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MESTRADO INTEGRADO EM MEDICINA

Impact of Pre-Transplant Dialysis Modality on Clinical Outcomes in Patients with Kidney Allograft Failure

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M

2026

INSTITUTO DE **CIÊNCIAS BIOMÉDICAS ABEL SALAZAR**

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Junho de 2026

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Dissertação de candidatura ao grau de Mestre em Medicina, submetida ao Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto

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Num. de Identificação: BI30947156
Data: 07-06-2026 20:11:20 +01:00

CHAVE MÓVEL

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Data: 2026-06-07 às 20:06:45

Junho de 2026

AGRADECIMENTOS

Muitas vezes dizem que a escrita de uma tese é um trabalho solitário, mas a minha foi escrita com muitas mãos. Guardei os agradecimentos para o fim pela dificuldade em resumir um percurso que, embora assinado por mim, foi percorrido por muitos.

O meu reconhecimento começa na Dra. La Salete Martins, a bússola inicial deste projeto, e estende-se à Dra. Ana Cunha, a quem serei eternamente grata por me ter acompanhado em toda esta jornada.

Agradeço também aos meus amigos de faculdade, que dividiram comigo cada desafio e cada dúvida. À minha Margarida, deixo um obrigada especial por ser a minha fiel companheira. Obrigada por todas as tardes de verão passadas na biblioteca, por todas as viagens de comboio e por todas as canetas emprestadas. À Rita, o meu GPS neste emaranhado de regras, prazos e congressos; sem a tua ajuda, este caminho teria sido muito mais difícil.

Contudo, o alicerce desta tese não nasceu no hospital ou na faculdade, mas sim nas bases que me sustentam desde sempre. Nela está impressa a determinação e resiliência da minha mãe, a persistência e dedicação do meu pai, a confiança da minha madrinha e a sinceridade do meu irmão. Obrigada por terem sido os meus melhores ouvintes e conselheiros. Não posso deixar de fazer um agradecimento especial à minha mãe, a mulher que me deu o meu nome e me ensinou tudo o que eu sei. Obrigada por me mostrares que posso ser tudo o que eu quiser. Espero conseguir um dia ser para alguém metade do que tu és para mim.

Ao meu Fábio, esta conquista não é minha, é nossa. Obrigada por todas as horas a ouvir as minhas reclamações e por todas as tardes perdidas. Por teres estado presente em cada momento. Obrigada por me mostrares que com paciência tudo se consegue. És a minha paz no meio do caos e por tudo o que és para mim serei eternamente grata a ti.

Por fim, dedico este trabalho ao meu avô, que depende da hemodiálise para permanecer ao nosso lado. Que dures muitos mais anos, sempre com essa vontade de ficar.

A todos os que contribuíram para que este trabalho fosse mais do que apenas papel, o meu eterno obrigada. Conseguimos!

RESUMO

Introdução e Objetivos: O impacto da modalidade dialítica pré-transplante, Hemodiálise (HD) ou Diálise Peritoneal (DP), nos resultados pós-transplante permanece incerto. Alguns estudos sugerem uma vantagem de sobrevivência para a DP, mas a evidência sobre a evolução clínica dos recetores que desenvolvem falência do enxerto é escassa. Este estudo compara a sobrevivência do enxerto e as complicações clínicas, desde o transplante até à falência, estratificadas pela modalidade pré-transplante.

Métodos: Estudo retrospetivo unicêntrico, com 76 doentes adultos, transplantados renais ou rim-pâncreas, com falência do enxerto entre 2014 e 2024. Os 76 recetores foram estratificados pela modalidade pré-transplante (HD=66; DP=10). O desfecho primário foi o tempo de sobrevida do enxerto. Os desfechos secundários incluíram a etiologia da falência, taxa anual de hospitalização, complicações infeciosas e modalidade dialítica escolhida após falência. A análise estatística foi realizada no SPSS (significância: $p<0.05$).

Resultados: A análise revelou homogeneidade quanto ao perfil demográfico e comorbilidades ($p>0.05$). Não se verificaram diferenças estatisticamente significativas na sobrevida mediana do enxerto (HD: 9.0 [AIQ: 12.0] anos vs. DP: 8.0 [AIQ: 4.0] anos; $p=0.460$). As taxas de complicações não revelaram diferenças significativas, incluindo atraso da função do enxerto (HD: 28.8% vs. DP: 30%; $p=1.000$), complicações urológicas (HD: 0% vs. DP: 10%; $p=0.132$) ou eventos vasculares (HD: 3% vs. DP: 0%; $p=1.000$). A taxa anual de hospitalização (HD: 0.61 [AIQ: 1.01] vs. DP: 0.65 [AIQ: 1.21]; $p=0.763$) e a taxa anual de infeções graves (HD: 0.25 [AIQ: 0.58] vs. DP: 0.31 [AIQ: 1.07]; $p=0.835$) foram comparáveis. A rejeição crónica foi a etiologia predominante de falência em ambas as coortes (HD: 78.79% vs. DP: 90%). Após perda do enxerto, observou-se uma associação significativa entre o historial de DP e a retoma a esta modalidade (HD: 1.5% vs. DP: 20%; $p=0.044$).

Conclusões: A modalidade pré-transplante não constitui um determinante independente da sobrevida do enxerto a longo prazo ou do perfil de morbilidade do doente. Todavia, o historial prévio de DP afirma-se como um preditor significativo para a retoma desta técnica após a falência, sublinhando o impacto da literacia técnica. Estes resultados reiteram que a seleção da modalidade inicial deve priorizar a elegibilidade clínica e a preferência do doente, dado que nenhuma das técnicas compromete a longevidade ou o sucesso de um futuro transplante renal.

