

SUPPLEMENTARY MATERIAL:

TransplantIQ

EN

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TransplantIQ

At TransplantIQ, we are a dedicated, multidisciplinary team committed to advancing the field of organ donations and transplantations. Our mission is driven by our passion for impactful research to raise awareness, support, and promote education on organ donation.



A small moment of your time, a great leap forward for medicine

QUESTIONNAIRE

ΕΡΩΤΗΜΑΤΟΛΟΓΙΟ

Our Aims & Goals in a Nutshell

Our aim is to assess the current state of knowledge, attitudes, and perceptions of medical students in Greece, and to determine whether these are influenced by factors such as educational background, clinical exposure, and personal beliefs regarding organ donation and transplantation.



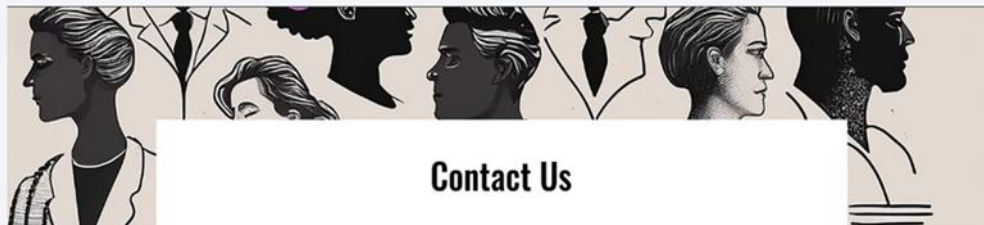
"Happiness doesn't result from what we get, but from what we give"

-Ben Carson

Our research is a questionnaire-based survey designed specifically for medical students across Greece, aimed at understanding their knowledge, attitudes, and perceptions regarding organ donation and transplantation. By participating, students can play a key role in identifying areas where more education or awareness is needed, helping to shape future efforts in this vital field.

The questionnaire is available in **both English and Greek** and is **completely anonymous**, ensuring that all responses remain **confidential**.

Best of all, completing the survey takes **no more than 6 minutes**—a small contribution that can lead to big improvements in public health and medical education.



Contact Us

Do you have any questions?
Our team is always very happy to help, 24/7

Stavrou Niarhou Avenue, 45500, University General Hospital of
Ioannina, Greece



Supplementary Figures 1-5 Screenshots from the platform developed for the dissemination of the questionnaire. All illustrations were created and designed using Adobe Photoshop version.26.1 (Adobe Inc., San Jose, CA, United States)

Supplementary Table 1 Questionnaire

Question	Responses
Domain A: Introduction/informed consent page	
Domain B: Demographic, personal and academic information	
Sex	Male/Female
Age	Number
Current institution/affiliation	NKUA/ AUTh/UoI/UoP/UoC/UoT/DUTh
Year of study	Preclinical (1 st -3 rd)/Clinical (4 th - 6 th)
Place of permanent residence	Rural area or island/City, >100.000 inhabitants/City, <100.000 inhabitants
Current academic grade	Good/ Very Good/ Excellent/ No grades assigned - for 1 st year medical students
Aspiring medical specialty	Surgical/ Non-surgical/ Not Decided
Are you a regular blood donor?	Yes/No
Domain C: Knowledge-related questions:	
Do you acknowledge which organs can be donated/transplanted in Greece?	Yes/No
Which of the following organs can be transplanted in Greece?	Multiple choice -multiple response answer
How well informed are you about the listing criteria (transplantation candidacy) on scale 1 to 5?	Likert scale 1-5

Is living donation legally permitted in Greece?	Yes, for both adult and pediatric recipients/ Yes, for adult recipients only/ Don't know
Do you know which organs can be transplanted from living donors in Greece?	Yes/No
Which of the following organs can be transplanted from living donors in Greece?	Multiple choice -multiple response answer
Are you familiar with core transplant terminology such as: "Donation after brain death" & "Donation after circulatory death"?	Yes/No
Which of the following categories of deceased donors are being utilized in Greece?	DBD, only/ DCD, only/ Both DBD and DCD
Is the following statement correct? "Any doctor can declare brain death"	Yes/No
Can people with systemic diseases become organ donors?	Yes/No
Are you familiar with how prioritization among transplant candidates is determined in Greece?	Yes/No
Is the following statement correct? "Medical urgencies (e.g. fulminant/acute liver failure, or inability to undergo renal replacement therapy), hypersensitized patients, and age <18, are among the most determining factors in the prioritization of transplant candidates"	Yes/No
Would you expect differences in the post-transplantation outcomes between recipients of living and deceased donor organs? (e.g. patient survival, graft survival, organ function etc.)	Yes, organs from living donors have superior function and lead to better outcomes/ No, grafts from either donor are equal in terms of function and survival/Don't know

