

Costs associated with kidney transplant in Portugal

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INTRODUCTION

- Portugal is one of the European countries with the highest incidence and prevalence rates of End Stage Kidney Disease undergoing renal replacement therapy [1], representing a serious public health problem and associated with a significant economic impact.

- In 2023, the prevalence was 21,511 cases, with 2,521 new cases recorded in Portugal that year [2].

OBJECTIVE

- Kidney transplantation is the gold standard treatment for End Stage Kidney Disease [3]. This study aimed to estimate the cost of kidney transplant patients in Portugal, from the time of entry on the transplant waiting list until death.

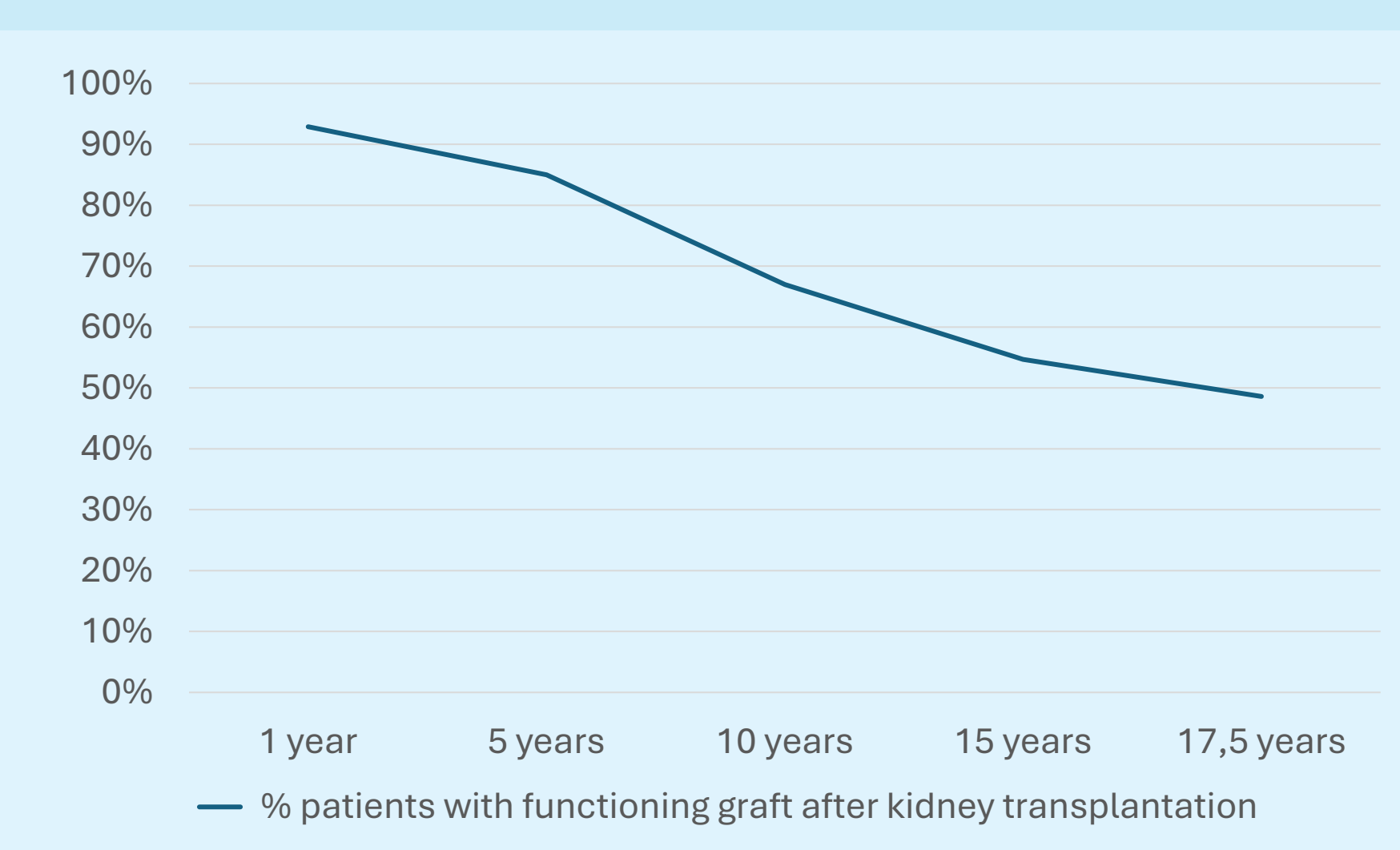
METHODS

- For a kidney transplant patient, four periods were considered: transplant waiting list, transplant procedure, post-transplant, and after graft loss.
- The length of each period was obtained based on the Portuguese Renal Transplant Registry (waiting list and graft survival) and the 2022 European Renal Association Annual Report (survival after transplantation) [4, 5].
- Graft survival was estimated using linear regression (Figure 1) based on graft survival rates at 1, 5, 10, and 15 years after kidney transplantation, as reported by the Portuguese Registry.

- The annual consumption of resources for each period was estimated according to an expert panel’s opinion for outpatient care and an analysis of the national Diagnosis Related Groups (DRG) database for hospitalizations. Prices were obtained from official sources.

- Indirect costs were established following the human capital approach [6] and supported by inputs from the expert panel.

FIGURE 1. GRAFT SURVIVAL AFTER KIDNEY TRANSPLANTATION



RESULTS

TRANSPLANT WAITING LIST

