed according to the dialysis modality. Most participants were male (71% PD, 63% HD). The median age in the PD group was lower than that in the HD group (68 years, interquartile range 56–72 vs 72 years, interquartile range 60–83, respectively), although this difference was not statistically significant. The percentage of patients who were not candidates for KT was higher among those treated with HD (56% HD, 21% PD, $P = .003$). No other differences between the 2 groups were statistically significant.

Dialysis modality selection was appropriate in 110 (78%, 95% confidence interval [CI]: 69%–85%) patients and potentially inappropriate in 31 (22%, 95% CI: 15%–31%) participants (Fig. 1). Appropriateness was 96% for PD and 74% for HD. The reasons for the appropriate dialysis modality selection were as follows: patients ending up on the only possible modality because of contraindications for the other option (40 patients, 28%) and the voluntary decision of a dialysis modality made by a fully informed patient (70 patients, 50%) (Table 3). Among the patients with contraindications for PD, 10 (7%) were unable to perform PD at home. This inability was due to barriers to self-care in 3 cases and home characteristics in 7 cases. Among the 70 (50%) patients suitable for PD who voluntarily chose a modality of dialysis after obtaining complete information, only one-third (16%) chose PD.

The reasons for the 31 participants with a potentially inappropriate dialysis modality selection are presented in Table 3. The most frequent reason was incomplete information or omission of information about both dialysis modalities, followed by the perception of a lack of shared decision-making. In the group of 24 patients who started treatment with PD, only 1 patient met the criteria for inappropriate selection, which was due to the perception of a lack of shared decision-making. Therefore, inappropriate selection of dialysis modality was predominantly observed in patients treated with HD. If these patients would have appropriately selected the modality, the number of patients with PD could have doubled the current one (24 patients, 17% vs 54 patients, 38%).

Table 4 shows the associations between patient characteristics and the appropriateness of the process of dialysis modality selection. We found that age, starting with HD, and not being a candidate for KT were risk factors for potentially ending up on dialysis's inappropriate modality. In contrast, follow-up in the ESKD consultation and information on RRT modalities were associated with ending up on appropriate dialysis. Multivariate analysis confirmed that age was an independent predictor of potentially inappropriate selection of dialysis modalities (adjusted odds ratio 1.05, 95% CI 1.01–1.08, $P = .011$), and information on dialysis options was a protective factor against potentially inappropriate selection (adjusted odds ratio 0.20, 95% CI 0.08–0.48, $P < .001$).

4. Discussion

This study found that the selection of dialysis modalities was appropriate in 78% of the study participants, and inappropriate in the remaining 22%, mainly among patients treated with HD. To our knowledge, this is the first study to explicitly quantify the magnitude and causes of the appropriate and inappropriate selection of dialysis modalities.

The proportion of contraindications for PD was in 17% to 28% range described in the literature,^[12,19] and the most frequent contraindication in our study was abdominal-peritoneal pathology. This result is consistent with that of Oliver et al.^[33] However, Jager et al noted that the most frequent contraindication for PD was the inability to perform PD independently.^[27] In contrast, we observed that only 2% of the patients had self-care barriers and could not perform PD at home. Forbes et al^[34] found that lack of adequate housing was a significant barrier to

Table 2
Characteristics of patients starting dialysis by dialysis modality.

