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Attitudes of undergraduate medical students towards end-of-life decisions: a systematic review of influencing factors

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Abstract

Background Medical end-of-life decisions, including voluntary active euthanasia (lethal injection), (physician-) assisted dying (prescribing lethal substances), passive euthanasia (refraining from or ceasing life-sustaining treatments), palliative sedation (administering sedatives to alleviate suffering, possibly leading to unintended life-shortening), and treatment withdrawal/withholding, have become prevalent in modern medical practice.

Aim This systematic review aims to analyse international data on undergraduate medical students' attitudes towards (physician-) assisted dying, palliative sedation, treatment withdrawal/withholding, active and passive euthanasia. The objectives are to assess approval rates over the past 24 years and to identify factors influencing these attitudes.

Design In accordance with PRISMA guidelines, a systematic search of six electronic databases (MEDLINE, CINAHL, EMBASE, ERIC, PsycINFO, and Web of Science) was conducted. The review encompasses studies from 2000–2024.

Results Forty-nine studies met the inclusion criteria (43 surveys, 6 qualitative studies, 1 mixed-method study). The studies were globally distributed: Europe (27), Asia (10), America (8), Africa (3), and Australia (1). Predictors such as age, clinical vs. pre-clinical status, religious aspects, sex, and ethnicity were investigated. Age and gender had limited influence, whereas religion was a significant factor. Compared with pre-clinical students, clinical students showed more support for end-of-life practices. Geographic locations and socioeconomic status also affect attitudes.

Conclusion Medical students' attitudes towards end-of-life decisions are influenced by clinical experience, religious beliefs, and geographic location. The acceptance rates for euthanasia and (physician-)assisted dying vary significantly across regions, reflecting diverse cultural and educational backgrounds.

Keywords Systematic review, Assisted dying, End-of-life decisions, Euthanasia, Assisted suicide, Palliative sedation, Terminal sedation, Ethical principles, Medical students

Introduction

The landscape of end-of-life decisions is undergoing significant transformation across the globe. Legal frameworks are evolving to accommodate the complex ethical considerations surrounding issues such as euthanasia and physician-assisted dying. In recent years, several countries, including the Netherlands, Belgium, Canada, and Germany, have revised their laws to allow for greater self-determination in the context of terminal illness. For instance, Austria in 2020 made notable changes to its legal landscape. The Austrian Constitutional Court overturned the prohibition on assisted suicide; therefore, the new Dying Decree Act allows individuals to end their

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lives through self-determination, including with the help of a third person if needed [1]. In contrast, euthanasia, which involves deliberately ending the life of a patient suffering from an incurable and painful disease [2], remains illegal in Austria.

End-of-life decisions (ELDs), defined as medical interventions performed by physicians at the end of a patient's life that may or will shorten life [3], have been the subject of extensive research [4–8]. ELDs are classified as follows: (active) euthanasia or (physician-)assisted suicide, palliative or terminal sedation, and non-treatment decisions as passive euthanasia or withhold/withdraw life-sustaining medical treatments, nutrition or hydration.

Euthanasia or (physician-)assisted suicide refers to the administration, prescription, or provision of lethal drugs explicitly intended to hasten death at the patient's explicit request, either directly or through a third party [4, 9–11].

Palliative sedation involves administering medication to patients near the end of life to alleviate intolerable symptoms, often resulting in a reduced level of consciousness and potentially hastening death, though it does not involve an explicit request to hasten death [4, 9, 12]. Palliative or terminal sedation is often discussed in relation to euthanasia. Broeckaert [13] highlighted the need for precise terminology and proposed the term 'palliative sedation.' Although the term is now widely used, its adoption does not guarantee uniform understanding or practices. There has been ongoing debate about the ethical assessment of this practice [14]. Almost from the start, it was controversial. Critics called it "slow euthanasia" or mercy killing in disguise, arguing that "terminal" did not just indicate the final phase of life but the intent to end it [15–17]. In 2009, the European Association for Palliative Care (EAPC) issued guidelines recognizing sedation as acceptable in palliative care if used appropriately [18]. However, it stressed that sedation should be a last resort to prevent pain due to potential risks, including reduced life expectancy.