- In the pre-transplant period, an initial assessment is carried out for inclusion on the waiting list, which includes outpatient visits and medical tests and diagnostic procedures, that are repeated periodically. Within the pre-transplant period, costs of dialysis were not considered.
- The average duration of this period is 4 years [4].
- The total average cost per patient for the pre-transplant period (transplant waiting list) is estimated at **€ 6,279.90** (Table 1).

TABLE 1. PRE-TRANSPLANT AVERAGE COSTS PER PATIENT

	Average annual cost	Total Cost
Initial assessment		
Outpatient visits	-	€ 223.39
Medical tests and diagnostic procedures	-	€ 1,031.51
Follow-up (Recurred visits and procedures)		
Outpatient visits	€ 46.50	€ 186.00
Medical tests and diagnostic procedures	€ 1,209.75	€ 4,839.00
Total	€ 1,256.25	€ 6,279.90

TRANSPLANT PROCEDURE

- The cost of the transplant procedure was based on the average price of a hospitalization episode for a kidney transplant, plus the histocompatibility test, organ procurement procedure and government financial incentives.
- In total, kidney transplant resulted in an estimated average cost of **€22,161.93** per patient (Table 2).

TABLE 2. KIDNEY TRANSPLANT AVERAGE COSTS PER PATIENT

	Average Cost per patient
Hospitalization episode for kidney transplant	€ 10,373.28
Histocompatibility test	€ 548.68
Organ procurement procedure	€ 5,000
Government financial incentives for kidney transplant	€ 6,239.97
Total	€ 22,161.93

POST-TRANSPLANT PERIOD

- The costs related to the post-transplant period include outpatient visits, emergency room visits, medical tests and diagnostic procedures, hospitalizations and immunosuppressive therapy;
- The duration of the post-transplant period considered for costing was 17.5 years, corresponding to the average life expectancy after kidney transplantation [5];
- The total average cost of the post-transplant period was estimated at **€72,965.03** per patient, considering the population of transplant patients with functioning graft over the years.