| | PD | | HD | | P value |
|--|--------------|-----------|---------------|-----------|---------|
| | n = 24 (17%) | | n = 117 (83%) | | |
| | n | % | n | % | |
| Sex | | | | | .479 |
| Male | 17 | 71 | 74 | 63 | |
| Female | 7 | 29 | 43 | 37 | |
| Age, median (IQR) | 68 | (56 - 72) | 72 | (60 - 83) | .096 |
| Distance to the nephrology department | | | | | .178 |
| <5 km | 11 | 46 | 75 | 64 | |
| Five a 20 km | 9 | 37 | 25 | 21 | |
| More than 20 km | 4 | 17 | 17 | 15 | |
| Living with | | | | | .108 |
| Alone | 2 | 9 | 10 | 9 | |
| With partner | 20 | 83 | 79 | 67 | |
| With other companions | 1 | 4 | 26 | 22 | |
| In a care facility | 1 | 4 | 2 | 2 | |
| Educational level | | | | | .147 |
| Illiterate/Primary education | 7 | 29 | 36 | 31 | |
| Secondary education | 2 | 8 | 29 | 25 | |
| Middle or higher education | 15 | 63 | 52 | 44 | |
| Karnofsky scale | | | | | .603 |
| ≥60 | 24 | 100 | 110 | 94 | |
| <60 | 0 | 0 | 7 | 6 | |
| Chronic kidney disease etiology | | | | | .373 |
| Diabetic nephropathy | 5 | 21 | 16 | 14 | |
| Glomerular disease | 5 | 21 | 14 | 12 | |
| Polycystic kidney disease | 0 | 0 | 9 | 8 | |
| Vascular | 3 | 12 | 10 | 9 | |
| Other | 4 | 17 | 17 | 14 | |
| Unknown etiology | 7 | 29 | 51 | 43 | |
| Comorbidities | | | | | .108 |
| None | 10 | 42 | 26 | 22 | |
| One comorbidity | 8 | 33 | 40 | 34 | |
| Two or more comorbidities | 6 | 25 | 51 | 44 | |
| Kidney transplant | | | | | .003 |
| Previously transplanted or KT candidate | 19 | 79 | 52 | 44 | |
| Not candidate | 5 | 21 | 65 | 56 | |

HD = hemodialysis, IQR = interquartile range, KT = kidney transplant, PD = peritoneal dialysis.

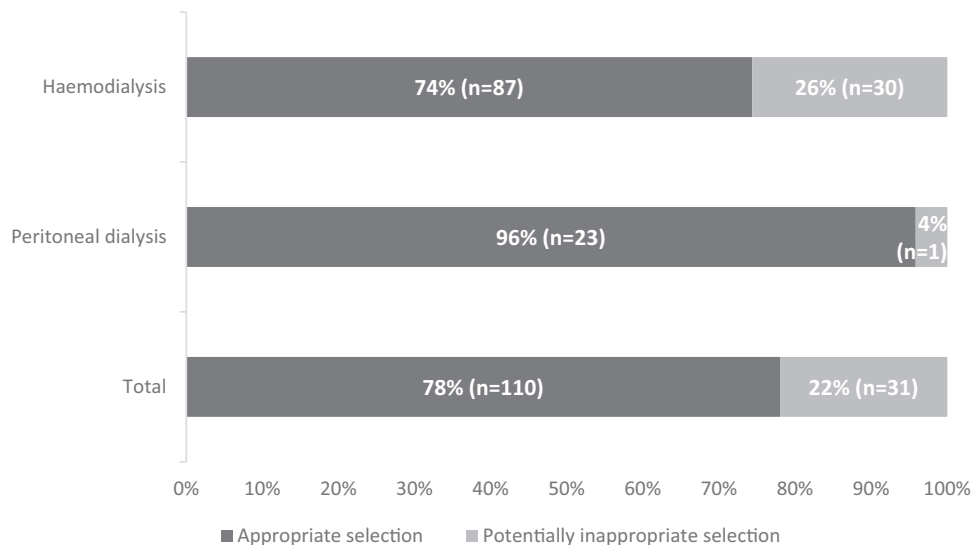


Figure 1. Degree of appropriate and potentially inappropriate selection of dialysis modalities.

implementing PD, reporting that only 29% of homes had the necessary characteristics for this technique. Only 5% of the participants in our study reported home characteristics that contraindicated PD use. Unlike other centers,^[25,35] in our nephrology

department, no home visits are conducted to assess whether the domicile is suitable for PD.