Treatment Withdrawal refers to deliberate discontinuation of life-sustaining interventions, while treatment withholding refers to their deliberate non-initiation, based on medical, ethical, or patient considerations, recognizing that both may result in death. However, TWW focuses on allowing a natural death process without the intention to hasten or cause death, whereas passive euthanasia implies an explicit intention to end life by withholding or withdrawing treatment specifically for the purpose of bringing about death. The term 'passive euthanasia' conflates these ethically distinct practices, potentially leading to misinterpretations in medical, legal, and ethical discussions, which can impact decision-making, policy development, and public perception [20].

Several countries have legalised physician-assisted suicide, including the Netherlands, Belgium, Luxembourg, Canada, ten US states, Colombia, and two Australian states, whereas countries such as Switzerland and Germany have decriminalised (physician-)assisted suicide [21, 22]. Belgium, Luxembourg, the Netherlands, Canada, Colombia, and New Zealand [23] also permit active euthanasia.

End-of-life interventions pose a dilemma for healthcare professionals, who must balance respecting patients' autonomy with their duty to alleviate suffering. Opponents argue that (physician-)assisted dying violates the Hippocratic Oath, contravenes moral or religious values, damages the patient-physician relationship, and undermines public trust in the healthcare system [24].

Numerous surveys [25–30] have explored attitudes toward euthanasia and (physician-) assisted dying among the general public, terminally ill patients or their relatives, and healthcare professionals. Comprehensive current comparative information about the opinions of medical students, who face these issues as future physicians, is lacking and needed. Therefore, this systematic review aims to analyse international data on medical students' attitudes toward different end-of-life decisions.

The review objectives are (a) to investigate the attitudes of undergraduate medical students towards active euthanasia, (physician-)assisted suicide, and other end-of-life decisions, such as palliative sedation, passive euthanasia, and treatment withdrawal or withholding; (b) to assess the approval rate over the past 24 years; and (c) to identify factors influencing these attitudes.

Method

The review followed the guidance for conducting and reporting systematic reviews according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, which can be applied to qualitative study reviews [31] (Fig. 1). Additionally, this review was registered in the International Prospective Register of Systematic Reviews (PROSPERO) with the registration ID CRD42022330030. The review process adhered to the PRISMA guidelines [32].

Data collection

We conducted a thorough search of six electronic databases, utilising a search strategy that was developed, refined, and tested for EMBASE and then adapted for other databases. This search was conducted in November 2024 in the following databases: EMBASE, MEDLINE (via OVID), PsycINFO (via OVID), ERIC (via OVID), CINAHL (via EBSCOhost), and SCI-E, SSCI, A&HCI, and ESCI (the last four via the Web of Science Core Collection, which will be summarised as Web of Science).