Palavras-chave: Transplante renal; Falência do enxerto; Hemodiálise; Diálise peritoneal; Sobrevida do enxerto.

ABSTRACT

Background & Aims: The impact of pre-transplant dialysis modality, hemodialysis (HD) or peritoneal dialysis (PD), on post-transplant outcomes remains unclear. Although some studies suggest a survival advantage for PD, evidence regarding the clinical course of recipients who develop graft failure is scarce. This study compares graft survival and clinical complications, from transplantation to failure, stratified by pre-transplant modality.

Methods: A retrospective single-center study evaluated 76 adult patients who underwent kidney or kidney-pancreas transplantation and experienced graft failure between 2014 and 2024. The 76 recipients were stratified by pre-transplant modality (HD=66; PD=10). The primary outcome was graft survival time. Secondary outcomes included the etiology of failure, annual hospitalization rate, infectious complications, and the dialysis modality chosen after graft failure. Statistical analysis was performed using SPSS (significance: $p<0.05$).

Results: The analysis revealed baseline homogeneity in terms of demographic profile and comorbidities ($p>0.05$). No statistically significant differences were observed in median graft survival (HD: 9.0 [IQR: 12.0] years vs. PD: 8.0 [IQR: 4.0] years; $p=0.460$). Complication rates showed no significant differences, including delayed graft function (HD: 28.8% vs. PD: 30%; $p=1.000$), urological complications (HD: 0% vs. PD: 10%; $p=0.132$), or vascular events (HD: 3% vs. PD: 0%; $p=1.000$). The annual hospitalization rate (HD: 0.61 [IQR: 1.01] vs. PD: 0.65 [IQR: 1.21]; $p=0.763$) and the annual rate of major infections (HD: 0.25 [IQR: 0.58] vs. PD: 0.31 [IQR: 1.07]; $p=0.835$) were comparable. Chronic rejection was the predominant cause of failure in both cohorts (HD: 78.79% vs. PD: 90%). Following graft loss, a significant association was observed between a history of PD and the resumption of this modality (HD: 1.5% vs. PD: 20%; $p=0.044$).

Conclusions: The pre-transplant modality is not an independent determinant of long-term graft survival or the patient's morbidity profile. However, the history of PD is a significant predictor of a return to this technique following graft failure, emphasizing the impact of technical literacy. These results reiterate that the selection of the initial modality should prioritize clinical eligibility and patient preference, given that neither technique compromises the longevity or success of a future kidney transplant.

Keywords: Kidney transplantation; Graft failure; Hemodialysis; Peritoneal dialysis; Graft survival.

ABBREVIATIONS

AVF	Arteriovenous Fistula
AVG	Arteriovenous Graft
CKD	Chronic Kidney Disease
CVC	Central Venous Catheter
DGF	Delayed Graft Function
HD	Hemodialysis
IQR	Interquartile Range
PD	Peritoneal Dialysis
RRT	Renal Replacement Therapy
ULSSA	Unidade Local de Saúde de Santo António

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INTRODUCTION

Kidney transplantation is currently recognized as the treatment of choice for renal replacement therapy over dialysis techniques, due to its advantages in terms of survival and quality of life, with preemptive transplantation being the most beneficial option [1–15].

Long-term graft survival depends on multiple factors, such as the interaction between immunological compatibility, organ quality, and clinical management of the recipient's comorbidities [1,5,10,12,16–34]. Despite the increasing longevity of kidney transplants, thanks to advances in pharmacology and personalized care, graft failure and the consequent return to dialysis remain common occurrences, leading to a substantial increase in morbidity and mortality and a significant decline in patients' biopsychosocial well-being [1,8,20,34–45]. The transition back to renal replacement therapy (RRT) is a period of high vulnerability, with a mortality rate three times higher than that observed in patients with a functioning graft, mainly due to cardiovascular causes [40]. This transition requires proactive and protocol-based management to prevent unplanned dialysis initiation and guarantee continuity of care through dedicated consultations [41,43]. Nevertheless, clinical circumstances may sometimes preclude a planned transition [41–43].

The influence of the pre-transplant dialysis modality on clinical transplant outcomes is a key area of research, based on the premise that hemodialysis and peritoneal dialysis are distinct techniques with different repercussions on the patient's vascular, metabolic, and hemodynamic systems [46,47].

Peritoneal dialysis (PD) is distinguished by its continuous nature and its ability to mimic renal physiology, thereby promoting longer preservation of residual renal function [46]. This characteristic is particularly advantageous in the postoperative period, as it facilitates hemodynamical stability [47–51]. However, many of these patients on PD maintain residual kidney function. The maintenance of native kidney diuresis requires careful clinical interpretation in the postoperative period, given its potential to be confounded with allograft urine output, which may initially mask a delayed graft function (DGF) [46,47,49–51]. Nevertheless, patients who have previously undergone PD have a higher volume of abdominal drainage in the postoperative period, which requires clinical monitoring [19,32]. This increase should be interpreted with caution, as it may simply reflect the drainage of residual fluid from a previous PD dwell or, more critically, the presence of a urinary fistula [19,32]. To distinguish between these two conditions, it is essential to perform laboratory tests to measure creatinine and potassium levels in the drainage fluid, thereby ensuring

an accurate differential diagnosis and patient safety [17]. From a technical and metabolic perspective, prolonged use of the peritoneal cavity and exposure to glucose-containing solutions can compromise the patient's metabolic profile and induce intra-abdominal calcifications, potentially increasing the complexity and surgical risks of transplantation [46–48,51]. Added to this scenario is the risk of microbial colonization associated with catheter indwelling and manual dialysate exchanges, factors that increase susceptibility to infectious complications during the perioperative period [47,50,51].