In our study, among patients with appropriate selection of dialysis modality without contraindications, despite receiving

Table 3
Reasons for appropriate and potentially inappropriate selection of dialysis modalities.

| | Dimensions | Reasons | n | % |
|---|---|--|------------|-------------|
| Patients ending up on the appropriate modality of dialysis | 1. Patients with contraindications for dialysis modalities: - Contraindications for HD (n = 0) - Contraindications for PD (n = 40/141; 28%) | Abdominal-peritoneal pathology | 21 | 14.9% |
| | | Severe relative contraindications for PD | 9 | 6.4% |
| | | Unable to perform PD at home, due to: a) Self-care problems (n = 3) b) Home characteristics (n = 7) | 10 | 7.1% |
| | 2. Patients without contraindications or barriers, with complete information and with a voluntary decision (n = 70/141; 50%) | Voluntarily choose HD | 47 | 33.3% |
| | Voluntarily choose PD | 23 | 16.3% | |
| Patients ending up on the potentially inappropriate modality of dialysis | 3. Patients without contraindications or barriers, with deficiencies in the information or the shared decision-making process (n = 31/141; 22%) | Incomplete information about the possible modalities (Started modality: HD = 12; PD = 0) | 12 | 8.5% |
| | | Absence of information about the possible modalities (Started modality: HD = 9; PD = 0) | 9 | 6.4% |
| | | Complete information but the perception of lack of shared decision-making (Started modality: HD = 9; PD = 1) | 10 | 7.1% |
| | | | | |
| Total | | | 141 | 100% |

HD = hemodialysis, PD = peritoneal dialysis.

complete information about the 2 dialysis modalities and after a shared decision-making process, 2-thirds voluntarily opted for HD. The remaining third of the patients without contraindications and who were correctly informed voluntarily opted for PD. It would be interesting to investigate why the patients voluntarily rejected DP. According to expert opinion,^[12,13] PD should reach 30% to 45% of the proportion of patients starting RRT and even 50% if an adequate decision-making process is carried out.^[24,25] Therefore, our results also suggest that higher percentages of PD can be achieved using well-designed strategies based on patient information and a more assertive decision-making process, always respecting patients' values and preferences.

Among patients with inappropriate selection of dialysis modality modalities, almost all started HD. When analyzing the drivers of potential inappropriateness, we observed that the most frequent reason was not receiving adequate information about dialysis modalities. A study conducted by the Spanish Nephrology Nursing Society^[36] reported that 65% of renal patients perceived HD as well (or very well), but only 20% perceived to know PD well (or very well). In our study, the second reason for patients ending up on a potentially inappropriate dialysis modality, and closely related to the level of information, was the perception of a lack of shared decision-making. This patient's perception of unsatisfactory participation in choosing the type of dialysis indicates the need to improve the decision-making process regarding the dialysis modality. In some nephrology departments, these limitations can be explained by structural, resource, or shortcomings. Simultaneously, some physicians may practice a more conservative PD use, especially in patients with advanced age or with specific clinical characteristics. Some authors have described this as physician bias and suggested that it could be a significant modifiable factor promoting PD rates.^[29]

To increase the appropriate use of dialysis modalities, the process of decision-making should be through integrated interdisciplinary renal care programs and interventions.^[29,37] Several decision aids have been designed to facilitate a shared decision-making process.^[38] A study by Prieto-Velasco et al conducted in 26 Spanish hospitals found that after implementing a structured shared decision-making program, the choice between the 2 dialysis modalities led to a 50/50 distribution between PD and HD.^[25] Mann et al recently published a scoping review of strategies to increase PD use and

proposed a 6-step quality improvement initiative to maximize PD utilization.^[39]

