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Adaptation and Validation of Ethics in Health Care Questionnaire Version 2 (EHCQ-2) to European Portuguese

Adaptação e Validação do Questionário de Ética em Cuidados de Saúde Versão 2 (EHCQ-2) para Português Europeu

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ABSTRACT

Introduction: Even though ethical decision-making is a cornerstone of medical practice there is a lack of validated tools to assess ethical sensitivity among medical students, junior, and senior doctors. The aim of this study was to adapt and validate the Ethics in Health Care Questionnaire – Version 2 (EHCQ-2) for use in Portugal, ensuring its relevance in evaluating ethical sensitivity within the Portuguese healthcare context.

Methods: The EHCQ-2 was translated into European Portuguese and culturally adapted through a rigorous process involving forward and back-translation, expert review, cognitive interviews with medical professionals, and pilot testing. A validation study was conducted with a sample of 156 participants, including medical students, junior, and senior doctors, to evaluate the questionnaire's reliability and validity.

Results: The adapted EHCQ-2 demonstrated good internal consistency (Cronbach's alpha = 0.74) and variable inter-rater reliability (ranging from 0.12 to 0.67 across tasks), reflecting the complexity of ethical dilemmas. Content validity was established through expert evaluation, while construct validity was supported by significant correlations between individual scenarios and overall scores (e.g., r = 0.683 for Scenario 7). Regression analysis revealed that sub-scales measuring issue identification, explanation sophistication, and value recognition collectively explained 99.6% of the variance in total scores, underscoring the questionnaire's robust predictive validity.

Conclusion: The European Portuguese version of the EHCQ-2 is a reliable and valid tool for assessing ethical sensitivity among medical students, junior and senior doctors. Its application can enhance ethics training programs, inform curriculum development, and support efforts to improve ethical decision-making skills in future healthcare professionals. Further research should explore its longitudinal utility and applicability in diverse cultural contexts.

Keywords: Decision Making/ethics; Education, Medical, Undergraduate/ethics; Ethics, Medical; Portugal; Reproducibility of Results; Surveys and Questionnaires; Translating

RESUMO

Introdução: Apesar da tomada de decisão ética ser um pilar fundamental da prática médica persiste uma carência de instrumentos validados para avaliar a sensibilidade ética entre estudantes de medicina, médicos internos e médicos especialistas. Este estudo teve como objetivo adaptar e validar o Questionário de Ética em Cuidados de Saúde – Versão 2 (EHCQ-2) para uso em Portugal, garantindo a sua relevância na avaliação da sensibilidade ética no contexto do sistema de saúde português.

Métodos: O EHCQ-2 foi traduzido para o português e adaptado culturalmente por meio de um rigoroso processo que envolveu tradução e retroversão da tradução, revisão por especialistas, entrevistas cognitivas com profissionais médicos e testes piloto. Um estudo de validação foi conduzido com uma amostra de 156 participantes, incluindo estudantes de medicina, médicos internos e médicos especialistas, para avaliar a confiabilidade e a validade do questionário.

Resultados: O EHCQ-2 adaptado demonstrou boa consistência interna (alfa de Cronbach = 0,74) e confiabilidade interavaliadores variável (variando de 0,12 a 0,67 entre tarefas), refletindo a complexidade dos dilemas éticos. A validade de conteúdo foi estabelecida por meio da avaliação de especialistas, enquanto a validade de construção foi corroborada por correlações significativas entre os cenários individuais e as pontuações gerais (por exemplo, r = 0,683 para o Cenário 7). A análise de regressão revelou que as subescalas que medem a identificação do problema, a sofisticação da explicação e o reconhecimento de valores explicaram coletivamente 99,6% da variância nas pontuações totais, reforçando a robusta validade preditiva do questionário.

Conclusão: A versão portuguesa do EHCQ-2 é uma ferramenta confiável e válida para avaliar a sensibilidade ética entre estudantes de medicina, médicos internos e especialistas. A sua aplicação pode aprimorar programas de educação ética, contribuir para o desenvolvimento curricular e apoiar esforços para aprimorar as habilidades de tomada de decisão ética em futuros profissionais de saúde. Será essencial no futuro explorar a sua utilidade longitudinal e aplicabilidade em diversos contextos culturais.

