

Dialysis After Graft Loss in Portugal: A National Survey of Nephrologists' Practices and Perspectives

Ricardo A. Macau^{1,2*}, Inês Carmo Ferreira¹, José Oliveira da Costa², Rita Leal^{3,4}, Sara Gonçalves^{1,2}, Bernardo Silva^{1,2}, Filipe Marques^{1,2}, Fernando Abreu^{1,2}, Alice Santana², José António Lopes^{1,2}

1. Faculdade de Medicina da Universidade de Lisboa, Lisboa, Portugal

2. Serviço de Nefrologia e Transplantação Renal, Unidade Local de Saúde de Santa Maria, Lisboa, Portugal

3. Faculdade de Medicina da Universidade de Coimbra, Coimbra, Portugal

4. Serviço de Nefrologia, Unidade Local de Saúde de Coimbra, Coimbra, Portugal

<https://doi.org/10.71749/pkj.147>

Abstract

Introduction: Kidney graft loss is a leading cause of dialysis initiation — dialysis after graft loss (DAGL) — and is associated with substantial morbidity and mortality. The absence of robust guidelines has resulted in considerable variability in clinical practice. This study aimed to characterize Portuguese nephrologists' perspectives on the best management of DAGL patients.

Methods: We conducted an observational, cross-sectional, web-based descriptive-exploratory study among Portuguese nephrologists using an anonymous online questionnaire. The survey was designed to capture professional opinions rather than to audit actual clinical activity. Closed-ended responses were analyzed descriptively. Free-text comments were examined using inductive thematic analysis.

Results: Fifty-six nephrologists responded. With respect to dialysis initiation, 78.6% indicated that uremic symptoms should take priority over strict eGFR thresholds, and 83.9% considered the choice of dialysis modality to be a case-by-case decision. At stage 5T, 55.5% endorsed an individualized approach to immunosuppression. After graft failure, 53.6% considered progressive immunosuppression weaning when retransplantation was feasible, and 94.7% when it was not. In addition, 33.9% believed DAGL patients have worse survival outcomes than non-DAGL patients. For 80.4% of respondents, the perceived retransplantation rate was below 25%. Finally, 91.1% considered a harmonized national guideline useful.

Conclusion: The findings reveal substantial heterogeneity in professional opinion. Key areas of agreement include multidimensional stage 5T assessment, symptom-guided dialysis initiation, and immunosuppression weaning sequence. The greatest discordance emerged in vascular access planning, comorbidity management, and perceptions of DAGL outcomes. These results support the development of a harmonised, yet flexible, protocol for the management of DAGL patients.

Keywords: Graft Rejection; Kidney Failure, Chronic; Kidney Transplantation; Nephrology; Practice Patterns, Physicians; Renal Dialysis; Renal Replacement Therapy; Surveys and Questionnaires

INTRODUCTION

Chronic kidney disease (CKD) is a global public-health problem, affecting approximately 9.1% of the world population, with rising prevalence.¹ End-stage kidney disease (ESKD), defined by an estimated glomerular filtration rate (eGFR) below 15 mL/min/1.73 m², marks the need for renal replacement therapy.

Kidney transplantation is the gold standard for renal replacement in ESKD, offering substantial advantages in survival and quality of life compared with available dialysis modalities.^{2,3} Despite major progress over recent decades — with first-year graft survival exceeding 95% in reference centers — long-term survival remains suboptimal, with 10-year graft survival of only 50%–60%.^{4,5} As a

Received: 02/06/2026 Accepted: 02/10/2026 Published Online: 19/10/2026 Published: -

* **Corresponding Author:** Ricardo A. Macau | ricardo.macau@ulssm.min-saude.pt | Faculdade de Medicina da Universidade de Lisboa, Avenida Professor Egas Moniz, 1649-028 Lisboa, Portugal

© PKJ 2026. Re-use permitted under CC BY NC 4.0. No commercial re-use.

consequence, an increasing number of patients return to dialysis because of graft failure.

Dialysis after graft loss (DAGL) is currently the fourth most common cause of dialysis worldwide, accounting for 4%–5% of incident dialysis patients.^{6,7} In Portugal, although specific incidence and prevalence data remain limited, the burden is rising, driven by improved transplant recipient survival, greater long-term graft stability, and therapeutic advances in comorbidity management. According to the Portuguese Society of Nephrology registry, in 2025, 166 of 2553 incident haemodialysis patients (6.5%) and 12 of 329 incident peritoneal dialysis patients (3.6%) initiated dialysis after graft failure.⁸ Demographically and clinically, the DAGL population differs from the dialysis population without prior transplantation — typically younger, predominantly male, with a higher burden of comorbidities (notably cardiovascular) and consequences of chronic immunosuppression.^{6,9,10} Mortality is paradoxically high in the immediate post-restart period and declines thereafter. Cardiovascular events and infectious complications together account for more than half of all deaths.^{11,12}

Clinical management is highly complex and characterized by marked variability across countries and centres, reflecting the scarcity of specific guidelines.^{13–15} In their absence, KDIGO recommends an individualized approach integrating clinical and personal criteria, professional experience, and available evidence.¹⁶

Challenges begin with the absence of a consensual definition of graft failure and the limited applicability of eGFR formulas in transplant recipients,¹⁷ extending to dialysis timing^{6,18} and modality selection — with no robust evidence of superiority between hemodialysis and peritoneal dialysis.¹⁹ Immunosuppression management is equally controversial: maintenance preserves residual renal function, prevents graft intolerance syndrome, and minimizes allosensitization, whereas weaning reduces infectious and neoplastic risk and improves metabolic and cardiovascular profile.^{14,15,20} Finally, the decision to perform graft nephrectomy remains controversial, with conflicting evidence regarding its impact on future allosensitization and retransplantation.^{14,21,22}

To date, systematic national data on Portuguese nephrologists' perspectives across the full DAGL care pathway are lacking. A previous national survey²³ addressed practices in immunosuppression withdrawal after graft failure, but other domains of DAGL care — including stage 5T management, dialysis timing and modality, vascular access, comorbidity monitoring, and nephrologists' perceptions of clinical outcomes — remain uncharacterized at the national level. Concurrently, Portuguese cohort data have shown that patients returning to dialysis after graft loss reach end-stage kidney disease in poorer clinical condition than transplant-naïve incident haemodialysis patients, despite shared institutional follow-up.²⁴ This gap limits the identification of regional and institutional disparities and

hampers improvement of care in this area.²⁵ The primary aim of this study was to characterize Portuguese nephrologists' perspectives on what they consider to be the best management of DAGL patients, with a view to identifying research opportunities and supporting the development of national protocols.