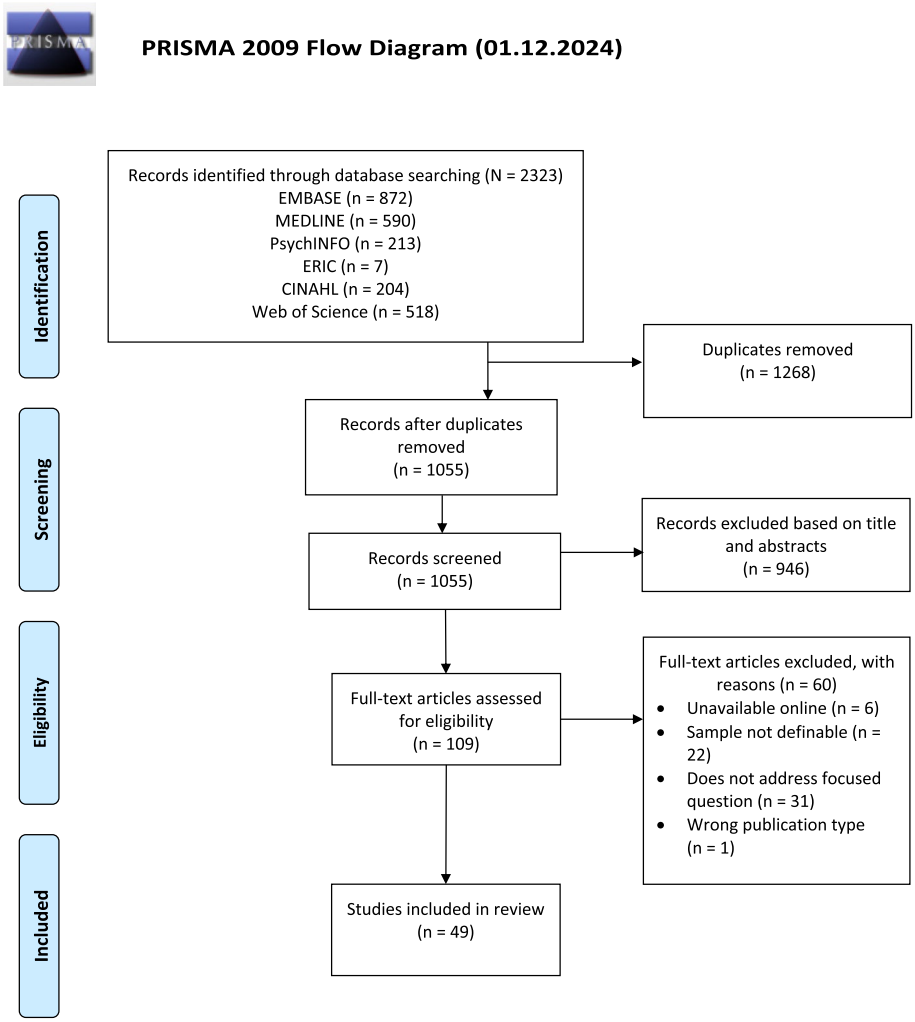

Fig. 1 PRISMA flowchart

The complete details of the search strategy are presented in the supplementary material (see Appendix A). A total of 2323 recorded studies were retrieved from the databases (Fig. 1). After duplicates ($n = 1268$) had been removed, two authors (JSG and AH) screened the titles and abstracts of the remaining records ($n = 1055$) for eligibility based on the inclusion and exclusion criteria. In case of disagreements, these were resolved through discussion.

Based on the titles and abstracts, 946 records were excluded, leaving 109 records for further screening. If an article could not be accessed as full text from the databases or via the library networks of the authors' universities, it was also excluded. All potentially eligible records that were available as full text ($n = 103$) were then retrieved and screened again by the authors (JSG and AH). Based on the inclusion criteria, this resulted in a total of 49 studies for analysis.

Inclusion and exclusion criteria

Our inclusion criteria included the following parameters: a search was conducted for peer-reviewed research papers and studies investigating the themes of euthanasia and (physician-)assisted suicide exclusively from the perspective of undergraduate medical students. We included all open access records published between 2000 and 2024 in English or German. Eligible articles were required to delineate research studies centred on medical educational programs or courses. For studies with samples from multiple programs,

the medical student sample had to be clearly distinguishable to meet the inclusion criteria. Papers were mandated to incorporate a minimum of one outcome measure relating to euthanasia, medical, or (physician-) assisted suicide from the perspective of undergraduate medical students.

We excluded conference abstracts, editorials, commentaries, letters, book chapters, discussions, posters, opinion papers, and review papers, as well as articles concerning graduated students and health education in related fields, such as nursing or pharmacy. We eliminated articles whose sample was not definable and did not consist only of medical students, or for which the results were not analysable for the medical student subsample. We also ruled out articles whose full text could not be found online, or articles written in languages other than English or German.

Data synthesis

The review followed a 5-step process for both the surveys and the qualitative studies.

(1) All the articles were analysed by means of which type of euthanasia practice/end-of-life intervention they examined: voluntary active euthanasia (AE), passive euthanasia (PE), palliative sedation (PS), (physician-) assisted suicide (PAS), treatment withdrawal/withholding (TW), or euthanasia that cannot be clearly attributed (EUT). (2) We extracted data such as the country and year of the study, study design, age range, male–female ratio, sample size of medical students, response rate, and use of interventions.