Palavras-chave: Educação de Graduação em Medicina/ética; Ética Médica; Inquéritos e Questionários; Portugal; Reprodutibilidade dos Resultados; Tomada de Decisão/ética; Tradução

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KEY MESSAGES

- Even though ethical decision-making is a cornerstone of medical practice, there is a lack of validated tools to assess ethical sensitivity.
- The adapted EHCQ-2 provides a reliable and valid tool, for both research and practice.
- This formative measurement model captures the multidimensional nature of ethical reasoning.
- This questionnaire could enhance ethics training programs, curriculum development, and ethical decision-making skills.

INTRODUCTION

Medical ethics has undergone significant transformations over the centuries, shaped by social, religious, and technological advancements, as well as evolving organizational models and economic pressures within the healthcare sector.[1,2] In the near future, medical ethics will increasingly need to address emerging challenges, such as artificial intelligence (e.g., decision algorithms, machine learning, biobanking), genetics (e.g., genetic engineering, reproductive biology, gene therapy), healthcare systems (e.g., resource allocation, funding), and health literacy.[3,4] Clinicians encounter ethically challenging situations daily, from end-of-life discussions to decisions about limiting care. Ethical decision-making is therefore a foundational competency for medical professionals, requiring the ability to recognize ethical dilemmas, identify relevant values, and make reasoned judgments in complex clinical scenarios.[5,6]

Recognizing the importance of ethics training, numerous instruments have been developed to assess ethical sensitivity and decision-making among medical students and residents.[7-10] However, many of these tools lack validation or are tailored to specific cultural contexts, limiting their applicability in diverse settings.[11,12] This gap highlights the need for culturally adapted instruments that can effectively evaluate ethical reasoning across different populations.[13]

During a systematic review on the effectiveness of medical ethics training,[14] we identified the Ethics in Health Care Questionnaire – Version 2 (EHCQ-2) as a promising tool. The EHCQ-2 stands out due to its scenario-based design, which combines quantitative scoring with qualitative insights into participants' reasoning processes.[8,10] By presenting realistic ethical dilemmas and asking participants to both select responses and provide written explanations, the EHCQ-2 captures a multidimensional view of ethical sensitivity, including issue identification, sophistication of reasoning, and value recognition. This dual approach makes it particularly well-suited for evaluating the nuanced nature of ethical decision-making in medical practice.

Despite its demonstrated utility in English-speaking contexts, the EHCQ-2 had not been adapted or validated for use in Portugal. Given the importance of cultural relevance in assessing ethical sensitivity, the aim of this study was to adapt and validate the EHCQ-2 for use among medical students, junior (resident), and senior doctors in Portugal. Specifically, we sought to:

- Translate the EHCQ-2 into Portuguese and culturally adapt it to align with local ethical norms and healthcare practices.
- Assess the reliability of the adapted questionnaire through measures of internal consistency and inter-rater reliability.
- Evaluate the validity of the adapted questionnaire using content validity and construct validity analyses.

By addressing these objectives, this study aims to provide a robust tool for evaluating ethical sensitivity in the Portuguese context, ultimately contributing to improved ethics training and professional development in healthcare.

METHODS

Translation and cultural adaptation

The Ethics in Health Care Questionnaire – Version 2 was translated into European Portuguese through a rigorous, multi-step process to ensure linguistic equivalence and cultural relevance. The process began with forward translation by two independent bilingual translators, followed by reconciliation to produce a single harmonized version. A third bilingual translator then performed back-translation to verify accuracy and identify potential discrepancies. The translated questionnaire was reviewed by a panel of experts in medical ethics and linguistics to ensure that the scenarios and response options were culturally appropriate and aligned with ethical norms in Portugal.

Cognitive interviews were conducted with 15 medical professionals, including medical students, junior, and senior doctors, to assess the clarity, comprehensibility, and cultural relevance of the translated questionnaire. Based on feedback

from these interviews, adjustments were made to refine the wording and context of specific items. For example, certain scenarios were rephrased to better reflect local healthcare practices, and culturally specific terms were clarified to ensure universal understanding.

A good cultural adaptation was defined as the absence of significant difficulties in understanding or responding to the scenarios by at least 80% of participants during cognitive interviews.