METHODS

Study design and population

We conducted an observational, cross-sectional, descriptive-exploratory, multicenter web-based survey using an anonymous self-administered questionnaire addressed to Portuguese nephrologists. The target population comprised physicians with full or partial training in Nephrology, from residents to senior consultants, regardless of years of experience or institutional setting.

The primary objective was to evaluate Portuguese nephrologists' perspectives on what they considered to be the best clinical approaches to kidney graft failure and return to dialysis after transplantation. The questionnaire was designed to capture professional opinions and views on recommended practice rather than to audit actual care delivered, since not all respondents routinely manage DAGL patients. Secondary objectives were to characterize respondents' views on: (1) strategies adopted in the management of stage 5T transplant recipients; (2) criteria and practices regarding dialysis timing and modality in patients with graft loss; (3) immunosuppression approaches before and after graft failure; (4) monitoring and management of comorbidities; and (5) nephrologists' perceptions of DAGL outcomes.

Data collection

The questionnaire was developed by the study authors, drawing on existing KDIGO recommendations¹⁶ and prior national survey work on DAGL management,^{13,23} and was reviewed internally by the author group for content and face validity. It was subsequently piloted with three nephrologists from the authors' department, whose feedback led to revisions in item wording and response format prior to national dissemination. The questionnaire was made available in electronic format via Google Forms® and disseminated by the Portuguese Society of Nephrology (SPN). Data collection took place between 13 February and 22 March 2026. Informed consent was obtained on the first page of the questionnaire, and no data allowing direct or indirect identification of respondents (including IP addresses) were collected. A total of 56 complete questionnaires were obtained. According to the Portuguese Society of Nephrology, active membership at the time of dissemination comprised 569 members. So, the estimated response rate was approximately 9.8% (56/569). Because the invitation was disseminated through the Society's general communication channels rather than

tracked individually, these figures should be interpreted as an estimated ceiling rather than a verified response rate. Closed-ended responses were exported to Microsoft Excel® for data management; tables and graphs were generated with Microsoft Excel® and Matplotlib®. Free-text comments and suggestions provided in the open-ended fields were exported in full and analysed separately using inductive thematic analysis to identify recurring themes and illustrative perspectives.

Sample and statistical analysis

The sample was non-probabilistic and convenience-based, relying on voluntary self-selection of Portuguese nephrologists. Given the exploratory nature of the study, no formal sample-size calculation was performed. Quantitative data from closed-ended items were analysed descriptively, with calculation of absolute (n) and relative (%) frequencies. Given the exploratory nature of the study and the limited size of respondent subgroups, formal comparative analyses across professional or institutional characteristics were not pursued.

Variables were predominantly ordinal and/or nominal categorical, and covered: (1) professional profile; (2) management of stage 5T transplant patients; (3) timing and dialysis modality in patients with graft failure; (4) immunosuppression in stage 5T patients; (5) immunosuppression after graft failure; (6) monitoring and comorbidities; (7) perspectives on outcomes in DAGL; and (8) future priorities.

Because the questionnaire elicited respondents' views on optimal management rather than their documented clinical activity, the data should be interpreted as expressions of perceived best practice and professional opinion. Where the source items asked about institutional resources (e.g. availability of formal education programs or integrated psychological support), responses do reflect local reality; this distinction is highlighted where relevant in the Results.

Free-text comments and suggestions were analyzed using inductive thematic analysis: responses were read repeatedly and independently coded line-by-line by the two first authors, with codes compared and discrepancies resolved by discussion to consensus, before being grouped into broader themes complementing and contextualizing the quantitative findings.

Ethical considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and in full compliance with the General Data Protection Regulation (Regulation (EU) 2016/679). As the research protocol involved no experimental procedures, biological samples or direct intervention in patient care, and did not require access to individual patient data, submission to an Ethics Committee was not required. All participants were informed of

the study objectives and voluntary nature, and electronic informed consent was obtained before completion of the questionnaire. Strict measures safeguarded respondent anonymity and confidentiality, including the non-collection of identifying personal data or IP addresses.

RESULTS

Sample characterization

The total sample consisted of 56 Portuguese nephrologists. Table 1 summarizes respondents' professional profile (years of experience, professional grade, institution type, activity within a renal transplant unit, and number of DAGL patients followed).

Table 1. Characterization of the sample (n = 56) by professional profile.

Variable	Category	n	%
Years of experience in Nephrology	0–5 years	6	10.7%
	6–10 years	9	16.0%
	11–15 years	14	25.0%
	16–20 years	10	17.9%
	> 20 years	17	30.4%
Current professional grade	Specialty trainee (IFE)	3	5.3%
	Hospital Consultant	17	30.4%
	Graduated Hospital Consultant	25	44.6%
	Senior Graduated Hospital Consultant	9	16.1%
	Other	2	3.6%
Institution type	Hospital with kidney transplant program	37	66.1%
	Hospital without kidney transplant program	16	28.6%
	Dialysis center	3	5.3%
	Private sector	0	0%
Main activity within a Renal Transplant Unit	Yes	19	33.9%
	No	37	66.1%
Number of DAGL patients followed	No regular follow-up	7	12.5%
	< 5 patients/year	21	37.5%
	5–15 patients/year	22	39.3%
	> 15 patients/year	6	10.7%

Stage 5T transplant management

Most respondents (64.3%) endorsed a multifactorial assessment (eGFR, decline trend, uremic symptoms and proteinuria) to identify stage 5T transitions, while 28.6% considered an eGFR threshold of 10–15 mL/min/1.73 m² sufficient. As the preferred timing for dialysis access planning, 51.8% favored eGFR 15–20 mL/min/1.73 m² and 37.5% favored delaying to 10–15 mL/min/1.73 m². Routine etiological investigation of graft decline was supported by 39.3%, whereas 55.4% considered it appropriate only for rapid unexplained decline. Regarding institutional resources, 53.6% of respondents indicated that a formal renal replacement therapy education program existed in their primary institution, 19.6% that it was available only informally during consultations, and 26.8% that no such program was in place. A dedicated stage 5T consultation was considered useful by 75%.

Table 2. Perspectives on the clinical management of transplant patients in stage 5T.