On scale 1 to 5, how well informed are you regarding the legislation on organ donation and transplantation in Greece?	Likert scale 1-5
Can organs from living donors be allocated to patients outside the family of the donor?	Yes/No
In your opinion, how well does organ donation fulfill the demands for transplantations in Greece?	Supply exceeds the demand/ Demand exceeds the supply/ Balance between organ donation and transplantations
Are there any significant risks associated with living organ donation for the donor, excluding the usual complications of major surgery?	Yes/ No
Are you familiar with the concept of xenotransplantation?	Yes/No
Do you know which body is responsible for the coordination of organ donations and transplantations in Greece?	Yes/No

Domain D: Attitudes and perceptions of medical students towards organ donation and transplantation

Do you know anyone who has received or is waiting for a graft?	Yes/No
Do you discuss topics related to organ donation and transplantation with family or friends?	Yes/No
Would you consider becoming an organ donor after death?	Yes/No
Do you possess a donor card (donor registration)?	Yes/No
Would you consider becoming a living donor?	Yes/No
Please indicate whether you would rather donate to a specific donor	A child - regardless of relationship/ a close family member - e.g. parent, sibling, spouse, grandparent/ own

child/ close friend but
not a relative

If you were ever diagnosed with End-Stage Kidney Disease (ESKD) would you rather receive a kidney from a living or a deceased donor? Living donor/ Deceased donor

Do you think the Hellenic Transplant Organization (HTO) is making sufficient efforts to promote organ donation in Greece? Yes/No

Do you think medical students could play a significant role in promoting organ donation and transplantations in Greece? Yes/ No

Do you think a mandatory course on organ donation and transplantation should be effectively integrated into medical school curricula in Greece? Yes/No

Do you believe that incorporating modern technological advancements into organ transplantation in Greece (e.g Machine Learning models/ Artificial Intelligence for optimizing donor-recipient matching and predicting post-transplant complications, as well as modern organ preservation techniques), could enhance donation rates? Yes/No

DBD: Donation after brain death; DCD: Donation after circulatory death;

Supplementary Appendix 1:

A) The baseline characteristics (Section B) consisted of 8 items covering demographics, academic background, specialty preferences and data regarding behavioral tendencies. Section C consisted of 19 items covering principal topics on OD and OT: organ-specific, legislative, donor-type and prioritization knowledge, as well as the awareness of medical students regarding the governing body, transplant-outcomes, associated risks and xenotransplantation. Section D included 11 items covering multiple assets of attitudes around the field of transplantation: Personal exposure to transplantation, willingness to donate (either through deceased or living donation), registration, preference for recipient and type of graft if ever in need, evaluation of national efforts, perceived role of students in promoting OD and belief in cutting-edge technological applications in the field. The final version of the questionnaire was administered online via Google Forms and was available in both English and Greek.

B) Test-retest reliability assessment of the questionnaire:

Supplementary Table 2 Baseline characteristics of the students who participated in the test-retest reliability assessment and pretest of the questionnaire (pilot test)

Baseline characteristics	Categories	N (%) or mean (SD)
Gender	Male	1 (50%)
	Female	1 (50%)
Age		
University	National and Kapodistrian University of Athens	0
	Aristotle University of Thessaloniki (AUTH)	0
	University of Ioannina	2 (100%)
	University of Patras	0
	University of Crete (Heraklion)	0

	University of Thessaly (Larissa)	0
	Democritus University of Thrace	0
Place of permanent residence	City with >100.000 inhabitants (Large city)	1 (50%)
	City with <100.000 inhabitants (Small city)	1 (50%)
	Rural area	0
Year of study	Years 1-3 (Preclinical)	1 (50%)
	Years 4-6 (Clinical)	1 (50%)
Grades	Good (5.00-6.49)	0
	Very good (6.50-8.49)	2 (100%)
	Excellent (8.50-10)	0
	No grades assigned yet	0
Preferred specialty	Surgical	1 (50%)
	Non-surgical	1 (50%)
	Undecided	0
Regular blood donation	Yes	1 (50%)
	No	1 (50%)