TABLE 3. POST-TRANSPLANT AVERAGE COSTS PER PATIENT

	Cost (first year)	Average annual cost (following years)	Total Cost
Outpatient visits	€ 718.06	€ 148.86	€ 2,374.89
Emergency room visits	€ 212.43	€ 106.69	€ 1,421.29
Medical tests & diagnostic procedures	€ 1,588.55	€ 588.81	€ 8,230.91
Hospitalizations	€ 1,873.95	€ 1,336.27	€ 7,219.04
Immunosuppressive therapy	€ 7,475.92	€ 4,077.05	€ 53,718.90
Total	€ 11,868.90	€ 6,257.69	€ 72,965.03

GRAFT LOSS

- Graft loss encompasses costs associated with diagnosis of kidney graft failure (including immunosuppressive therapy until discontinuation) and associated with dialysis and re-transplantation;
- Detailed costs are presented in Table 4.

TABLE 4. GRAFT LOSS AVERAGE COSTS PER PATIENT

	Cost (first year)	Average annual cost (following years)	Total Cost
Procedures during diagnosis of kidney graft failure*	€ 1,783.71	-	€ 1,783.71
Re-transplantation cost per patient**	€ 48.04	€ 5.34	€ 69.39
Dialysis	€ 28,377.57	€ 25,219.80	€ 80,174.00
Transportation for dialysis sessions	€ 1,738.80	€ 1,738.80	€ 5,421.00
Total	€ 31,948.12	€ 26,963.94	€ 87,448.10

*including immunosuppressive therapy until discontinuation
**estimated value according to the rate of re-transplants

OTHER DIRECT COSTS

- Transportation-related costs, covered by the national health service, were estimated at **€2,626.61** per patient. This estimation does not include transportation costs for dialysis sessions, which were considered in Table 4.

INDIRECT COSTS

- Total costs associated with temporary leave or premature abandon of labour market after kidney transplant were estimated at **€ 69,565.08**.
- Detailed costs are presented in Table 5.

TABLE 5. INDIRECT COSTS

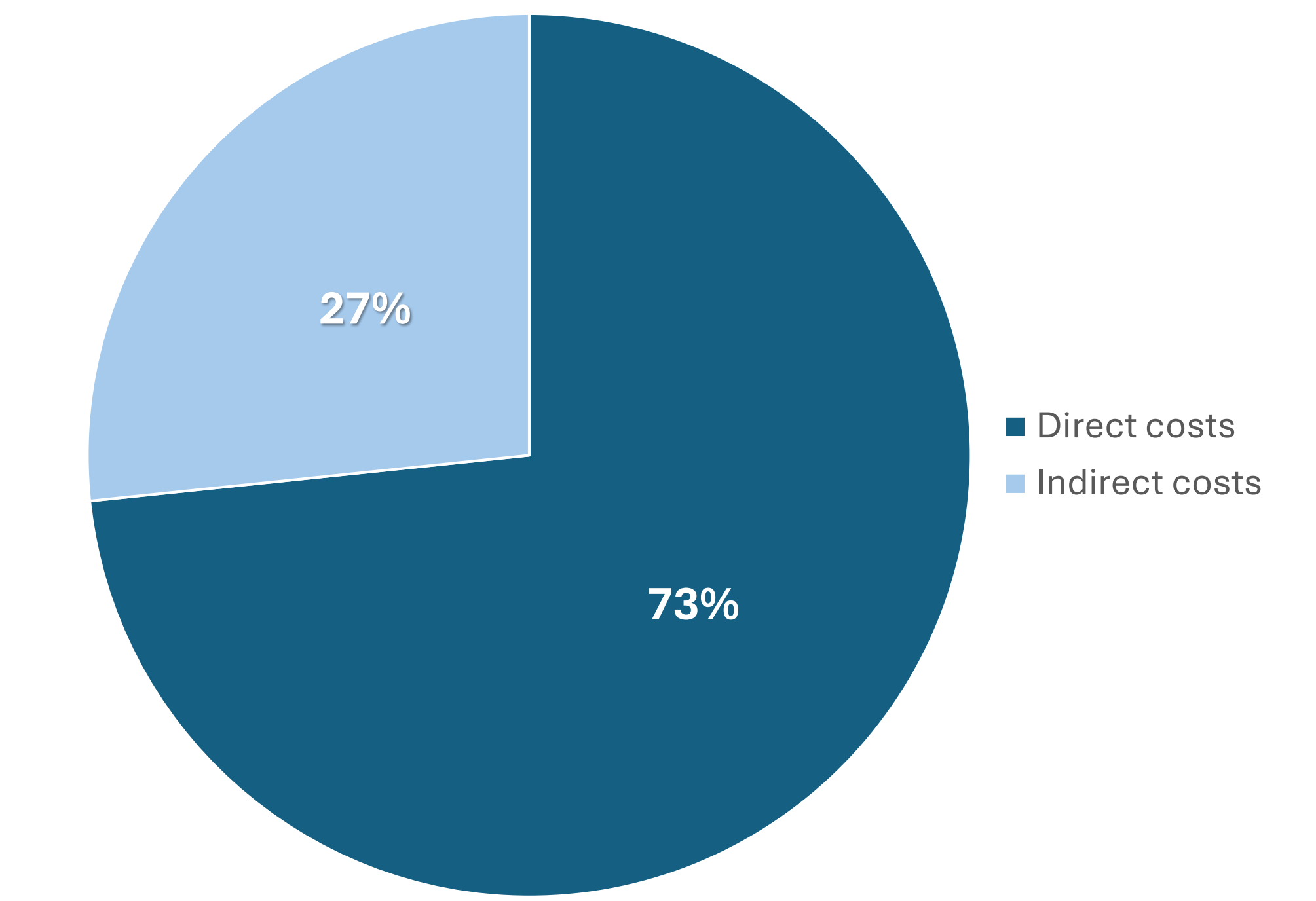
		Cost
Transplant patients who temporarily leave the labour market	80%	
Average time to return (months)	3,50	€ 6,629.70
Premature abandon of labour market	20%	
Average time to retirement age (years)	16	€ 93,365.12
Total		€ 69,565.08*