On the other hand, the intermittent nature of hemodialysis (HD) poses specific pathophysiological challenges, such as vascular stunning, which, combined with the dependence on vascular access, can lead to exhaustion of the patient's vascular network and heart failure due to high-flow phenomena [46–49,51,52]. When central venous catheters are utilized, there is an increased risk of infection that can complicate post-transplant recovery, a period during which arteriovenous fistulas also exhibit heightened vulnerability to thrombosis [53]. Currently, the scientific literature maintains an active debate regarding the appropriateness of elective closure of these accesses after successful transplantation, with the procedure being particularly considered for access flow rates exceeding 700 mL/min in patients with stable graft function [54–57].

The choice of dialysis modality should be individualized, weighing clinical efficacy and the patient's lifestyle. PD is generally indicated for younger individuals with active and independent lives, as well as for elderly patients with cardiovascular comorbidities and hemodynamic instability [46,48–50]. It may also be necessary in cases of vascular access failure [58]. In contrast, HD is indicated in cases of compromised peritoneal membrane function, cognitive impairments, or acute graft failure requiring immediate clearance in preemptive transplant recipients [51,59,60]. Ultimately, the final decision must emerge from a shared dialogue, where clinical parameters and the patient's preferences are both taken into consideration. The main advantages and limitations of each technique in the context of kidney transplantation are summarized in Figure 1.

Given the ongoing debate in the literature regarding the role of dialysis history in transplant longevity, this study assesses the impact of the pre-transplant dialysis modality on allograft survival and clinical complications in patients who progress to graft failure, aiming to consolidate scientific evidence for individualized prognosis and optimal clinical management in chronic kidney disease.

METHODS

This observational retrospective study was conducted at the Unidade Local de Saúde de Santo António (ULSSA). Initial sample selection, based on institutional databases, resulted in a cohort of 114 patients. Eligible criteria comprised patients aged 18 or older at transplantation, recipients of isolated kidney transplants or combined kidney-pancreas transplants, who experienced irreversible graft failure between the 1st of January 2014 and the 31st of December 2024. Conversely, pediatric patients and those with incomplete medical records regarding dialysis modality or graft failure history were excluded. After applying these criteria, the final sample consisted of 92 adult patients, recipients of isolated kidney transplants (n=83) or combined kidney-pancreas transplants (n=9).

In order to ensure methodological accuracy, 76 patients were included in the primary statistical analysis, whereas 16 cases (preemptive transplants or early graft failures with a graft survival of 2 months or less) were reserved for a purely descriptive analysis.

The main cohort of 76 patients was stratified into the HD group (n=66), consisting of those who underwent HD exclusively, and the PD group (n=10), which included patients who underwent PD exclusively as well as those exposed to both dialysis modalities, regardless of duration or sequence of such procedures. The analysis evaluated the clinical course from transplantation to graft failure, defined as the return to dialysis or retransplantation. Figure 2 illustrates the study flowchart of the sample selection process.

Data collection was structured in a multidimensional manner, covering demographic variables, nephrological history, and clinical determinants of transplantation. The primary outcome, graft survival, was measured in months from surgery to graft failure. Meanwhile, the annual hospitalization rate was calculated by dividing the total number of hospitalizations, regardless of etiology, by graft survival time in years. Additionally, the study analyzed the etiology of graft failure, delayed graft function, and the occurrence of urological, vascular or major infectious complications. The main independent variable was the pre-transplant dialysis modality. The protocol was approved by the Ethics Committee of ULSSA, ensuring compliance with the General Data Protection Regulation and the Declaration of Helsinki through data anonymization. Statistical analysis was performed using IBM SPSS Statistics software (version 29), with a p-value < 0.05 considered statistically significant.

RESULTS

The statistical analysis focused on a sample of 76 patients who underwent kidney transplantation, stratified according to their pre-transplant dialysis modality: the HD group, consisting of 66 patients (86.8%), and the PD group, comprising 10 patients (13.2%).

The baseline demographic analysis (Table I) reveals homogeneity among the studied groups, with no statistically significant differences observed in the mean age of patients at the time of kidney transplantation (HD: 42.41±14.10 years vs. PD: 37.10±14.63 years; *p*=0.273) or in the age of donors (HD: 49.51±16.91 years vs. PD: 42.57±8.66 years; *p*=0.129). This parity extends to sex distribution (HD: 53% male vs. PD: 50% male; *p*=1.000) and the type of donor used (HD: 87.3% deceased vs. PD: 77.8% deceased; *p*=0.603). Similarly, the burden of major comorbidities, such as diabetes mellitus (HD: 39.4% vs. PD: 40%; *p*=1.000), hypertension (HD: 87.9% vs. PD: 80%; *p*=0.612), cerebrovascular disease (HD: 7.6% vs. PD: 0%; *p*=1.000) and cardiovascular disease (HD: 48.5% vs. PD: 40%; *p*=0.740), was equivalent across cohorts. This homogeneity was maintained in the stratified analysis of cardiovascular morbidity, including ischemic heart disease (HD: 16.7% vs. PD: 10%; *p*=1.000), heart failure (HD: 21.2% vs. PD: 10%; *p*=0.676) and peripheral arterial disease (HD: 21.2% vs. PD: 30%; *p*=0.684).