The test-retest reliability of the questionnaire was assessed using Cohen's Kappa. Separate values were calculated for domain C (knowledge-related items) and domain D (attitude-related items), based on two students who completed the survey twice, two weeks apart. Baseline characteristics of these participants are presented in the table above (Supplementary Table 1). For student 1, Kappa values were 0.835 ($Z = 6.49$, $p < 0.0001$) for knowledge items and 0.857 ($Z = 4.24$, $P < 0.0001$) for attitude items, both indicating almost perfect agreement. For student 2, corresponding values were 0.845 ($Z = 7.30$, $p < 0.0001$) and 0.730 ($Z = 3.45$, $p = 0.0006$), respectively, reflecting substantial agreement. Overall, these findings are consistent with temporal stability and lend preliminary support to the reliability and clarity of domains C and D of the questionnaire. Nevertheless, because the pilot sample was extremely small ($n = 2$), the agreement estimates are likely unstable and underpowered to separate genuine

reproducibility from chance agreement. These results should therefore be interpreted cautiously.

C) *Target population and sample size:*

Greece is home to seven medical schools (University of Athens/NKUA, Aristotole University of Thessaloniki/AuTH, University of Ioannina/UoI, University of Patras/UoP, University of Thessaly/Larissa, Democritus University of Thrace/DUTh), each offering a six-year course with approximately 200 enrolled students per year.

Total Target Population (TTP)= 200 (students) x 6(years) x 7(medical schools) = 8400 medical students

Calculated sample size (n):

$$n = \frac{Z^2 - p(1-p)}{E^2}$$

Z=Confidence level=1.96 (for 95% Confidence Interval)

p= proportion of the population that exhibits a trait of interest= 0.5 (for maximum sample size)

E=Margin of error=5%

n= 384

Supplementary Table 3 Variables used in the regression analyses

Variable type	Variable	Measurement	Relevance
Outcome (Dependent)	Correct knowledge of deceased donor organs (Correct/ Wrong)	Knowledge	a. Establishes a minimum competency domain for physicians that is independent of personal beliefs, thereby differentiating an informational deficit from non-knowledge factors b. Identifies specific misconceptions that can be addressed through targeted education, as misclassification of organ eligibility reflects a correctable knowledge error. c. Highlights specific misconceptions that likely arise from limited exposure to transplantation during clinical rotations
Outcome (Dependent)	Correct knowledge of living donor organs (Correct/ Wrong)	Knowledge	a. Captures a distinct knowledge domain with different clinical constraints, donor risk, and ethical and legal considerations compared with deceased donation b. Identifies barriers to program expansion because incorrect beliefs about what is possible or permissible can suppress both willingness and advocacy quality c. Enables targeted curricular design around donor safety, indications, and governance, rather than generic donation awareness

Outcome (Dependent)	Perceived graft quality by donor type (Living is better/ No difference)	Knowledge	a. Assesses expectations about outcomes, which can be inaccurate even when factual knowledge is correct b. Outcome expectations are amenable to communication interventions and can be evaluated using baseline and follow-up measurements
Outcome (Dependent)	Willingness to donate organs posthumously (Yes/No)	Attitude	a. Captures students' stated willingness, which typically precedes concrete steps such as donor registration, discussing donation with family, and later professional engagement b. Enables analysis of modifiable drivers relevant to medical students, including awareness of the national donation framework and confidence in the system, which are direct targets for educational and communication interventions c. Relevant even before any behavior occurs (donor registration) because students' stated willingness is likely to influence how they approach and communicate about donation with patients and families during clinical training and as physicians
Outcome (Dependent)	Willingness for living donation (Yes/ Conditionally)	Attitude	a. Not interchangeable with deceased donation willingness because it is constrained by perceived personal risk and family ethics b. Living donation initiatives require different messaging, safeguards, and educational content than deceased donation