Variable	Category	n	%
eGFR threshold for stage 5T definition	> 20 mL/min/1.73 m ²	0	0%
	15–20 mL/min/1.73 m ²	1	1.8%
	10–15 mL/min/1.73 m ²	16	28.6%
	< 10 mL/min/1.73 m ²	3	5.3%
eGFR threshold for dialysis access planning	Multifactorial assessment (eGFR + trend + symptoms + proteinuria)	36	64.3%
	20–25 mL/min/1.73 m ²	5	8.9%
	15–20 mL/min/1.73 m ²	29	51.8%
	10–15 mL/min/1.73 m ²	21	37.5%
Aetiological investigation of graft decline	< 10 mL/min/1.73 m ² or symptom onset	1	1.8%
	Routinely	22	39.3%
	Only if proteinuria > 1 g/day	3	5.3%
	Only if rapid unexplained decline	31	55.4%
Formal RRT education programme (institutional)	No (chronic rejection assumed)	0	0%
	Yes, formal program	30	53.6%
	Yes, informally during consultations	11	19.6%
Dedicated stage 5T consultation considered useful	No program	15	26.8%
	Yes	42	75.0%
	No	14	25.0%

Dialysis restart: timing and modalities

There was strong consensus on the preferred timing for dialysis restart, with 78.6% of respondents indicating that uremic symptoms should take priority over strict eGFR thresholds. Modality selection was considered to be a patient-centered decision by 83.9%, with only 1.8% expressing a rigid preference for haemodialysis or peritoneal dialysis. When asked about the vascular access predominantly observed at dialysis restart in their clinical experience, 58.9% of respondents indicated arteriovenous (AV) fistulas, while 39.3% reported central venous catheters as predominant (30.4% tunnelled CVC, 8.9% urgent/temporary). Incremental haemodialysis was endorsed for patients with preserved residual renal function by 85.7%; 14.3% reported insufficient experience to form a view, and none rejected it on grounds of mortality risk.

Table 3. Perspectives on the timing and modality of dialysis in patients with renal graft failure.

Variable	Category	n	%
eGFR threshold for dialysis initiation after graft failure	< 5 mL/min/1.73 m ²	1	1.8%
	5–10 mL/min/1.73 m ²	8	14.3%
	10–15 mL/min/1.73 m ²	3	5.3%
	Presence of uremic symptoms	44	78.6%
Preferred dialysis modality in DAGL	Hemodialysis	1	1.8%
	Peritoneal dialysis	1	1.8%
	Decision based on patient characteristics	47	83.9%
	No rigid preference	7	12.5%
View on incremental HD in DAGL	Consider if RRF preserved	48	85.7%
	Avoid due to high mortality risk	0	0%
	No significant experience	8	14.3%
Predominant vascular access at restart (observed)	Urgent/temporary CVC	5	8.9%
	Tunnelled CVC	17	30.4%
	AV fistula	33	58.9%
	Prosthesis (PTFE)	1	1.8%

Immunosuppression management (stage 5T and after graft failure)

In stage 5T, a case-by-case individualization approach was favored by 55.5%, selective progressive weaning by 33.9%, and full maintenance or reduced-dose maintenance of all agents by 5.3% each. Striking consensus emerged on the weaning sequence: 89.3% identified mycophenolate mofetil/mycophenolic acid (antiproliferative agents) as the first drug to be discontinued, and 89.3% identified corticosteroids as the last (with 10.7% citing calcineurin inhibitors as the last).

Preferred strategies varied substantially according to re-transplant prospects after graft failure. When retransplantation was anticipated within 12 months, 53.6% considered progressive weaning (antimetabolite discontinuation with reduced doses of other agents) the most appropriate approach, 33.9% favored maintenance of immunosuppression to minimize allosensitization, and 12.5% endorsed gradual dose reduction retaining all classes. When no retransplant was foreseen, consensus strengthened markedly: 94.7% endorsed progressive weaning, 5.3% gradual reduction of all classes, and none considered indefinite maintenance appropriate. Regarding immunological monitoring (HLA/PRA) during weaning, 89.3% considered it warranted only for retransplant candidates, while the remaining respondents indicated that monitoring should be performed after each dose reduction or annually.

Table 4. Perspectives on immunosuppression management in stage 5T and after graft failure (DAGL).

Variable	Category	n	%
Preferred IS strategy in stage 5T	Full IS maintenance	3	5.3%
	Gradual dose reduction, all drugs maintained	3	5.3%
	Preparation for weaning, selective discontinuation	19	33.9%
	Individualised case-by-case approach	31	55.5%
First drug to be discontinued	Mycophenolate mofetil (MMF/MPA)	50	89.3%
	Calcineurin inhibitor	1	1.8%
	mTOR inhibitor	2	3.6%
	No defined protocol	3	5.3%
Last drug to be discontinued	Corticosteroids	50	89.3%
	Calcineurin inhibitor	6	10.7%
	mTOR inhibitor	0	0%
	Indefinite low-dose maintenance of all	0	0%
IS strategy in DAGL with retransplant prospects (≤ 12 months)	Maintenance of IS	19	33.9%
	Gradual reduction, all classes maintained	7	12.5%
	Progressive weaning (antimetabolite discontinuation + dose reduction)	30	53.6%
IS strategy in DAGL without retransplant	Maintenance of IS	0	0%
	Gradual reduction, all classes maintained	3	5.3%
	Progressive weaning	53	94.7%
Immunological monitoring (HLA/PRA) during weaning	Only if retransplant candidate	50	89.3%
	Annual monitoring	1	1.8%
	After each dose reduction/discontinuation	4	7.1%
	Before each dose reduction/discontinuation	1	1.8%

When asked about preferred immunosuppression strategies in DAGL (multiple-choice item), respondents most frequently selected choice based on retransplant prospects (n = 47) and choice based on individual infectious risk (n = 32). Table 5 details the full distribution.

Table 5. Considerations regarding the best immunosuppression strategy(ies) after graft loss (multiple-choice item; respondents could select more than one option).

Variable	n	%
Choice based on retransplant prospects	47	83.9%
Choice based on individual infectious risk	32	57.1%
Progressive weaning	28	50%
Gradual reduction with low-dose maintenance	17	30.4%
Indefinite maintenance (preserve RRF + reduce allosensitization)	11	19.6%

On nephrectomy after graft loss, refractory graft intolerance syndrome was identified as the primary indication by 54 respondents. Avoidance based on surgical risk and residual renal function loss was the most cited deterrent (n = 25). Table 6 details the full distribution.