Regarding the duration of exposure to renal replacement therapies prior to transplantation (Table I), the analyzed groups demonstrated homogeneity. The median total duration of dialysis was 54 months (IQR: 53.50) for the HD group and 38 months (IQR: 60.75) for the PD group, with no statistically significant differences (*p*=0.614). Within the PD group, it is important to note that seven patients underwent a mixed dialysis regimen, with sequential use of both techniques.

The analysis of chronic kidney disease (CKD) etiology (Table II) showed a diverse clinical profile across the study groups. In the HD group, glomerular disease was the leading cause (31.8%), while in the PD group, diabetic nephropathy was predominant (40%).

Concerning post-transplant outcomes (Table III), the median graft survival was 9 years (IQR: 12.00) for the HD group and 8 years (IQR: 4.00) for the PD group, a difference that did not reach statistical significance (*p*=0.460). The incidence of DGF (HD: 28.8% vs. PD: 30%; *p*=1.000) and the occurrence of urological (HD: 0% vs. PD: 10%; *p*=0.132) or vascular (HD: 3% vs. PD: 0%; *p*=1.000) complications were also similar between groups. Additionally, stable serum creatinine levels (HD: 1.70 [IQR: 1.20] mg/dL vs. PD: 1.43 [IQR: 1.27] mg/dL; *p*=0.562), and the estimated glomerular

filtration rate (HD: 40.82±19.56 mL/min/1.73m² vs. PD: 47.00±23.23 mL/min/1.73m²; *p*=0.388) were comparable between the cohorts.

With regard to the profile of morbidity and hospitalization characteristics (Table III), there is a notable statistical parity between the groups, with no significant differences identified in the annual hospitalization rate (HD: 0.61 [IQR: 1.01] vs. PD: 0.65 [IQR: 1.21]; *p*=0.763) or in the median number of inpatient days per year (HD: 5.00 [IQR: 10.83] vs. PD: 6.66 [IQR: 22.78]; *p*=0.470). The annual rate of major infections also did not reach statistical significance (HD: 0.25 [IQR: 0.58] vs. PD: 0.31 [IQR: 1.07]; *p*=0.835), and the incidence of post-transplant malignancies was also similar between the groups (HD: 24.2% vs. PD: 10%; *p*=0.441).

Regarding the causes of hospitalization from transplantation to graft failure (Table IV), graft dysfunction was the main reason for admission in both cohorts, affecting 50% of patients in the HD group and 60% in the PD group. Infectious complications were also highly prevalent across both cohorts, with acute pyelonephritis (HD: 47% vs. PD: 40%) and respiratory infections (HD: 45.5% vs. PD: 50%) constituting major causes of morbidity. Overall, the profile of hospitalizations was comparable between the two pre-transplant modalities.

In terms of the causes leading to irreversible graft loss (Table V), chronic rejection was the predominant cause in both cohorts (HD: 78.79% vs. PD: 90%). In the HD group, recurrence of the primary kidney disease (7.58%) was the second most frequent cause. The incidence of urological complications (HD: 3.03% vs. PD: 10%) was comparable between groups, whereas vascular complications occurred exclusively in the HD group (3.03%). Notably, no episodes of acute rejection were recorded as the primary cause of allograft failure in either modality. Other etiologies, such as BK virus nephropathy (3.03%), calcineurin inhibitor toxicity (1.52%) and non-adherence to therapy (1.52%), showed a low prevalence restricted entirely to the hemodialysis group.

Following graft failure (Table III), a statistically significant difference was observed in the choice of subsequent dialysis modality. Although hemodialysis was the predominant technique in both cohorts, reinstatement of peritoneal dialysis was significantly more frequent in patients with a prior history of this modality (HD: 1.5% vs. PD: 20%; *p*=0.044). Regarding vascular access, arteriovenous fistula (AVF) or arteriovenous venous graft (AVG), was the most used method overall (HD: 75.8% vs. PD: 55.6%; *p*=0.236), although central venous catheter (CVC) utilization was higher in the PD group (PD: 44.4% vs. HD: 24.2%; *p*=0.236). Finally, the proportion of patients who underwent a new transplant after graft failure was low and statistically comparable between the groups (HD: 6.1% vs. PD: 10%; *p*=0.516).

In the group of patients with early graft failure (*n*=12), the majority were on hemodialysis prior to surgery (66.7%) or had undergone preemptive transplantation (25%), with a mean age of 50 years. The leading causes of early allograft loss were vascular complications (75%), followed by acute rejection episodes (16.7%) and urological complications (8.3%). Following graft failure, there was a nearly universal transition to hemodialysis (91.7%), with one death (8.3%) and approximately 42% of these patients were eligible for a new kidney transplant.

Regarding the group of patients who underwent preemptive transplantation (*n*=7), the mean age was 41 years. Three patients (42.9%) experienced early allograft failure due to vascular complications; conversely, the remaining patients (57.1%) demonstrated good long-term outcomes, with graft survival extending up to 26 years. No cardiovascular events occurred in any patient within this preemptive cohort. Following graft loss, all patients transitioned to hemodialysis, with a high proportion of eligible candidates for retransplantation (71.4%) and no deaths recorded.