Pilot testing

The adapted questionnaire was pilot tested with 20 participants, comprising medical students, junior doctors, and senior doctors. Pilot testing was intended to evaluate the feasibility, acceptability, and clarity of the questionnaire in a real-world setting. Feedback from participants indicated that the questionnaire was generally comprehensible and culturally appropriate. However, some scenarios required further refinement to address ambiguities or align with local ethical norms. Specific adjustments included:

- Clarifying ambiguous phrasing in Scenario 3 (“Patient’s Family”) to better reflect family dynamics in the Portuguese context.
- Adjusting specific references in Scenario 6 (“Teenager requests abortion”) to ensure alignment with Portuguese legal and ethical guidelines.
- Adding contextual details to Scenario 12 (“Flu Vaccine”) to improve its applicability to public health practices in Portugal.

These changes ensured that the final version of the questionnaire was both linguistically accurate and culturally relevant, enhancing its suitability for use in the Portuguese healthcare context.

Validation study design

A validation study was conducted to assess the psychometric properties of the adapted EHCQ-2 as a formative measurement model. The study involved a convenience sample of 156 participants, including medical students (68), junior (43), and senior doctors (45), to evaluate the questionnaire’s applicability across different stages of medical training and professional practice.

Inclusion criteria:

- Medical students (5th or 6th year) at University of Minho’s School of Medicine.
- Residents completing internships at Braga Hospital.
- Attending physicians working at Braga Hospital.

Exclusion criteria:

- Not fluent in Portuguese.

Participants were asked to respond to 12 ethical scenarios included in the EHCQ-2. Each scenario required participants to:

- Identify the correct (consensual) response.
- Identify the ethical issue presented.
- Provide a short explanation of their reasoning.
- Indicate whether they agreed with a proposed course of action.

Responses were scored using a formal coding system that evaluated four key domains:

- Correct response (0 - 11 points): Participants received one point for each ethical scenario for which the response matched expert consensus as the most appropriate course of action.
- Issue identification (0 - 36 points): Participants received points for correctly identifying the primary ethical issue in each scenario. Full credit was awarded for responses that matched expert consensus or reflected a nuanced understanding of the dilemma.
- Sophistication of explanation (0 - 60 points): Written explanations were scored based on the depth and balance of reasoning. Higher scores were assigned to responses that demonstrated a sophisticated understanding of competing values and ethical principles.
- Value recognition (0 - 48 points): Participants earned points for identifying relevant ethical values (e.g., autonomy, beneficence, non-maleficence) and explaining their relevance to the scenario.

For example, in Scenario 7 (“The baby with Down syndrome”), a participant who identified the ethical issue as “parental decision-making in the context of disability,” provided a balanced explanation weighing parental rights against societal norms, and recognized the values of autonomy and justice would receive high scores across all three domains.

Statistical analysis

The statistical analysis included the calculation of Cronbach's alpha to assess internal consistency, Spearman's rank-order correlations to examine construct validity, and analysis of variance (ANOVA) followed by *post-hoc* tests (Tukey) to compare differences between groups. Predictive validity was evaluated through multiple linear regression analysis, where sub-scales measuring issue identification, explanation sophistication, and value recognition were used as independent variables to predict the total score.

Statistical analyses were conducted to evaluate the reliability and validity of the adapted questionnaire. Descriptive statistics were calculated for each sub-scale and the total score, while correlation and regression analyses were used to assess construct validity. Group comparisons were performed to explore differences in ethical sensitivity based on professional experience.

Ethical approval for the study was obtained from Health Ethics Committee of Braga's Hospital, Ethics Committee for Research in Life and Health Sciences of the University of Minho, and all participants provided informed consent before completing the questionnaire. Responses were kept confidential to ensure data integrity.

RESULTS

The validation study involved a sample of 156 participants, comprising medical students, junior, and senior doctors in Portugal. This diverse sample allowed for the examination of the EHCQ-2's applicability across different stages of medical training and practice.

The adapted EHCQ-2 demonstrated good internal consistency, with a Cronbach's alpha of 0.74, indicating reliable measurement of ethical sensitivity. This value meets the generally accepted threshold (0.7) for reliability in social science research, suggesting that the items within the questionnaire consistently measure a cohesive construct.

Inter-rater reliability, which assesses the degree of agreement between different evaluators, varied considerably across different tasks within the questionnaire, with coefficients ranging from 0.12 to 0.67. This variation may reflect the inherent complexity of the ethical dilemmas presented. Scenarios with higher consensus (e.g., values close to 0.67) tend to involve more clear-cut ethical norms or principles, while those with lower consensus (e.g., values close to 0.12) may reflect more subjective or context-dependent dilemmas, open to multiple interpretations.