Table 6. Perspectives on management of nephrectomy after graft loss (multiple-choice item; respondents could select more than one option).

Variable	n	%
In cases of clinical intolerance (graft intolerance syndrome)	54	96.4%
Avoid due to surgical risk and RRF loss	25	44.6%
Routinely before retransplant listing	5	8.9%
When complete IS cessation is desired	1	1.8%

Monitoring and comorbidities in stage 5T

As the preferred hemoglobin target in stage 5T, 69.7% of respondents indicated 10–11 g/dL, 14.3% indicated 11–12 g/dL, 7.1% indicated 9–10 g/dL, and 8.9% indicated that the target should be titrated according to tolerance and residual function. Views on mineral-bone disorder management were heterogeneous: 48.2% considered monitoring with intervention appropriate if PTH > 300 pg/mL, 28.6% endorsed universal use of non-calcium binders plus vitamin D, 19.6% would consider cinacalcet for persistent

elevation, and 3.6% favored expectant management. With respect to institutional resources, 85.8% reported that structured psychological/psychiatric support was not routinely available in their setting, 7.1% reported integrated team support, and 7.1% external referral. Regarding cardiovascular screening before or immediately after dialysis restart, 75% considered that it should be protocolized for all patients, 7.2% would restrict it to symptomatic or diabetic patients, 8.9% to retransplant candidates, and 8.9% would not perform routine screening.

Table 7. Perspectives on monitoring and comorbidity management in stage 5T patients.

Variable	Category	n	%
Target haemoglobin in stage 5T	9 g/dL	1	1.8%
	9–10 g/dL	3	5.3%
	10–11 g/dL	39	69.7%
	11–12 g/dL	8	14.3%
	Titrated according to tolerance and RRF	5	8.9%
Hyperparathyroidism management	Monitor + intervene if PTH > 300 pg/mL	27	48.2%
	Non-calcium binders + vitamin D	16	28.6%
	Cinacalcet if persistently elevated PTH	11	19.6%
	Expectant management	2	3.6%
Psychological/psychiatric support (institutional)	Integrated team	4	7.1%
	External referral	4	7.1%
	Not routinely available	48	85.8%
Cardiovascular screening before/after dialysis restart	Protocolized for all patients	42	75.0%
	Only in symptomatic or diabetic patients	4	7.2%
	Only in retransplant candidates	5	8.9%
	No routine screening	5	8.9%

Perspectives on DAGL outcomes and future priorities

Regarding survival in DAGL versus native dialysis, 41.1% reported insufficient data to respond, 33.9% perceived worse survival in DAGL, 12.5% similar survival, and 12.5% slightly better survival. The primary mortality predictor was identified as pre-existing comorbidities (age, diabetes, cardiovascular disease) by 82.1%, and prior immunosuppression duration by 10.7%. Estimated retransplantation rates were < 10% for 51.8% of respondents, 10%–25% for 28.6%, and 25%–50% for 7.1%. The principal cause of

first-year hospitalization was perceived as cardiovascular (53.6%), followed by non-access infections (28.6%), graft intolerance syndrome (10.7%), and vascular access complications (7.1%). A harmonized national guideline was considered very useful by 30.4% and useful with flexibility for local adaptation by 60.7%; 5.3% were neutral and 3.6% did not consider it helpful.

Table 8. Perspectives on outcomes in DAGL patients and usefulness of a national guideline.

Variable	Category	n	%
DAGL vs native-dialysis survival (perception)	DAGL has worse survival	19	33.9%
	Similar	7	12.5%
	DAGL slightly better	7	12.5%
	Insufficient data	23	41.1%
Main predictor of mortality in DAGL	Advanced age	2	3.6%
	Pre-existing comorbidities	46	82.1%
	Absence of residual renal function	0	0%
	Infection	2	3.6%
	Duration of prior immunosuppression	6	10.7%
Estimated retransplantation rate	< 10%	29	51.8%
	10%–25%	16	28.6%
	25%–50%	4	7.1%
	> 50%	0	0%
	Not applicable	7	12.5%
Main cause of first-year hospitalisation	Vascular access complications	4	7.1%
	Non-access infections	16	28.6%
	Cardiovascular complications	30	53.6%
	Graft intolerance syndrome	6	10.7%
	Oncological disease	0	0%
Usefulness of a harmonised national guideline	Yes, very useful	17	30.4%
	Yes, with flexibility for local adaptation	34	60.7%
	Neutral	3	5.3%
	No	2	3.6%

When asked about priorities for improving DAGL outcomes (multiple-choice item), respondents most frequently identified enhanced coordination between transplant and

dialysis teams (n = 42, 75%) and harmonized immunosuppression protocols (n = 37, 66.1%). Table 9 details the full distribution.

Table 9. Priorities identified by Portuguese clinicians for improving outcomes in DAGL patients (multiple-choice item; respondents could select more than one option).

Variable	n	%
Improved coordination between transplant and dialysis teams	42	75.0%
Harmonised immunosuppression protocol	37	66.1%
Structured psychosocial support	31	55.4%
Early vascular access creation for all DAGL patients	31	55.4%
Prospective research on optimal dialysis restart timing	21	37.5%

Qualitative analysis of clinical challenges

Regarding the greatest clinical challenge in DAGL, 28 free-text responses were obtained, sometimes citing multiple challenges simultaneously: immunosuppression management (10), patient acceptance of dialysis restart (5), loss of follow-up after transfer to outpatient haemodialysis units (4), cardiovascular risk and disease management (3), dialysis restart timing (3), psychological management (3), management of retransplantation

expectations (2), CKD complications on dialysis (1), and oncological risk (1).

DISCUSSION

Overview: the paradox of successful renal transplantation The DAGL population has gained increasing relevance in global nephrology, illustrating the therapeutic paradox in which improvements in graft survival inevitably lead to

functional graft exhaustion and return to dialysis. In Portugal — among the European countries with the highest kidney transplantation rates — DAGL accounted for 6.5% of incident hemodialysis and 3.6% of incident peritoneal dialysis starts in 2025.⁸ Despite this clinical burden, systematic data on Portuguese nephrologists' perspectives have remained scarce.