DISCUSSION

The clinical and demographic homogeneity observed among the groups mitigates the impact of confounding variables, allowing for a reliable comparison of post-transplant outcomes. The key finding of this study is that pre-transplant dialysis modality does not have a decisive influence on long-term renal graft survival or on the patient's morbidity profile. The similarity observed in critical indicators, such as the median allograft survival (*p*=0.460) and the incidence of DGF (*p*=1.000), suggests that the physiological differences between HD and PD dissipate after transplantation. Likewise, the absence of statistically significant differences in annual hospitalization rates reinforces the fact that the post-transplant burden of morbidity is independent of the prior renal replacement therapy. The equivalence in annual rate of major infections indicates that the infectious risk theoretically associated with PD did not affect the patients' clinical stability or their hospitalization profile during the post-transplant period. The predominance of chronic rejection as the primary cause of failure in both groups reiterates that allograft outcomes are primarily dictated by the adaptive immune response and post-transplant clinical management, rather than the patient's dialysis history [34].

The findings suggest that the patient's dialysis history influences the choice of treatment modality following graft failure, demonstrating that a prior history of PD significantly increases the likelihood of returning to this technique (PD: 20% vs. HD: 1.5%; *p*=0.044). This phenomenon reflects not only the preservation of the peritoneal membrane's functional viability during the transplantation period, but also the impact of previously acquired technical literacy and a

preference for maintaining autonomy, since our center does not have a domiciliary HD option [46,48]. This hypothesis is reinforced by the clinical pattern observed in patients undergoing preemptive kidney transplantation, where, in the absence of prior experience with any dialysis method, this subpopulation universally initiated hemodialysis following functional loss of the organ (100%), suggesting that prior modality-specific experience is a decisive factor in the transition to dialysis after graft failure.

HD emerges as the predominant modality following graft failure in both groups (HD: 98.5% vs. PD: 80%), probably as a result of patient preference, prior experience, or the technical ease of initiation, compared with PD, in acute and unplanned transitions (crash-land), which frequently precludes the immediate use of peritoneal dialysis. Notably, CVC utilization in our cohort is low compared with other international centers, but it rises significantly in patients coming from peritoneal dialysis (PD: 44.4% vs. HD: 24.2%), potentially increasing the risk of infectious complications and central vascular stenosis [61]. The lower CVC prevalence among the HD group may be attributed to the preservation of a patent vascular access that lasted from the pre-transplant dialytic period. The management of a functional AVF or AVG following a successful kidney transplant remains a subject of ongoing debate. While some clinicians advocate for its preservation to secure future vascular access, others recommend elective closure to prevent high-output heart failure, particularly in patients with high access blood flow [53]. In this context, PD plays a key role in preserving the patient's vascular network, a finite and critical resource, especially in younger patients. Therefore, PD should be proactively considered for autonomous patients facing allograft failure. This is particularly relevant for those transitioning from previous HD (who, as our study demonstrates, choose PD less frequently) and lack a patent AVF or AVG. As such, these results reinforce the need for proper monitoring and early planning in the event of graft failure. For this purpose, a schematic model (Figure 3) was developed, summarizing a proposed clinical guideline for the management of patients following renal transplant loss. The proposed flowchart is organized into two distinct clinical pathways: planned and unplanned transitions. In planned transitions, driven by chronic conditions, the patient is referred for an informational consultation to learn more about the dialytic options and make an informed decision. Conversely, the unplanned transition pathway focuses on responding to acute events that require immediate dialysis initiation based on current access availability (PD catheter or vascular access), with the ultimate goal of incorporating an informational consultation as soon as clinical stability is achieved.

It is important to clarify that even though our results highlight a clear predominance of HD as the post-failure modality, our center already has a well-stablished informational consultation

that is mandatory for all patients transitioning from kidney transplant to any of the techniques. This informational consultation, conducted by the medical or nursing team, constitutes a crucial step in preparing the patient for RRT. During this session, all available treatment options are explained in detail, using practical demonstrations, such as a simulation of a peritoneal dialysis exchange or a guided tour of the dialysis unit, to bridge the gap between theory and clinical practice. The primary goal of this consultation is to empower patients with enhanced health literacy, enabling them to make autonomous, informed, and well-considered decisions regarding their dialysis modality.

In the group of patients who experienced early graft loss (*n*=12), the predominance of vascular complications (75%) as the direct cause of failure suggests that, at this initial stage, the outcome is determined mainly by technical perioperative factors or organ quality, rather than the overall impact of prior dialytic treatment. In these cases, and exclusively for recipients of a prior living donor transplant, a group of experts evaluates whether the patient should be prioritized for access to a new transplant (Figure 3). Active consideration should be given particularly in cases involving a prior living donor transplant, provided they meet the physical, clinical and immunological conditions for a new transplant. Subsequently, the patient undergoes a transitional period of HD or PD while awaiting a new allograft or until optimal clinical stability is achieved to allow safe reinstatement onto the active waiting list.

In the preemptive group (*n*=7) substantial longevity is observed (up to 26 years); notably, no cardiovascular events occurred, which further supports the cardioprotective effect of avoiding the chronic inflammatory environment of dialysis. Three cases of vascular complications, resulting in early graft loss, were recorded in this group. In such scenarios, the patient may return to conservative management if residual kidney function is preserved or may need to initiate PD or HD.