Content validity was evaluated through an expert review process. Experts in medical ethics and Portuguese language assessed the translated scenarios and response options, ensuring they reflected culturally relevant ethical standards and considerations specific to the Portuguese healthcare context. The expert review confirmed that the adapted EHCQ-2 aligns with Portuguese legal and ethical guidelines, supporting its relevance and applicability in this setting.

Descriptive statistics

Descriptive statistics were calculated for the Total Score (0 - 155) and its sub-scales: Total Correct Response Score (0 - 11), Total Identification Ability Score (0 - 36), Total Sophistication of Explanation Score (0 - 60), and Total Value Identification Score (0 - 48). These scores were analyzed across three groups: medical students, junior doctors, and senior doctors.

The fact that some participants did not identify ethical issues or explain values raises questions about questionnaire comprehension or response motivation. Contextual factors, such as time pressure or fatigue, may have influenced the quality of responses. Future research should explore strategies to mitigate this issue, such as including incentives or improving questionnaire design.

Correlations

The correlation analysis revealed significant positive correlations between individual scenarios and the total subscale scores, supporting the expectations of a formative measurement model. Each scenario contributed independently to the overall ethical sensitivity score, as evidenced by strong and statistically significant Spearman's rank-order correlations. For instance, Scenario 1 ("Voluntary withdrawal of treatment") showed a correlation of r = 0.485 ($p < 0.001$), while Scenario 3 ("Patient's family") demonstrated an even stronger correlation of r = 0.613 ($p < 0.001$). Notably, Scenario 7 ("The baby with Down syndrome") and Scenario 12 ("Flu vaccine") exhibited particularly high correlations, with r = 0.683 ($p < 0.001$) and r = 0.671 ($p < 0.001$), respectively.

These findings suggest that certain scenarios resonate more strongly with participants due to their relevance to real-world clinical practice. For example, scenarios involving family dynamics, such as Scenario 3 ("Patient's family") and Scenario 7 ("The baby with Down syndrome"), likely show stronger correlations because they reflect situations healthcare professionals encounter frequently in their daily practice. Ethical dilemmas involving family decision-making often

require navigating competing values, such as patient autonomy and familial concerns, making them especially significant in both medical education and clinical practice. Similarly, public health dilemmas, like those presented in Scenario 12 ("flu vaccine"), may elicit stronger responses due to their societal implications and alignment with contemporary healthcare challenges, such as vaccination hesitancy and resource allocation. These types of scenarios highlight the intersection of individual ethics and broader public health considerations, which are increasingly relevant in modern medical practice.

The variability in correlation strengths across scenarios underscores their distinct roles in shaping ethical sensitivity. This pattern aligns with the formative measurement model, where indicators contribute independently to the latent construct. The robust correlations also indicate that the questionnaire is sensitive to differences in how participants engage with specific ethical dilemmas, further supporting its utility as a tool for assessing ethical sensitivity in medical education and practice. These results collectively reinforce the suitability of the EHCQ-2 as a formative measurement model for evaluating ethical reasoning in healthcare professionals.

Linear regression

The multiple linear regression analysis provided robust evidence for the predictive validity of the adapted EHCQ-2. The three sub-scales – total identification ability score (TIAS), total sophistication of explanation score (TSES), and total value identification score (TVIS) – collectively explained 99.6% of the variance in the total score ($R^2 = 0.996$, adjusted $R^2 = 0.996$), with a low root mean square error (RMSE = 1.048), indicating high accuracy in predicting overall ethical sensitivity.

The ANOVA results confirmed the statistical significance of the model [$F(3, 152) = 13{,}373.591$, $p < 0.001$]. Standardized coefficients revealed that TSES had the strongest impact ($\beta = 0.454$, $p < 0.001$), followed by TIAS ($\beta = 0.298$, $p < 0.001$) and TVIS ($\beta = 0.259$, $p < 0.001$).

Group comparisons

Analysis of variance (ANOVA) was conducted to compare mean scores across participant groups (medical students, junior, and senior doctors). No statistically significant differences were found for the total score (0 - 155) between groups [$F(2, 153) = 1.234$, $p = 0.293$], indicating that overall ethical sensitivity does not vary significantly based on professional experience. *Post-hoc* comparisons using Tukey's adjustment revealed minor differences in specific sub-scales. For instance, students scored significantly higher than seniors in the total correct response score [mean difference = 0.486, SE = 0.202, $t(153) = 2.402$, $p = 0.046$], while seniors scored marginally higher than juniors in the total sophistication of explanation score [mean difference = -0.486, SE = 0.224, $t(153) = -2.168$, $p = 0.08$].