*considering employment rate among renal patients: 69.57%

AVERAGE COST PER PATIENT

TABLE 6. PATIENT COSTS ASSOCIATED WITH KIDNEY TRANSPLANT, INCLUDING GRAFT LOSS

Direct costs	
Medical costs	
Pre-transplant period (Waiting list)	€ 6,279.90
Transplant procedure	€ 22,161.93
Post-transplant period	€ 72,965.03
Graft loss	€ 87,448.10
Non-medical costs	
Transportation costs	€ 2,626.61
Total Direct costs	€ 191,481.59
Indirect costs	€ 69,565.08
Total	€ 261,046.67



CONCLUSIONS



The cost of a kidney transplant patient was about €261,000, with direct costs representing 73% (€191,482). Almost half of this value is related to care after graft loss. The value of preventing graft loss needs to be rigorously evaluated considering its cost implications.

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Pedro Carvalho and Margarida Borges are employees of IQVIA Portugal. IQVIA Portugal received payment from Takeda Farmacêuticos Portugal, Lda. for the work related to this study. André Weigert received fees for lectures or participation in advisory boards from: Astellas Pharma Inc., AstraZeneca, Chiesi Farmaceutici, Merck Sharp & Dohme, Neovii Pharmaceuticals, and Takeda Farmacêuticos Portugal, Lda. Cristina Jorge received fees for participation in advisory board, as speaker or moderator from: AstraZeneca, Chiesi Farmaceutici, Merck Sharp & Dohme and Takeda Farmacêuticos Portugal, Lda. She is the President of the Portuguese Transplantation Society. José António Lopes has nothing to disclose. Susana Sampaio received fees for participation in advisory boards, and as speaker in symposia from: Alexion Pharmaceuticals, Inc., AstraZeneca, Chiesi Farmaceutici, Hansa Biopharma, Merck Sharp & Dohme and Takeda Farmacêuticos Portugal, Lda., Astellas Pharma Inc., Hansa Biopharma, Neovii Pharmaceuticals. Carla Lopes is an employee of Takeda Farmacêuticos Portugal, Lda.