This study fills an important gap in the literature by detailing the morbidity profile of post-transplant patients and the clinical transition to dialysis following graft failure, demonstrating that both modalities have the same results concerning transplant outcomes. Although certain limitations, such as the retrospective design, the single-center nature, and the small sample size of PD cohort, restrict the generalization of these findings, this research validates the extreme clinical vulnerability of this transition period, regardless of dialysis history. Another limitation of our study is that the PD group included patients with sequential exposure to both PD and HD, a confounding factor that should be addressed separately in further studies to better understand the impact of each technique. Finally, future research should focus on multicenter studies with larger sample sizes, specifically investigating the clinical impact of unplanned transitions (crash-land) versus planned transitions and how both pathways can be optimally managed.

CONCLUSION

In conclusion, this study demonstrates that the pre-transplant dialysis modality is not an independent determinant of long-term renal allograft survival, with comparable clinical outcomes and morbidity rates observed between hemodialysis and peritoneal dialysis cohorts. However, a history of peritoneal dialysis proved to be a significant predictor for resuming this technique after graft loss, highlighting the importance of previously acquired technical literacy and the preservation of autonomy, which reinforces the need for early planning in the event of graft failure. Therefore, the choice of initial modality should continue to prioritize the patient's preference and clinical eligibility, since current evidence shows that neither technique adversely affects the longevity of a future kidney transplant.

This study was selected for an oral presentation at the IJUP conference and a E-poster for the ERA 2026 congress. It has also been submitted to the Luso-Brazilian Transplant Congress for the dissemination of its results to the scientific community.

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TABLES

Table I. Demographic data

	HD (*n*=66)	**PD** (*n*=10)	***p* value**
Recipient age (years), mean ± SD	42.41 ± 14.10	37.10 ± 14.63	0.273
Recipient sex			1.000
Male, *n* (%)	35 (53%)	5 (50%)	
Female, *n* (%)	31 (47%)	5 (50%)	
Donor age (years), mean ± SD	49.51 ± 16.91	42.57 ± 8.66	0.129
Type of donor			0.603
Deceased donor, *n* (%)	55 (87.3%)	7 (77.8%)	
Living donor, *n* (%)	8 (12.7%)	2 (22.2%)	
Diabetes mellitus, *n* (%)	26 (39.4%)	4 (40%)	1.000
Hypertension, *n* (%)	58 (87.9%)	8 (80%)	0.612
Cerebrovascular disease, *n* (%)	5 (7.6%)	0	1.000
Cardiovascular disease, *n* (%)	32 (48.5%)	4 (40%)	0.740
Ischemic heart disease, *n* (%)	11 (16.7%)	1 (10%)	1.000
Heart failure, *n* (%)	14 (21.2%)	1 (10%)	0.676
Peripheral arterial disease, *n* (%)	14 (21.2%)	3 (30%)	0.684
Renal replacement therapy			
Total time on dialysis (months), mdn [IQR]	54.00 [53.50]	38.00 [60.75]	0.614
Total time on HD (months), mdn [IQR]	54.00 [53.50]	12.00 [68.00]	0.045
Total time on PD (months), mdn [IQR]	_____	23.50 [19.50]	0.752

HD, hemodialysis; IQR, interquartile range; mdn, median; PD, peritoneal dialysis; SD, standard deviation.

Table II. Etiology of CKD

	HD (*n*=66)	**PD** (*n*=10)
Glomerular disease, *n* (%)	21 (31.8%)	3 (30%)
Diabetic nephropathy, *n* (%)	13 (19.7%)	4 (40%)
ADPKD, *n* (%)	6 (9.1%)	0
Undetermined, *n* (%)	15 (22.7%)	2 (20%)
Others, *n* (%)	11 (16.7%)	1 (10%)

ADPKD, autosomal dominant polycystic kidney disease; CKD, chronic kidney disease; HD, hemodialysis; PD, peritoneal dialysis.

Table III. Post-transplant and post-failure outcomes

	HD (*n*=66)	PD (*n*=10)	*p* value
Graft survival (years), mdn [IQR]	9.00 [12.00]	8.00 [4.00]	0.460
Early post-transplant outcomes			
Delayed graft function, *n* (%)	19 (28.8%)	3 (30%)	1.000
Urological complications, *n* (%)	0	1 (10%)	0.132
Vascular complications, *n* (%)	2 (3%)	0	1.000
Stabilized creatinine levels mg/dL, mdn [IQR]	1.70 [1.20]	1.43 [1.27]	0.562
GFR mL/min/1.73m², mean ± SD	40.82 ± 19.56	47.00 ± 23.23	0.388
Post-transplant morbidity			
Annual hospitalization rate, mdn [IQR]	0.61 [1.01]	0.65 [1.21]	0.763
Inpatient days per year, mdn [IQR]	5.00 [10.83]	6.66 [22.78]	0.470
Annual rate of major infections, mdn [IQR]	0.25 [0.58]	0.31 [1.07]	0.835
Diagnosis of malignancy, *n* (%)	16 (24.2%)	1 (10%)	0.441
Outcomes after graft failure			
Dialysis modality post graft failure			**0.044**
HD, *n* (%)	65 (98.5%)	8 (80%)	
PD, *n* (%)	1 (1.5%)	2 (20%)	
Vascular access post graft failure			0.236
AVF/AVG, *n* (%)	50 (75.8%)	5 (55.6%)	
CVC, *n* (%)	16 (24.2%)	4 (44.4%)	
New transplant, *n* (%)	4 (6.1%)	1 (10%)	0.516

AVF/AVG, arteriovenous fistula or arteriovenous graft; CVC, central venous catheter; GFR, glomerular filtration rate (calculated using the CKD-EPI creatinine-based equation); HD, hemodialysis; IQR, interquartile range; mdn, median; PD, peritoneal dialysis.