This study represents the first comprehensive, multidomain national characterization of Portuguese clinicians' perspectives on stage 5T transplant recipients and DAGL management, extending earlier work that was restricted to immunosuppression withdrawal.²³ The findings confirm international trends, revealing a duality of substantial heterogeneity in professional opinion alongside areas of robust consensus, mirroring the current evidence base in which clinician expertise and individualized assessment remain central.^{6,13-15}

Sample characteristics and representativeness

The final sample of 56 respondents showed relatively balanced experience but a predominance of seasoned clinicians, with 73.3% reporting more than 10 years of experience and 60.7% holding senior consultant grades. Institution types — 66.1% transplant hospitals, 28.6% non-transplant hospitals, and 5.3% dialysis centers — align with national registry data concentrating DAGL cases in specialized centers. Approximately half of respondents managed five or more DAGL patients annually, 37.5% fewer than five, and 12.5% none regularly. This limited individual exposure, combined with DAGL's clinical complexity, underscores the need for inter-center knowledge sharing and harmonized national guidelines.

Stage 5T transplant management

Identifying the transition to stage 5T poses a major obstacle because of the lack of universal definition. While 64.3% of respondents endorsed a multifactorial assessment as proposed by Leal,¹³ 28.6% considered an eGFR threshold of 10–15 mL/min/1.73 m² sufficient, highlighting a perceived gap in the uptake of integrated criteria. Accurate identification critically influences the timing of renal replacement therapy planning, since delays consistently associate with worse outcomes.

Regarding access planning, 51.8% considered that planning should start at eGFR 15–20 mL/min/1.73 m² (in line with KDIGO stage 4 recommendations), while 37.5% favored delaying it to 10–15 mL/min/1.73 m². Given that graft decline is often abrupt and unpredictable, later planning risks inadequate AV-fistula maturation or peritoneal catheter adaptation. This concern is reinforced by cohort data showing substantial mortality reduction with AV fistula starts compared with central venous catheter starts, particularly in the first 30 days post-transition.

A formal renal replacement therapy education program was reported to be absent in the institution of 26.8% of

respondents. This is consistent with evidence that DAGL patients often restart dialysis in poorer clinical condition and with less pre-dialysis preparation than transplant-naïve patients.^{24,26,27} The predominantly positive response (75%) regarding the utility of dedicated stage 5T consultations supports systematic investment in this area, in line with international recommendations.^{28,29}

Dialysis restart: timing and modalities

The strong consensus on symptom-prioritized dialysis initiation (78.6%) aligns with the KDIGO individualized framework and avoids the early-dialysis paradox, in which sicker patients (with higher eGFR at initiation) experience worse outcomes.^{6,16,18} The endorsement of a patient-centered approach to modality selection by 83.9% reflects sophisticated clinical reasoning that incorporates analytics, prior access viability, disease kinetics, and sociodemographic context, and matches evidence showing no medium- or long-term survival advantage of one modality over the other.

Respondents indicated that AV fistulas were the predominant access at restart in their clinical experience (58.9%), apparently outperforming international benchmarks. Nonetheless, the 39.3% who identified central venous catheters as predominant signals room for optimization through systematic monitoring of previous accesses and early placement of definitive accesses in patients with predictable trajectories.^{30,31} Broad endorsement of incremental hemodialysis (85.7%) reflects alignment with emerging data on the prognostic value of residual renal function^{32,33} and positions this strategy as a promising innovation in DAGL.

Immunosuppression management

Immunosuppression management is one of the most complex and least consensual domains in DAGL care, lacking robust universal guidelines and requiring multifactorial risk-benefit assessment. In stage 5T, 55.5% favored case-by-case individualization and 33.9% selective progressive weaning, reflecting both recognition of the need for individualized strategies and a stepwise consensus in the absence of standardized protocols. Striking consensus emerged on the weaning sequence: antiproliferative agents (MMF/MPA) are typically discontinued first to minimize toxicity and infection risk, while corticosteroids are discontinued last to prevent graft intolerance syndrome and adrenal insufficiency, and to preserve residual renal function.

Post-failure immunosuppression management requires balancing residual renal function preservation and prevention of allosensitization, graft intolerance syndrome and adrenal insufficiency against minimized risks of infection, malignancy and cardiovascular events.^{20,34} Strategies varied substantially according to retransplant prospects: for 12-month retransplant candidates, 53.6% favored

progressive weaning with antimetabolite discontinuation; without retransplant prospects, consensus strengthened to 94.7% favoring progressive weaning. These approaches align with the literature: maintenance benefits early retransplant candidates by minimizing allosensitization, whereas prolonged exposure without retransplant prospects yields an unfavorable risk-benefit profile owing to heightened infectious and neoplastic vulnerability without immunological gain.^{20,34} The heterogeneity among retransplant candidates mirrors the fragility of the evidence regarding peri-discontinuation allosensitization risk and its true impact on retransplant success.^{9,14} A previous national survey focused exclusively on immunosuppression withdrawal reported that, when faced with a patient returning to dialysis after graft loss, all participants immediately discontinued the antiproliferative agent, 66.7% maintained the calcineurin inhibitor (CNI) plus prednisolone, and 33.3% maintained prednisolone alone; among those continuing CNI, half (46.6%) weaned it within 6–12 months, while 64.3% maintained corticosteroids indefinitely or until graft removal.²³ Our findings extend that earlier work by stratifying immunosuppression strategy according to retransplant prospects and by capturing the broader spectrum of DAGL care, and broadly reinforce the trend towards progressive weaning, particularly in non-retransplant candidates.

Immunological monitoring (HLA/PRA) during weaning was considered warranted only for retransplant candidates by 89.3% of respondents, overlooking *de novo* sensitization and its association with worse long-term outcomes in the broader population.^{35,36} Logistical constraints and laboratory turnaround likely explain this gap more than deliberate omission, meriting targeted investment for correction.

Nephrectomy indications and perspectives

Nephrectomy in the context of graft failure remains highly debated, with conflicting evidence on its impact on survival, allosensitization, and future retransplantation. Respondents identified refractory graft intolerance syndrome as the primary indication, with strong consensus, and cited surgical risk and residual renal function loss as the main deterrents. Only one respondent considered nephrectomy necessary specifically to enable immunosuppression cessation.