Our study showed an independent association between age and potentially ending up on inappropriate dialysis. Previous studies have described the underuse of PD in older adults.^[26,27] The authors reported that the principal reasons for PD underuse in this age group were non-clinical and consisted mainly of incomplete information regarding dialysis modalities and barriers to PD. In our study, correctly informed patients without contraindications for PD, but with a perception of a lack of shared decision-making had a mean age of 81. Although age is a non-modifiable characteristic, it is not a contraindication for the use of PD; therefore, information on both modalities should be offered indistinctly to older adults.^[24] Another independent association found in our study regarding the potential underuse of PD was information about dialysis modalities. This variable was a strong protective factor against inappropriate selection and highlighted the importance of an ESKD consultation unit for increasing PD use. This finding agrees with the efficacy of patient-targeted educational interventions in promoting PD, as described in the literature.^[37] Since none of our objectives was to analyze the causes of inappropriate modality selection, it is possible that we may have missed other potential reasons that could explain the issue.

In the literature, there are nuances and variability in defining clinical situations as contraindications to or barriers to PD. It would help gather more scientific evidence and consensus to specify rational criteria for PD contraindications and barriers, and reduce heterogeneity. Additionally, it would be interesting to qualitatively assess the reasons, values, and preferences of patients with ESKD who voluntarily choose HD over PD when they can choose between the 2 dialysis modalities. As future implications for clinical practice, it is essential to promote ESKD consultations that follow a structured process that provides adequate information on dialysis modalities and is supported by decision aids to facilitate a shared decision-making process. Integrating home assessments for possible PD candidates would also help estimate a high percentage of home problems reported by patients.

This study is the first to explicitly quantify the appropriate and potentially inappropriate use selection of dialysis modalities. We conducted a comprehensive analysis of clinical records and complemented this information using a patient questionnaire. This approach resulted in a valid and reliable tool for evaluating the

Table 4

Association between patients' characteristics and the potentially inappropriate selection of dialysis modalities.

| | Appropriate | | Potentially inappropriate | | OR | CI 95% | P value |
|---|---------------|---------|---------------------------|---------|------|------------|---------|
| | n = 110 (78%) | | n = 31 (22%) | | | | |
| | n | % | n | % | | | |
| Sex | | | | | | 0.29–1.64 | .398 |
| Male | 69 | 76 | 22 | 24 | 1 | | |
| Female | 41 | 82 | 9 | 18 | 0.69 | | |
| Age, median (IQR) | 69 | (58–78) | 78 | (62–85) | 1.03 | 1.01–1.07 | .04 |
| Distance to the hospital | | | | | | | |
| <5 km | 67 | 78 | 19 | 22 | 1 | | |
| Five to 20 km | 28 | 82 | 6 | 18 | 0.76 | 0.27–2.09 | .59 |
| More than 20 km | 15 | 71 | 6 | 29 | 1.41 | 0.48–4.13 | .531 |
| Living with | | | | | | | |
| Alone | 7 | 58 | 5 | 42 | 1 | | |
| With partner | 81 | 82 | 18 | 18 | 0.31 | 0.09–1.10 | .068 |
| With other companions | 20 | 74 | 7 | 26 | 0.49 | 0.12–2.06 | .33 |
| In a care facility | 2 | 67 | 1 | 33 | 0.7 | 0.05–10.01 | .793 |
| Educational level | | | | | | | |
| Illiterate/Primary education | 54 | 81 | 13 | 19 | 1 | | |
| Secondary education | 25 | 81 | 6 | 19 | 0.99 | 0.34–2.93 | .996 |
| Middle or higher education | 31 | 72 | 12 | 28 | 1.61 | 0.65–3.96 | .301 |
| Karnofsky scale grouped | | | | | | | |
| ≥ 60 | 104 | 78 | 30 | 22 | 1 | | |
| < 60 | 6 | 86 | 1 | 14 | 0.58 | | |
| Chronic kidney disease etiology | | | | | | 0.07–4.99 | .618 |
| Diabetic nephropathy | 18 | 86 | 3 | 14 | 1 | 0.10–4.75 | .721 |
| Glomerular disease | 17 | 89 | 2 | 11 | 0.71 | | |
| Polycystic kidney disease | 7 | 78 | 2 | 22 | 1.71 | 0.23–12.55 | .596 |
| Vascular | 9 | 69 | 4 | 31 | 2.67 | 0.49–14.56 | .257 |
| Other | 17 | 81 | 4 | 19 | 1.41 | 0.27–7.26 | .68 |
| Unknown etiology | 42 | 72 | 16 | 28 | 2.29 | 0.59–8.83 | .23 |
| Comorbidities | | | | | | | |
| None | 32 | 89 | 4 | 11 | 1 | | |
| One comorbidity | 32 | 67 | 16 | 33 | 4 | 1.20–13.28 | .024 |
| Two or more comorbidities | 46 | 81 | 11 | 19 | 1.91 | 0.56–6.54 | .301 |
| Chronic kidney disease presentation | | | | | | 0.28–1.46 | .296 |
| Planned | 35 | 73 | 13 | 27 | 1 | | |
| Unplanned | 75 | 81 | 18 | 19 | 0.65 | | |
| End-stage kidney disease consultation | | | | | | 0.14–0.76 | .009 |
| No visits | 26 | 63 | 15 | 37 | 1 | | |
| Periodic visits | 84 | 84 | 16 | 16 | 0.33 | | |
| Information of RRT modalities provided | | | | | | 0.11–0.59 | .001 |
| Not recorded on the clinical chart | 26 | 60 | 17 | 40 | 1 | | |
| Recorded on the clinical chart | 84 | 86 | 14 | 14 | 0.25 | | |
| Starting dialysis modality | | | | | | 1.03–61.28 | .047 |
| Peritoneal dialysis | 23 | 96 | 1 | 4 | 1 | | |
| Hemodialysis | 87 | 74 | 30 | 26 | 7.93 | | |
| Kidney transplant | | | | | | 1.33–7.48 | .009 |
| Previously transplanted or KT candidate | 62 | 87 | 9 | 13 | 1 | | |
| Not a candidate | 48 | 69 | 22 | 31 | 3.16 | | |