Table IV. Cause of hospitalization

	HD (*n*=66)	**PD** (*n*=10)
Graft dysfunction, *n* (%)	33 (50%)	6 (60%)
Acute pyelonephritis, *n* (%)	31 (47%)	4 (40%)
Respiratory infection, *n* (%)	30 (45.5%)	5 (50%)
Cardiac disease, *n* (%)	17 (25.8%)	2 (20%)
Vascular disease, *n* (%)	11 (16.7%)	2 (20%)

HD, hemodialysis; PD, peritoneal dialysis.

Table V. Etiology of graft failure

	HD (*n*=66)	**PD** (*n*=10)
Chronic rejection, *n* (%)	52 (78.79%)	9 (90%)
Recurrence of primary disease, *n* (%)	5 (7.58%)	0
Urological complications, *n* (%)	2 (3.03%)	1 (10%)
Vascular complications, *n* (%)	2 (3.03%)	0
BK virus nephropathy, *n* (%)	2 (3.03%)	0
Calcineurin inhibitor toxicity, *n* (%)	1 (1.52%)	0
Non-adherence, *n* (%)	1 (1.52%)	0
Acute rejection, *n* (%)	0	0
Other causes, *n* (%)	1 (1.52%)	0

HD, hemodialysis; PD, peritoneal dialysis.

FIGURES

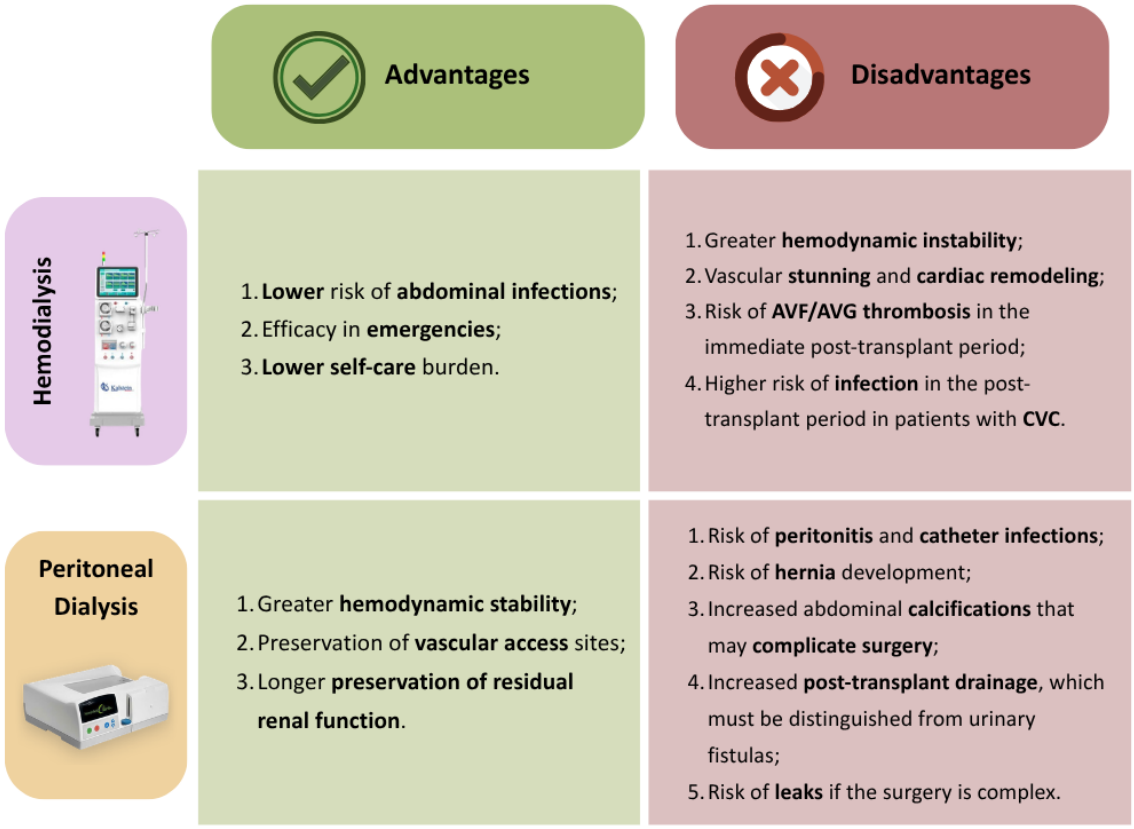

Figure 1. Comparative analysis of hemodialysis vs. peritoneal dialysis

AVF/AVG, arteriovenous fistula or arteriovenous graft; CVC, central venous catheter.