While no overall differences were observed, the marginal differences observed in sub-scales, such as the superior performance of students in the total correct response score, may reflect their recent exposure to formal ethics training. In contrast, the greater sophistication in explanations provided by senior doctors (higher scores in the total sophistication of explanation score) may result from accumulated clinical experience, suggesting that practice enhances the depth of ethical reasoning. These observations suggest opportunities for targeted educational interventions. Future research could explore these patterns further for refining ethics curricula and addressing gaps in professional development.

These findings underscore the importance of fostering ethical reasoning as a core competency throughout medical training and practice. The adapted EHCQ-2 provides a reliable and valid tool for assessing these competencies, enabling educators and practitioners to monitor progress and tailor interventions to meet the evolving needs of healthcare professionals.

DISCUSSION

The adaptation and validation of the EHCQ-2 for use in Portugal represents a significant step forward in assessing ethical sensitivity among medical students, junior, and senior doctors. This culturally adapted tool (Appendix 1 : https://www.actamedicaportuguesa.com/revista/index.php/amp/article/view/23531/15817) successfully integrates linguistic nuances and ethical norms specific to the Portuguese healthcare context while retaining the robust psychometric properties of the original questionnaire. The findings demonstrate that the adapted EHCQ-2 effectively captures key dimensions of ethical reasoning, including issue identification, sophistication of explanation, and value recognition, making it a valuable resource for both research and practice.

A notable strength of this study lies in its alignment with the formative measurement model framework. Unlike reflective models, where indicators are expected to correlate highly due to their shared underlying construct, formative models anticipate that indicators contribute independently to the overall construct.[15,16] The results support this assumption, as the sub-scales – total identification ability score (TIAS), total sophistication of explanation score (TSES), and total value

identification score (TVIS) – were found to independently and significantly predict the total score. This finding underscores the importance of retaining all sub-scales to capture the multidimensional nature of ethical sensitivity. For instance, the prominence of TSES as the strongest predictor highlights the critical role of nuanced reasoning in ethical decision-making, while the contributions of TIAS and TVIS reinforce the complexity of ethical reasoning processes.

The correlation analysis further validates the questionnaire's utility. Significant positive correlations between individual scenarios and the total subscale scores indicate that performance on specific tasks meaningfully contributes to overall ethical sensitivity. Scenarios involving family dynamics (e.g., Scenario 3: "Patient's family") and public health dilemmas (e.g., Scenario 12: "Flu vaccine") demonstrated particularly strong correlations, likely reflecting their relevance to real-world clinical practice in Portugal. These findings suggest that certain ethical challenges resonate more strongly with participants due to their frequent occurrence or societal significance, underscoring the questionnaire's ability to capture context-specific ethical reasoning.

Group comparisons showed no statistically significant differences in overall ethical sensitivity among medical students, junior doctors, and senior doctors, although larger studies could detect them. Still, this finding may suggest that ethical reasoning is influenced more by standardized training and exposure to ethical dilemmas than by years of professional experience. However, significant differences in specific sub-scales, such as the total correct response score, where students outperformed seniors, may reflect variations in familiarity with ethical principles or differences in how groups approach ethical challenges. These patterns highlight opportunities for targeted educational interventions, such as reinforcing foundational ethics knowledge among senior doctors or enhancing reasoning sophistication among junior doctors.

The regression analysis provided evidence for the predictive validity of the adapted questionnaire, with the three subscales collectively explaining 99.6% of the variance in the total score ($R^2 = 0.996$). This high explanatory power may confirm the questionnaire's ability to capture the key dimensions of ethical sensitivity, further validating its use as a formative measurement tool.

Nevertheless, we also recognize that this high explanatory power may be influenced by the structural proximity between the sub-scales and the total score. This phenomenon may indicate overfitting or multicollinearity, limiting the interpretation of R^2 as robust evidence of predictive validity.

The ANOVA results validate the formative measurement model, as each sub-scale independently and meaningfully contributed to the overall construct of ethical sensitivity.