Outcome (Dependent)	Donor card possession (Yes/ No)	Attitude	a. Quantifies the intention-behavior gap, which is critical for translating findings into interventions rather than only describing attitudes b. Behavioral marker that reduces social desirability bias relative to attitude-only outcomes, since it reflects a concrete commitment c. Policy-relevant implementation endpoint that can benchmark the effectiveness of awareness and registration initiatives
Outcome (Dependent)	Perceived efficiency of HTO's efforts to promote organ donation (Yes/ No)	Attitude/ Perspective	a. Captures a system-level factor that may limit students' engagement with donation even when factual understanding and prosocial intent are present b. Low trust among medical students can indicate perceived gaps in transparency, communication, or procedural fairness
Predictor (Independent)	Place of permanent residence (Rural area or island/City, >100.000 inhabitants/City, <100.000 inhabitants)	Demographic	a. Students' knowledge and attitudes may reflect differences in exposure to transplant hospitals, access to reliable local health information on organ donation and transplantation, and frequency of routine contact with healthcare services b. Provides a proxy for community social structure, allowing assessment of whether smaller-population settings with tighter kinship networks and stronger social norms are associated with distinct attitudes or discussion patterns around organ donation

Predictor (Independent)	Year of study (Preclinical/ Clinical Year)	Baseline characteristic	a. Surrogate for cumulative teaching input and hands-on clinical exposure throughout medical school b. Indicator of whether knowledge and attitudes change as students progress through medical school, helping to determine whether the current curriculum and academic schedule are effective or need adjustment
Predictor (Independent)	Specialty preference (Surgical/ Non-surgical/ Not Decided)	Baseline characteristic	a. Important confounding control because specialty preference correlates with year of study and clinical exposure b. It examines whether career aspirations shape transplantation-related knowledge and attitudes
Predictor (Independent)	Blood donation status (Yes/ No)	Baseline characteristic	Behavior-based indicator of donation orientation, more credible than self-described altruism
Predictor (Independent)	Relative who has undergone organ transplantation or is waiting for a compatible graft (Yes/ No)	Attitude	It captures real-world, personal exposure to transplantation that can shape beliefs and knowledge beyond what is learned through formal teaching
Predictor (Independent)	Awareness of the responsible body coordinating organ donation and transplantation in Greece (Yes/ No)	Knowledge	a. Awareness of the national coordinating body matters because high-performing systems like Organización Nacional de Trasplantes in Spain are often cited as succeeding in part through a clearly visible, transparent coordinating authority that strengthens public trust

Predictor (Independent)	Prior discussion about organ donation with family and friends (Yes/ No)	Attitude
		b. Potential actionable target to strengthen medical students' understanding of, and readiness to advocate for organ donation and transplantation, using targeted strategies implemented successfully in other countries (e.g. Spain) a. Reflects social engagement with donation and mirrors how donation decisions are commonly discussed and shaped in practice b. Especially relevant in Greece, where family plays a central role and shared norms can strongly shape beliefs and donation-related decisions c. High translational relevance because targeted interventions can prompt and normalize these conversations

Supplementary Table 4 Awareness and accuracy regarding organs transplanted from deceased donors in Greece

Knowledge-related outcome	Category	N (%)
Acknowledgement of the organs transplanted from deceased donors in Greece (Self-perceived)	Yes	195 (35%)
	No	367 (65%)
Accuracy of medical students' knowledge on organs transplanted from deceased donors in Greece (Kidneys, Liver, Heart, Lungs, Pancreas)	Correct	72 (13%)
	Wrong	490 (87%)
Organ identification by students who initially reported to acknowledge the transplantable organs in Greek hospitals (N=195)	Correct	41 (21%)
	Wrong	154 (79%)
N=Number of medical students who claimed to know which organs can be transplanted from deceased-donors in Greece		

Supplementary Table 5 Awareness and accuracy regarding organs transplanted from living donors in Greece

Knowledge-related outcome	Category	N (%)
Acknowledgement of the organs transplanted from living donors in Greece (Self-perceived)	Yes	173 (31%)
	No	389 (69%)
Accuracy of medical students' knowledge on organs transplanted from living donors in Greece (Kidneys, liver/part of donor's liver)	Correct	349 (62%)
	Wrong	213 (38%)
Organ identification by students who initially reported to acknowledge the transplantable organs in Greek hospitals (N=173)	Correct	123 (71%)
	Wrong	50 (29%)
N=Number of medical students who claimed to know which organs can be transplanted from living donors in Greece		