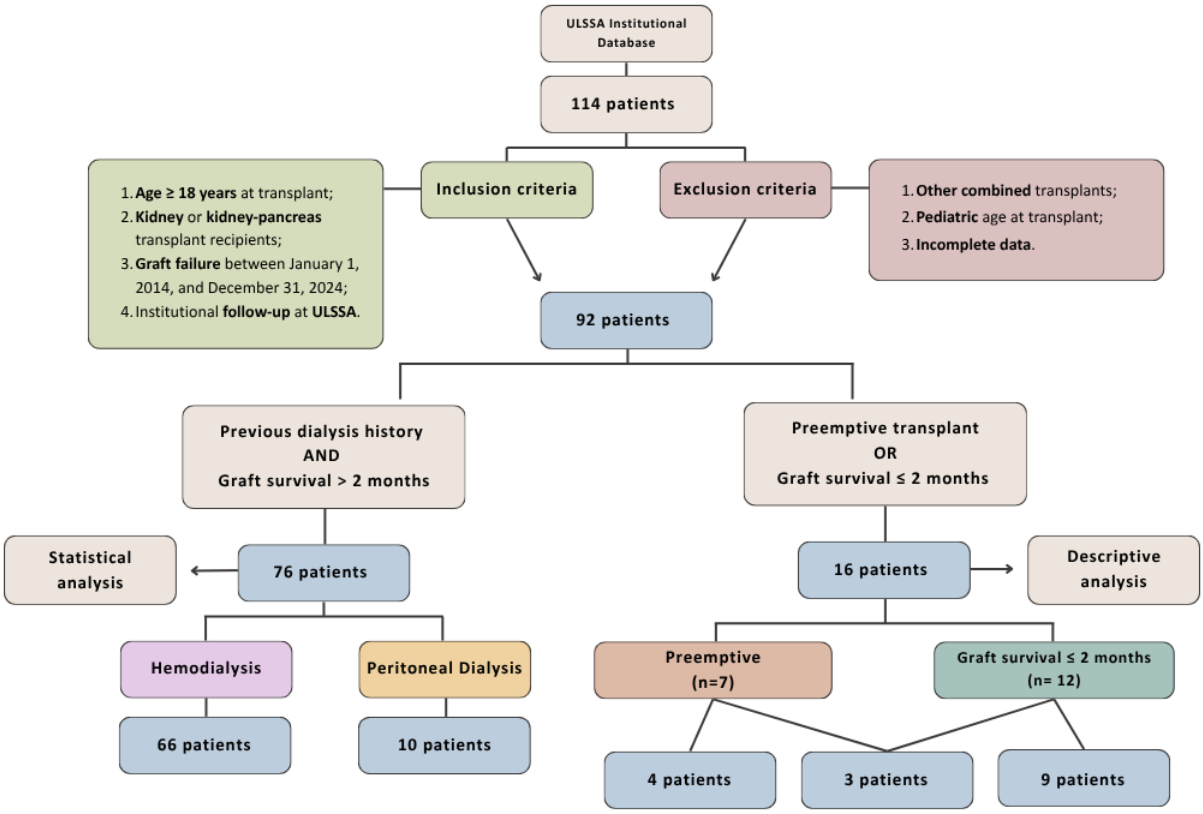

Figure 2. Flowchart of the sample selection, validation and stratification process

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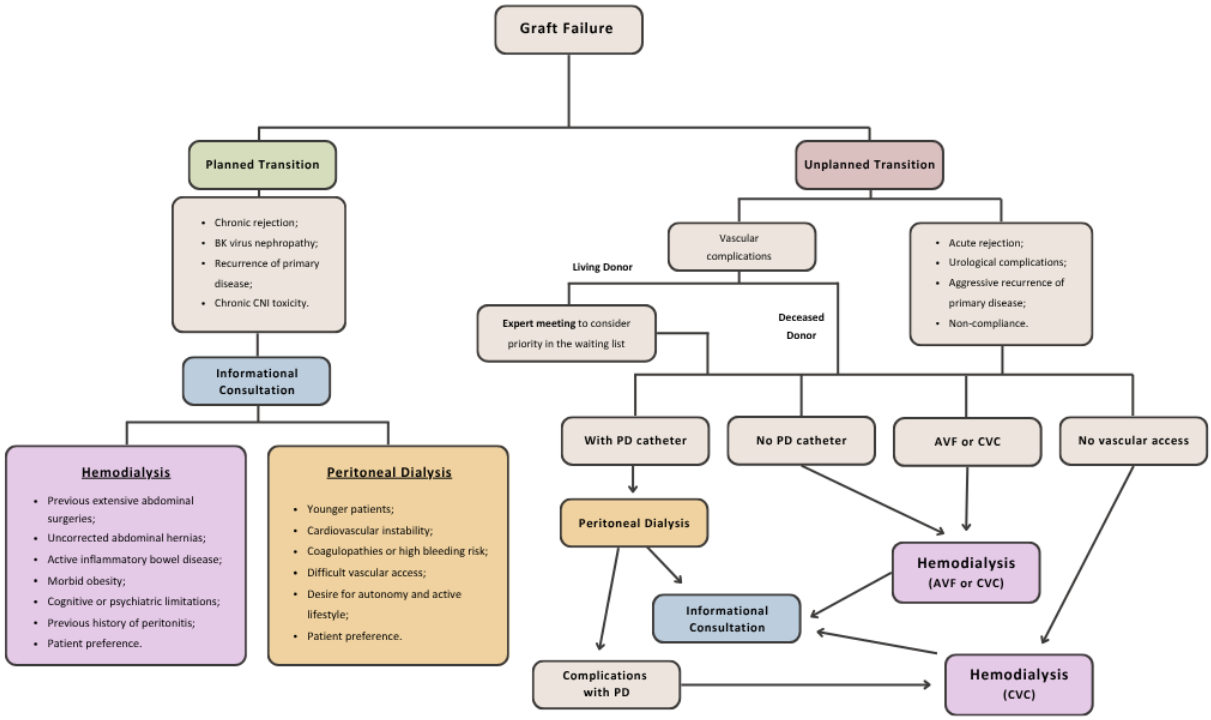

Figure 3. Proposed clinical flowchart for dialysis transition management after graft failure

AVF, arteriovenous fistula; CNI, calcineurin inhibitor; CVC, central venous catheter; PD, peritoneal dialysis.