This response profile shows marked adherence to classical indications — graft intolerance syndrome, graft sepsis, refractory hyperacute/acute rejection, thrombosis with non-viability, and intragraft neoplasia — while reluctance reflects awareness of the technique's high morbidity (17%–69%) and perioperative mortality (1.5%–14%).^{14,15,22}

Monitoring and comorbidity management in stage 5T Respondents' preferred hemoglobin targets aligned with the liberal KDIGO range, with 69.7% indicating 10–11 g/dL as the most appropriate target. This is consistent with lower pre-dialysis hemoglobin and graft-failure-induced

erythropoietin resistance due to chronic inflammation.^{26,37,38} Views on mineral-bone disorder management showed substantial heterogeneity, reflecting the absence of national protocols and gaining urgency in patients on prolonged corticosteroid therapy who are susceptible to complex renal osteodystrophy. Of note, a recent Portuguese single-centre comparative study reported that, among incident hemodialysis patients with a failed graft, anaemia was less frequently corrected with erythropoiesis-stimulating agents (37% vs 58% in transplant-naïve incident patients with hemoglobin < 10 g/dL), hyperparathyroidism was less often managed with vitamin D analogs or calcimimetics, and hyperphosphataemia was less commonly treated with phosphate binders, despite both groups being followed by the same nephrology team.²⁴ These findings suggest that, although Portuguese nephrologists endorse appropriate targets for stage 5T comorbidities, translation into real-world clinical practice remains incomplete and warrants targeted institutional efforts.

The scarcity of structured psychological/psychiatric support emerged as a major deficiency, with 85.8% reporting that such support is not routinely available. This stark gap contrasts with the documented “second loss” experience following graft failure, which compromises quality of life and adherence at dialysis restart.^{29,28} Universal protocolized cardiovascular screening was endorsed by 75% of respondents, with substantial mortality-reduction potential if extended consistently across centers.

Perspectives on DAGL outcomes

Perception of survival in DAGL versus native dialysis revealed alarming data gaps, with 41.1% of respondents lacking comparative survival data — highlighting limitations of national registries with parallels internationally. Among those providing a response, perceptions mirrored the literature ambiguity.^{11,12,37,39} Primary mortality predictor consensus (82.1%) favored pre-existing comorbidities, in line with multivariate analyses in the literature.^{11,12} Notably, residual renal function was not cited as a primary predictor, possibly because comorbidity burden dilutes its isolated perceived impact. Recent Portuguese cohort data lend objective support to this perception: in a single-centre study of patients initiating hemodialysis after graft failure, the Clinical Frailty Scale (CFS) was an independent predictor of both hospitalization and mortality at two years, while the Charlson Comorbidity Index (CCI) was strongly associated with mortality, with a cut-off of CCI ≥ 8 stratifying patients at substantially higher early mortality risk (AUC 0.95).⁴⁰ These findings reinforce the value of systematically integrating frailty and comorbidity assessment at the time of graft failure, which may help to identify patients who would benefit from intensified multidisciplinary support, conservative kidney management discussions, or proactive retransplantation planning.

Perceptions of first-year admission etiologies identified cardiovascular and non-access infectious complications as responsible for more than 50% of mortality and hospitalization — consistent with published data.^{11,12,39}

Future priorities and the relevance of national guidelines Portuguese nephrologists overwhelmingly support the development of a harmonized national guideline (91.1%). Such a document should standardize consensus areas — namely immunosuppression weaning protocols, access planning, and formal patient education programs — while preserving clinical individualization in more ambiguous domains such as dialysis restart timing, nephrectomy indications, and management of retransplant candidates. Open responses on the greatest DAGL challenges converged with the identified priorities, with immunosuppression management as the leading clinical hurdle, followed by patient acceptance of dialysis restart, loss of follow-up after transfer to outpatient units, cardiovascular risk management, dialysis restart timing, and psychological support needs.

Strengths and Limitations

This is a comprehensive, multidomain national survey of Portuguese nephrologists' perspectives on DAGL management, building on and extending an earlier national survey regarding immunosuppression management.²³ Its strengths include national dissemination via the SPN, broad representation across institutional settings, and integration of quantitative and qualitative analyses.

Several limitations should be acknowledged. The cross-sectional descriptive-exploratory design precludes causal inference. The convenience, self-selected non-probabilistic sample introduces potential selection bias, possibly overrepresenting clinicians with particular interest in DAGL. The modest sample size ($n = 56$) limits statistical power. Using Portuguese Society of Nephrology membership data with 569 active members, the estimated response rate was 9.8%. However, because the invitation was disseminated through general Society communication channels rather than tracked individually, true representativeness relative to the underlying population of practicing nephrologists cannot be formally assessed. Reliance on mostly closed-ended items with predefined options risks response bias, and the survey was deliberately designed to capture respondents' views on optimal management rather than to audit their actual clinical activity; the data should therefore be interpreted as expressions of perceived best practice and may not coincide with care delivered at the bedside. Additionally, two items: the hemoglobin target and PTH-threshold-based CKD-MBD management questions reduced inherently individualized, trend-based clinical decisions to single-threshold or single-target response options and the resulting response distributions may partly reflect this constrained item format rather than genuine disagreement in clinical

reasoning. Patient-level outcome data were beyond the scope of this study. The absence of geographic and institutional respondent distribution hinders identification of regional disparities. Finally, 12.5% of respondents did not regularly manage DAGL patients; their inclusion is consistent with the study's focus on professional opinion rather than current practice, but may have influenced the results in an uncontrolled manner.

Future Perspectives

Research on DAGL remains suboptimal, with multiple evidence gaps requiring national and international collaborative efforts. The most prominent limitation — the lack of systematized clinical data on the Portuguese DAGL population — supports the development of a dedicated national registry capturing demographic, clinical and laboratory data from stage 5T, graft failure and dialysis restart, including detailed immunosuppression weaning strategies (timing, sequence and agents). Future studies should prioritize multicenter analyses and prospective designs with probabilistic sampling and structured longitudinal follow-up, correlating implemented practices with clinical outcomes such as global survival, retransplantation rates, residual renal function evolution, quality of life, and cause-specific morbidity and mortality.

CONCLUSION

This study represents a comprehensive national survey to date of Portuguese nephrologists' perspectives on what they consider to be best practice in the management of patients with kidney graft failure and return to dialysis (DAGL). Overall, the results reveal substantial heterogeneity in professional opinion across centers, consistent with international literature and reflecting evidence limitations in several domains, while also identifying multiple consensus axes.