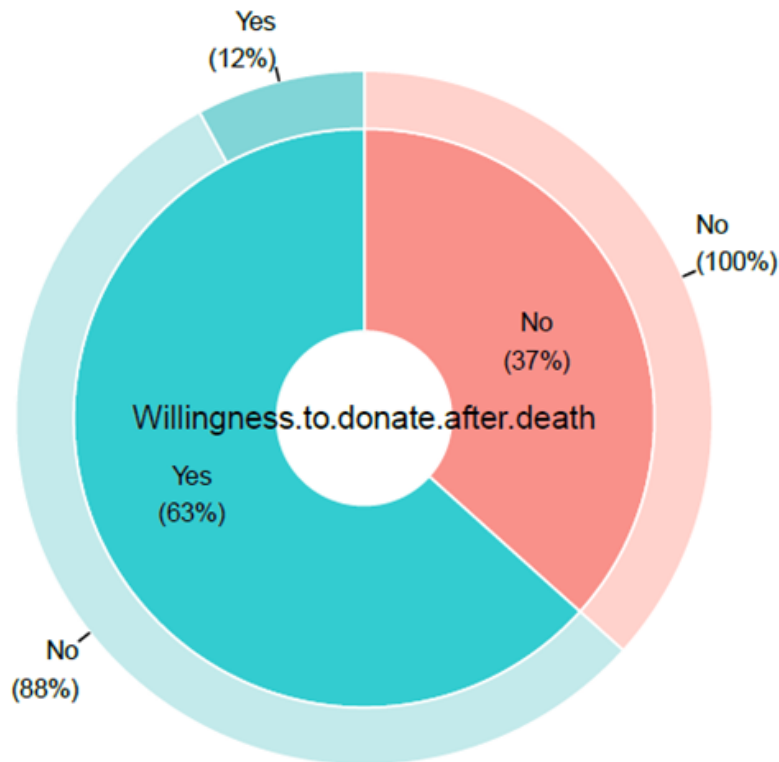
Supplementary Table 6 Responses of medical students to knowledge-related items of the questionnaire

	Question	Category	N (%)
1	Acknowledgment of the organs transplanted from deceased donors in Greece (Self-perceived)	Yes	195 (34.7%)
		No	367 (65.3%)
2	Selected organs transplanted from deceased donors in Greece (Multiple response question)	Kidneys	557 (99.1%)
		Liver	518 (92.2%)
		Heart	467 (83.1%)
		Lungs	400 (71.2%)
		Pancreas	254 (45.2%)
		Small intestine	133 (23.7%)
		Large intestine	101 (18%)
		Brain	12 (2.1%)
		Adrenal Glands	111 (19.8%)
3	Perceived level of knowledge on transplant candidacy criteria (5-point scale)	1	131 (23.3%)
		2	226 (40.2%)
		3	154 (27.4%)
		4	42 (7.5%)
		5	9 (1.6%)
4	Practice of living-donor transplantations in Greece	Legal for both adults and pediatric transplant candidates	283 (50.4%)
		Legal only for adult transplant candidates	234 (41.6%)
		Uncertain	45 (8.0%)
5		Yes	173 (30.8%)

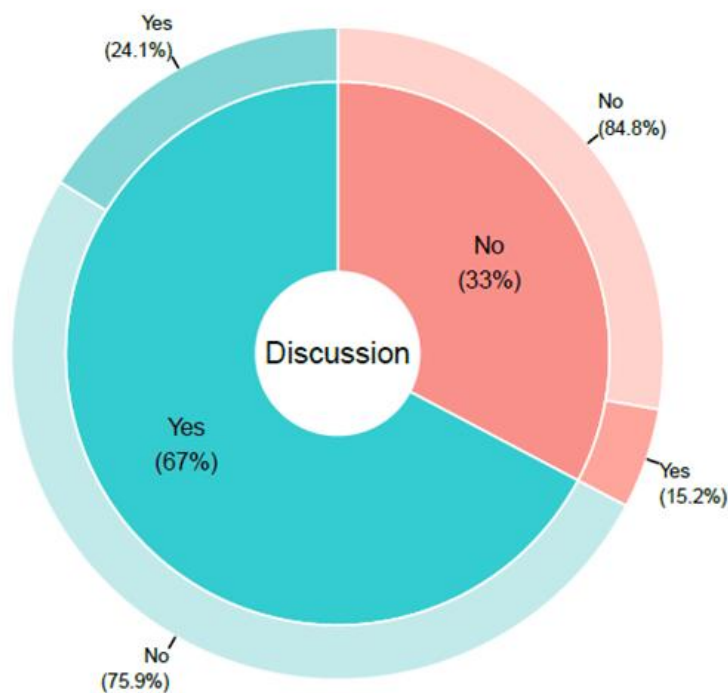
	Acknowledgment of the organs routinely transplanted from living donors in Greece (Self-perceived)		
		No	389 (69.2%)
6	Selected organs routinely transplanted from living donors in Greece (Multiple response question)	Kidneys	537 (95.6%)
		Liver	495 (88.1%)
		Lungs	96 (17.1%)
		Pancreas	42 (7.5%)
		Heart	50 (8.9%)
7	Familiarity with core transplant terminology (DBD/DCD)	Yes	444 (79.0%)
		No	118 (21.0%)
8	Type(s) of deceased donors that can be utilized in Greece	DBD, only	277 (49.3%)
		DCD, only	56 (9.9%)
		Both DBD and DCD	229 (40.8%)
9	All doctors have the authority to declare death	Yes	51 (9.1%)
		No	511 (90.9%)
10	Feasibility of organ donation in context of systemic disease	Yes	83 (14.8%)
		No	479 (85.2%)
11	Familiarity with allocation/prioritization criteria	Yes	180 (32.0%)
		No	382 (68.0%)
12	Medical urgencies (e.g., fulminant liver failure, inability to undergo renal replacement therapy), hypersensitized patients, age <18 years are among the most determining factors in the	Yes	476 (84.7%)