The strong predictive validity of the sub-scales underscores the questionnaire's ability to measure distinct dimensions of ethical sensitivity. For example, the prominence of TSES as the strongest predictor highlights the critical role of nuanced reasoning in ethical decision-making. Similarly, the contributions of TIAS and TVIS reinforce the multidimensional nature of ethical sensitivity, capturing issue identification, reasoning sophistication, and recognition of ethical values.

The variability observed in inter-rater reliability reflects the inherent complexity of the ethical dilemmas presented. Scenarios with higher consensus tend to involve clear ethical norms or principles, with higher values, while those with lower consensus present lower values, reflecting more subjectivity or context-dependent dilemmas.

Beyond its psychometric properties, the EHCQ-2 has broader implications for medical education and practice. For example, it can be used to evaluate the effectiveness of ethics training programs by assessing changes in ethical sensitivity over time. Longitudinal studies could explore trends in ethical reasoning throughout medical training, identifying critical periods for intervention. Additionally, the questionnaire could serve as a tool for assessing the impact of specific curricular innovations or training modules designed to enhance ethical decision-making skills.

Cultural factors also play a significant role in shaping ethical reasoning within the Portuguese context. The emphasis on family-centered decision-making, collectivism, and respect for authority in Portuguese society may influence how healthcare professionals' approach ethical dilemmas. For instance, scenarios involving family dynamics may elicit stronger responses due to their alignment with cultural norms, highlighting the importance of considering local values when designing ethics training programs. Future research could explore these cultural influences in greater depth, providing insights into how ethical reasoning varies across different cultural contexts.

Despite its strengths, this study has limitations that warrant consideration. First, the sample size, while adequate for initial validation, may not fully represent the diversity of healthcare professionals in Portugal. Expanding the sample to include a broader range of specialties and settings would enhance the generalizability of the findings. Second, the reliance on self-reported responses introduces the potential for social desirability bias, which may influence participants' answers. Incorporating objective measures, such as simulated ethical scenarios or observational assessments, could mitigate this limitation. Third, while the adapted questionnaire demonstrates strong psychometric properties, its applicability to other Portuguese-speaking countries remains untested. Cross-cultural validation studies are needed to assess its utility in

diverse contexts and ensure its relevance beyond Portugal.

The EHCQ-2 presents opportunities for further research and application. Future studies could explore its use in evaluating the impact of ethics training interventions, assessing longitudinal trends in ethical sensitivity, or adapting it for use in other healthcare professions. Additionally, cross-cultural validation studies could expand its applicability to Portuguese-speaking countries and other global contexts, contributing to a deeper understanding of ethical reasoning across diverse populations. As healthcare continues to evolve, tools like the EHCQ-2 will play an essential role in fostering ethical competence and ensuring high-quality patient care.

CONCLUSION

The Portuguese version of the EHCQ-2 demonstrated evidence of reliability and validity for assessing ethical sensitivity among medical students, junior, and senior doctors. Its alignment with a formative measurement model ensures that it captures the multidimensional nature of ethical reasoning, providing actionable insights for educators and practitioners. By addressing gaps in existing assessment tools, this questionnaire has the potential to enhance ethics training programs, inform curriculum development, and may support efforts to improve ethical decision-making skills in future healthcare professionals.

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The authors have declared that no AI tools were used during the preparation of this work.

AUTHOR CONTRIBUTIONS

FM: Data collection and analysis, writing of the manuscript.
CL, JB, PMT: Critical review of the manuscript.
All authors approved the final version to be published.

PROTECTION OF HUMANS AND ANIMALS

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the Helsinki Declaration of the World Medical Association updated in October 2024.

DATA CONFIDENTIALITY

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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Table 1 – Descriptive statistics

		n	Mean	Std. deviation	Minimum	Maximum
Total score (0 - 155)	Student	68	52.721	15.775	6	97
	Senior	45	54.244	17.927	5	88
	Junior	43	50.860	17.710	5	92
	Total n	156	52.647	16.894	5	97
Total correct response score (0 - 11)	Student	68	7.441	0.998	5	9
	Senior	45	6.956	0.878	5	9
	Junior	43	7.442	1.278	5	10
	Total n	156	7.301	1.068	5	10
Total identification ability score (0 - 36)	Student	68	13.676	4.586	0	26
	Senior	45	14.444	5.345	0	24
	Junior	43	13.279	5.063	0	24
	Total n	156	13.788	4.934	0	26
Total sophistication of explanation score (0 - 60)	Student	68	18.176	6.859	0	38
	Senior	45	18.889	7.408	0	34
	Junior	43	17.233	7.505	0	35
	Total n	156	18.122	7.181	0	38
Total value identification score (0 - 48)	Student	68	13.426	4.372	0	25
	Senior	45	13.956	5.117	0	25
	Junior	43	12.907	4.970	0	24
	Total n	156	13.436	4.748	0	25