Key areas of agreement include multidimensional stage 5T assessment, symptom-guided dialysis initiation, personalized dialytic modality selection, immunosuppression weaning sequence, and recognition of pre-existing comorbidities as the primary mortality predictor. The greatest discordance emerged in vascular access timing and planning, stage 5T comorbidity management, and DAGL outcome perceptions — highlighting the gaps in robust prospective registries.

These observations underscore the need for evidence-based national guidelines that are uniform yet flexible enough to accommodate individual patient characteristics and clinical expertise. Portugal's established transplantation experience positions it favorably to lead DAGL practice harmonization through robust, clinically coherent protocols. Three main axes should be operationalized: (1) clinical standardization through institutional and national guidelines on stage 5T management and DAGL immunosuppression; (2) investment in integrated

multidisciplinary structures uniting medical and nursing teams to mitigate care fragmentation at dialysis restart; and (3) development of a national prospective DAGL registry for epidemiological characterization, therapeutic strategy monitoring, and efficacy assessment. Collectively,

these measures will enable the identification of optimal practices, whose implementation could yield tangible improvements in outcomes and quality of life for DAGL patients through the evidence-based, humanized approach this population requires.

Acknowledgments

Artificial intelligence tools were used solely for English language editing.

Ethical Disclosures

Conflicts of Interest: The authors have no conflicts of interest to declare.

Financing Support: This work has not received any contribution, grant or scholarship

Confidentiality of Data: The authors declare that they have followed the protocols of their work center on the publication of patient data.

Protection of Human and Animal Subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and those of the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in 2024).

Provenance and Peer Review: Not commissioned; externally peer-reviewed.

Contributorship Statement

All authors approved the final version of the manuscript for publication and assume responsibility for all aspects of the work, ensuring the accuracy and integrity of the data presented.

REFERENCES

1. GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2020;395:709–33. doi:10.1016/S0140-6736(20)30045-3
2. Wolfe RA, Ashby VB, Milford EL, Ojo AO, Ettenger RE, Agodoa LY, et al. Comparison of mortality in all patients on dialysis, patients on dialysis awaiting transplantation, and recipients of a first cadaveric transplant. *N Engl J Med*. 1999;341:1725–30. doi: 10.1056/NEJM19991203412303.
3. Laupacis A, Keown P, Pus N, Krueger H, Ferguson B, Wong C, Muirhead N. A study of the quality of life and cost-utility of renal transplantation. *Kidney Int*. 1996;50:235–42. doi: 10.1038/ki.1996.307.
4. Coemans M, Süsal C, Döhler B, Anglicheau D, Giral M, Bestard O, et al. Analyses of the short- and long-term graft survival after kidney transplantation in Europe between 1986 and 2015. *Kidney Int*. 2018;94:964–73. doi: 10.1016/j.kint.2018.05.018.
5. Lamb KE, Lodhi S, Meier-Kriesche HU. Long-term renal allograft survival in the United States: a critical reappraisal. *Am J Transplant*. 2011;11:450–62. doi: 10.1111/j.1600-6143.2010.03283.x.
6. Tanriover C, Copur S, Basile C, Ucku D, Kanbay M. Dialysis after kidney transplant failure: how to deal with this daunting task? *J Nephrol*. 2023;36:1777–87. doi: 10.1007/s40620-023-01758-x.
7. Collins AJ, Foley RN, Gilbertson DT, Chen SC. United States Renal Data System public health surveillance of chronic kidney disease and end-stage renal disease. *Kidney Int Suppl*. 2015;5:2–7. doi: 10.1038/kisup.2015.2.
8. Gabinete de Registo da Sociedade Portuguesa de Nefrologia. Relatório Anual 2025. Lisboa: Sociedade Portuguesa de Nefrologia; 2026.
9. Schrezenmeier E, Lehner LJ, Merkel M, Mayrdorfer M, Duettmann W, Naik MG, et al. What happens after graft loss? A large, long-term, single-center observation. *Transpl Int*. 2021;34:732–42. doi: 10.1111/tri.13834.
10. Johansen KL, Chertow GM, Gilbertson DT, Ishani A, Israni A, Ku E, et al. US Renal Data System 2022 Annual Data Report: Epidemiology of Kidney Disease in the United States. *Am J Kidney Dis*. 2023;81:A8–A11. doi: 10.1053/j.ajkd.2022.12.001.
11. Kabani R, Quinn RR, Palmer S, Lewin AM, Yilmaz S, Tibbles LA, et al. Risk of death following kidney allograft failure: a systematic review and meta-analysis of cohort studies. *Nephrol Dial Transplant*. 2014;29:1778–86. doi: 10.1093/ndt/gfu205.
12. Gill JS, Abichandani R, Kausz AT, Pereira BJ. Mortality after kidney transplant failure: the impact of non-immunologic factors. *Kidney Int*. 2002;62:1875–83. doi: 10.1046/j.1523-1755.2002.00640.x.
13. Leal R, Pardinhas C, Martinho A, Sá HO, Figueiredo A, Alves R. Challenges in the Management of the Patient with a Failing Kidney Graft: A Narrative Review. *J Clin Med*. 2022;11:6108. doi: 10.3390/jcm11206108.
14. Pham PT, Everly M, Faravardeh A, Pham PC. Management of patients with a failed kidney transplant: Dialysis reinitiation, immunosuppression weaning, and transplantectomy. *World J Nephrol*. 2015;4:148–59. doi: 10.5527/wjn.v4.i2.148.
15. Bunthof KL, Hazzan M, Hilbrands LB. Review: Management of patients with kidney allograft failure. *Transplant Rev*. 2018;32:178–86. doi: 10.1016/j.trre.2018.03.001.
16. Drüeke TB, Parfrey PS. Summary of the KDIGO guideline on anemia and comment: reading between the (guide)line(s). *Kidney Int*. 2012;82:952–60. doi: 10.1038/ki.2012.270.
17. Haller MC, Kainz A, Baer H, Oberbauer R. Dialysis Vintage and Outcomes after Kidney Transplantation: A Retrospective Cohort Study. *Clin J Am Soc Nephrol*. 2017;12:122–30. doi: 10.2215/CJN.04120416.
18. Chan CT, Blankestijn PJ, Dember LM, Gallieni M, Harris DC, Lok CE, et al. Dialysis initiation, modality choice, access, and prescription: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference. *Kidney Int*. 2019;96:37–47. doi: 10.1016/j.kint.2019.01.017.