CI = confidence interval, IQR = interquartile range, KT = kidney transplant, OR = Odds ratio, RRT = renal replacement treatment.

appropriateness of dialysis modality selection, incorporating the patient's perspective and evidence recommendations. However, our approach has some limitations. First, the study was retrospective in nature, as we relied on information entered in the clinical records. Although we supplemented this information with data from the patients' questionnaires, patient recall when they started dialysis may be incomplete or inaccurate. The number of participants included in the study was the one estimated with the sample calculation. However, given the small number of patients in the study, statistical interpretation and generalizability of the results should be considered with caution. Our findings are also center-specific, given the variation in how education and decision-making are undertaken. A multicenter study with more participants and different approaches to education and decision-making in other settings would support these associations, ensure the usability of our approach, and reinforce the generalizability of our results.

5. Conclusions

In conclusion, our study on the appropriateness of the dialysis modality selection process for ESKD has the potential to increase the use of the PD modality. With better education and shared decision-making, the number of patients on PD in our study could potentially have doubled the current one. Interdisciplinary consultations with structured information processes and shared decision-making should be promoted. Analysis of appropriateness is a good tool for studying PD selection patterns and identifying opportunities to extend its use.

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Author contributions

Conceptualization: Karla Salas-Gama, Juan-Manuel Díaz-Gómez, Ignasi Bolívar Ribas.

Data curation: Karla Salas-Gama, Juan-Manuel Díaz-Gómez.

Formal analysis: Karla Salas-Gama.

Investigation: Karla Salas-Gama.

Methodology: Karla Salas-Gama, Juan-Manuel Díaz-Gómez, Ignasi Bolívar Ribas.

Project administration: Karla Salas-Gama.

Supervision: Ignasi Bolívar Ribas.

Validation: Ignasi Bolívar Ribas.

Writing – original draft: Karla Salas-Gama.

Writing – review & editing: Juan-Manuel Díaz-Gómez, Ignasi Bolívar Ribas.

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