	prioritization of transplant candidates, as perceived by medical students		
		No	86 (15.3%)
13	Graft quality based on type of donor	Living-donor grafts are superior	174 (31.0%)
		Living and deceased donor grafts are equivalent	114 (20.3%)
		Uncertain	274 (48.7%)
14	Self-perceived familiarity with the legislative framework concerning organ donation in Greece (5-point scale)	1	267 (47.5%)
		2	190 (33.8%)
		3	83 (14.8%)
		4	17 (3.0%)
		5	5 (0.90%)
15	Feasibility of allocation of living-donor graft outside family	Yes	412 (73.3%)
		No	150 (26.7%)
16	Supply and demand for transplant grafts	Demand exceeds supply	546 (97.2%)
		Supply exceeds demand	6 (1.0%)
		Balance	10 (1.8%)
17	Perceived major risks posed to living donors beyond the standard surgical complications	Yes	514 (91.5%)
		No	48 (8.5%)
18	Awareness of the concept of xenotransplantation	Yes	234 (41.6%)
		No	328 (58.4%)
19	Awareness of the existence of a national transplant organization in Greece among medical students	Yes	128 (22.8%)
		No	434 (77.2%)

DCD: Donation after Circulatory Death; DBD: Donation after Brain Death;



Supplementary Figure 6 Willingness to donate organs after death by donor card possession. Proportion of medical students who expressed willingness to donate organs after death (inner ring); Corresponding proportions stratified by whether they reported holding a donor card/official registration (outer ring). “Willingness to donate after death” indicates students who reported being willing to donate their organs posthumously.



Supplementary Figure 7 Discussion of organ donation and transplantation with family or friends by having a transplanted relative. Proportion of medical students who reported discussing organ donation and transplantation with family or friends (inner ring); corresponding proportions stratified by whether they had a relative who had undergone or was awaiting an organ transplant (outer ring). "Discussion" indicates students who reported having discussed organ donation and transplantation with family or friends at least once.

Supplementary Table 7 Regression models' validity

Dependent Variables/Outcomes	AUC (95% CI)	P-value	R ² _L	McFadden's-R ²
Willingness to donate after death (Yes vs No)	0.66 (0.61-0.71)	5x10 ⁻⁶	0.06	N/A
Willingness for living donation (Yes vs Conditionally)	0.60 (0.55-0.66)	6x10 ⁻³	N/A	0.04
Donor card possession (Yes vs No)	0.83 (0.76-0.90)	7x10 ⁻¹¹	0.22	N/A
Correct knowledge of deceased donor organs (Correct vs Wrong)	0.59 (0.52-0.66)	0.78	0.01	N/A
Correct knowledge of living donor organs (Correct vs Wrong)	0.58 (0.53-0.63)	0.49	0.01	N/A
Perceived quality of graft per donor type (Living is better vs No difference)	0.62 (0.55-0.68)	7x10 ⁻³	N/A	0.04

AUC: Area Under the Curve; CI: Confidence Interval; P-value: P-value from the overall model test, comparing the fitted model to the intercept-only model; Hosmer-Lemeshow: P-value from the Hosmer-Lemeshow goodness-of-fit test assessing calibration in binary logistic regression models; McFadden's R²: McFadden pseudo R² quantifying relative improvement in fit for multinomial regression models compared with the intercept-only model; N/A: Not Applicable.