19. Perl J, Dong J, Rose C, Jassal SV, Gill JS. Is dialysis modality a factor in the survival of patients initiating dialysis after kidney transplant failure? *Perit Dial Int.* 2013;33:618-28. doi: 10.3747/pdi.2012.00280.
20. Ryu H, Kim YC, Moon JJ, Song EY, Min SI, Ha J, et al. Weaning Immunosuppressant in Patients with Failing Kidney Grafts and The Outcomes: A Single-Center Retrospective Cohort Study. *Sci Rep.* 2020;10:6425. doi: 10.1038/s41598-020-63266-3.
21. Ayus JC, Achinger SG, Lee S, Sayegh MH, Go AS. Transplant nephrectomy improves survival following a failed renal allograft. *J Am Soc Nephrol.* 2010;21:374-80. doi: 10.1681/ASN.2009050480.
22. Johnston O, Rose C, Landsberg D, Gourlay WA, Gill JS. Nephrectomy after transplant failure: current practice and outcomes. *Am J Transplant.* 2007;7:1961-7. doi: 10.1111/j.1600-6143.2007.01884.x.
23. Leal R, Venda J, Sá HO, Figueiredo A, Alves R. Perspectives in Immunosuppression Management Following Renal Graft Failure: A Portuguese National Survey. *Kidney Int Rep.* 2024;9:2303-4. doi: 10.1016/j.ekir.2024.05.015.
24. Silva AR, Guedes Marques M, Rodrigues L, Santos L, Romãozinho C, Caramelo F, et al. Chronic kidney disease management in patients with a failing graft: a comparative study with incident non-transplant hemodialysis patients. *Ren Fail.* 2025;47:2447791. doi: 10.1080/0886022X.2024.2447791.
25. Gittus M, Bailey PK, Griffin S. Management of patients with a failing kidney transplant: a survey of UK-based renal units. *Nephrol Dial Transplant.* 2023;38:2086-8. doi: 10.1093/ndt/gfad084.
26. Caldés Ruisánchez S, Marcén Letosa R, Amezcua Orjuela Y, Fernández Lucas M, Rivera Gorriñ M, Galeano Álvarez C, et al. Dialysis after kidney transplant failure: do patients start in a worse condition than the general population with chronic kidney disease? *Nefrologia.* 2011;31:51-7. doi: 10.3265/Nefrologia.pre2010.Nov.10610.
27. Naylor KL, Knoll GA, McArthur E, Garg AX, Lam NN, Field B, et al. Outcomes of an Inpatient Dialysis Start in Patients With Kidney Graft Failure: A Population-Based Multicentre Cohort Study. *Can J Kidney Health Dis.* 2021;8:2054358120985376. doi: 10.1177/2054358120985376.
28. Lubetzky M, Tantisattamo E, Molnar MZ, Lentine KL, Basu A, Parsons RF, et al. The failing kidney allograft: A review and recommendations for the care and management of a complex group of patients. *Am J Transplant.* 2021;21:2937-49. doi: 10.1111/ajt.16717.
29. Fiorentino M, Gallo P, Giliberti M, Colucci V, Schena A, Stallone G, et al. Management of patients with a failed kidney transplant: what should we do? *Clin Kidney J.* 2020;14:98-106. doi: 10.1093/ckj/sfaa094.
30. Vajdič Trampuž B, Arnol M, Gubenšek J, Ponikvar R, Buturovič Ponikvar J. A national cohort study on hemodialysis arteriovenous fistulas after kidney transplantation - long-term patency, use and complications. *BMC Nephrol.* 2021;22:344. doi: 10.1186/s12882-021-02550-4.
31. Zawistowski M, Nowaczyk J, Domagała P. Peritoneal dialysis catheter removal at the time or after kidney transplantation: a systematic review and meta-analysis. *Langenbecks Arch Surg.* 2022;407:2651-62. doi: 10.1007/s00423-022-02637-y.
32. Basile C, Casino FG, Mitra S; EuDial Working Group of the European Renal Association. Towards a tailored prescription of dialysis adequacy: the key role of incremental haemodialysis. *Nephrol Dial Transplant.* 2023;38:855-7. doi: 10.1093/ndt/gfac281.
33. Casino FG, Lopez T, Santarsia G, Mostacci SD, Sabato A, Di Carlo M, et al. Could incremental haemodialysis be a new standard of care? A suggestion from a long-term observational study. *G Ital Nefrol.* 2022;39:2022-vol3.
34. Woodside KJ, Schirm ZW, Noon KA, Huml AM, Padiyar A, Sanchez EQ, et al. Fever, infection, and rejection after kidney transplant failure. *Transplantation.* 2014;97:648-53. doi: 10.1097/01.TP.0000437558.75574.9c.
35. Aubert O, Loupy A, Hidalgo L, Duong van Huyen JP, Higgins S, Viglietti D, et al. Antibody-Mediated Rejection Due to Pre-existing versus De Novo Donor-Specific Antibodies in Kidney Allograft Recipients. *J Am Soc Nephrol.* 2017;28:1912-23. doi: 10.1681/ASN.2016070797.
36. Loupy A, Lefaucheur C. Antibody-Mediated Rejection of Solid-Organ Allografts. *N Engl J Med.* 2018;379(11):1150-60. doi: 10.1056/NEJMra1802677.
37. Mourad G, Minguet J, Pernin V, Garrigue V, Peraldi MN, Kessler M, et al. Similar patient survival following kidney allograft failure compared with non-transplanted patients. *Kidney Int.* 2014;86:191-8. doi: 10.1038/ki.2014.6.
38. Mourad G, Szwarc I, Buzançais A. Retour en dialyse après échec de transplantation: comment améliorer les résultats dans cette population fragile? *Néphrol Thérap.* 2016;12:S89-S94. doi:10.1016/j.nephro.2016.01.007.
39. Knoll G, Muirhead N, Trpeski L, Zhu N, Badovinac K. Patient survival following renal transplant failure in Canada. *Am J Transplant.* 2005;5:1719-24. doi: 10.1111/j.1600-6143.2005.00921.x.
40. Leal R, Almiro E, Castro P, Duarte R, Rita Silva A, Guedes Marques M, et al. Clinical Frailty Scale and Charlson Comorbidity Index as predictors of hospitalization and mortality risk after kidney transplant failure. *Nefrologia.* 2025;45:501353. doi: 10.1016/j.nefro.2025.501353.