Table 2 – Identification ability score results

Scenario	Total identification ability score		
S01 Voluntary withdrawal of treatment	Spearman's rho	0.523	***
	p-value	< 0.001	
S02 The Patient with epilepsy	Spearman's rho	0.512	***
	p-value	< 0.001	
S03 Patient's family	Spearman's rho	0.645	***
	p-value	< 0.001	
S04 Patient refuses transfusion	Spearman's rho	0.502	***
	p-value	< 0.001	
S05 Disclosure of HIV positive status	Spearman's rho	0.484	***
	p-value	< 0.001	
S06 Teenager requests abortion	Spearman's rho	0.535	***
	p-value	< 0.001	
S07 The baby with Down syndrome	Spearman's rho	0.566	***
	p-value	< 0.001	
S08 Child with leukemia	Spearman's rho	0.582	***
	p-value	< 0.001	
S09 The attractive patient	Spearman's rho	0.440	***
	p-value	< 0.001	
S10 The resident	Spearman's rho	0.544	***
	p-value	< 0.001	
S11 The new face	Spearman's rho	0.519	***
	p-value	< 0.001	
S12 Flu vaccine	Spearman's rho	0.616	***
	p-value	< 0.001	

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Table 3 – Sophistication of explanation score results

Scenario	Total sophistication of explanation score		
S01 Voluntary withdrawal of treatment	Spearman's rho	0.485	***
	p-value	< 0.001	
S02 The patient with epilepsy	Spearman's rho	0.536	***
	p-value	< 0.001	
S03 Patient's family	Spearman's rho	0.613	***
	p-value	< 0.001	
S04 Patient refuses transfusion	Spearman's rho	0.556	***
	p-value	< 0.001	
S05 Disclosure of HIV positive status	Spearman's rho	0.517	***
	p-value	< 0.001	
S06 Teenager requests abortion	Spearman's rho	0.535	***
	p-value	< 0.001	
S07 The baby with Down syndrome	Spearman's rho	0.521	***
	p-value	< 0.001	
S08 Child with leukemia	Spearman's rho	0.590	***
	p-value	< 0.001	
S09 The attractive patient	Spearman's rho	0.487	***
	p-value	< 0.001	
S10 The resident	Spearman's rho	0.529	***
	p-value	< 0.001	
S11 The new face	Spearman's rho	0.531	***
	p-value	< 0.001	
S12 Flu vaccine	Spearman's rho	0.636	***
	p-value	< 0.001	

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Table 4 – Value identification score results

Scenario	Total value identification score		
S01 Voluntary withdrawal of treatment	Spearman's rho	0.521	***
	p-value	< 0.001	
S02 The patient with epilepsy	Spearman's rho	0.581	***
	p-value	< 0.001	
S03 Patient's family	Spearman's rho	0.598	***
	p-value	< 0.001	
S04 Patient refuses transfusion	Spearman's rho	0.562	***
	p-value	< 0.001	
S05 Disclosure of HIV positive status	Spearman's rho	0.520	***
	p-value	< 0.001	
S06 Teenager requests abortion	Spearman's rho	0.598	***
	p-value	< 0.001	
S07 The baby with Down syndrome	Spearman's rho	0.683	***
	p-value	< 0.001	
S08 Child with leukemia	Spearman's rho	0.607	***
	p-value	< 0.001	
S09 The attractive patient	Spearman's rho	0.535	***
	p-value	< 0.001	
S10 The resident	Spearman's rho	0.566	***
	p-value	< 0.001	
S11 The new face	Spearman's rho	0.551	***
	p-value	< 0.001	
S12 Flu vaccine	Spearman's rho	0.671	***
	p-value	< 0.001	

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

Table 5 – Linear regression coefficients

Model		Unstandardized	Standard error	Standardized	t	*p*
M_1	(Intercept)	6.843	0.263		26.031	< 0.001
	TIAS	1.020	0.082	0.298	12.484	< 0.001
	TSES	1.069	0.047	0.454	22.909	< 0.001
	TVIS	0.921	0.072	0.259	12.738	< 0.001