(3/a) We analysed the surveys to identify the types of predictors that were studied and to determine whether they had a significant effect on attitudes towards the practice of euthanasia or end-of-life care. (4/a) To ensure comparability, we categorised the survey outcome measures. (5/a) In the end, we exported the consent rates of medical students towards the surveyed euthanasia practices/end-of-life care, as well as their consent rates towards the legalisation of one of these practices.

(3/b) We exported the purpose and method of data analysis used in the qualitative studies. (4/b) We extracted and described the outcomes of the qualitative studies. (5/b) In the final step, the medical students' attitudes are described, and the respective qualitative results are presented.

Results

Forty-nine articles met the inclusion criteria, 43 were surveys (see Table 1), five studies used a qualitative design, and one was a mixed-method study (see Table 2). Among the 49 selected articles, 8 studies were from America [33–40], 10 studies from Asia [41–50], 3 studies from Africa [51–53], 1 study from Australia [54], and 27 studies from Europe [55–81]. Publications were derived from different countries, including Austria [68], Belgium [65], Brazil [37], Canada [33, 35, 36], China [44], Croatia [67], Germany [55, 56, 66, 69, 81], Greece [59], Hong Kong [46], India [47, 49], Iran [48], Ireland [77], Malaysia [41], Mexico [34, 39, 40], New Zealand [54], Norway [63], Pakistan [45, 50], Poland [58, 60–62, 74, 76, 78, 79], Puerto Rico [38], Serbia [57, 80], South Africa [52, 53], Sudan [51], Sweden [71, 72], Switzerland [73],Turkey [42, 43], and the UK [64, 70].

Survey results

Consent rates

Three articles investigated medical students' attitudes towards palliative sedation and reported consent rates [38, 55, 59]. Twenty articles reported medical students' consent rates to (physician-)assisted suicide [33, 35, 36, 38, 39, 42, 49, 50, 52, 53, 55, 59, 62, 64, 66, 67, 69, 73, 77, 81]. Seven articles focused on treatment withdrawal/withholding [37, 39, 44, 53, 59, 64, 67], four articles reported consent rates for passive euthanasia [34, 41, 42, 48], and twelve articles reported consent rates for active euthanasia [33, 34, 41, 42, 44, 45, 48, 56, 57, 64, 68, 73]. Finally, twenty articles reported approval rates for euthanasia [37, 38, 43, 46, 47, 49–53, 55, 58–62, 65, 74, 78, 79]. Twenty-six articles investigated medical students'attitudes towards the legalisation of end-of-life interventions [33, 36, 38, 41, 42, 45, 47, 49, 51–54, 56–58, 60–63, 65–67, 73, 76, 79, 80].

Consent for palliative sedation

The acceptability of palliative sedation among medical students was studied in Germany, Puerto Rico, and Greece. The results revealed that a vast majority of medical students in Germany (83.8%) [55] and Puerto Rico (76.3%) [38] considered palliative sedation acceptable. However, the percentage was much lower in Greece, where only 53.3% of medical students approved of palliative sedation [59].

Consent for (physician-)assisted suicide

The acceptance of physician-assisted suicide (PAS) varies significantly across countries and jurisdictions. In countries where PAS is permitted, medical students in Germany exhibit a wide range of approval rates, from 24.7% [66] to 93% [69]. Comparable rates are observed in Canada (over 61%) [33] and Switzerland (64%) [35].

In contrast, countries where PAS is prohibited tend to report lower approval rates, ranging from 12% in Poland [62] to 38% in India [49]. However, notable exceptions include Greece and Croatia, where approval rates reach 69.7% [59] and 85.2% [67], respectively.

Table 1 Summary of Survey Results

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[41]	EUT	Hong Kong	2021	cross-sectional survey, anonymous online self-administered 28-item questionnaire	17–25	57.0%/43.0%	N/A	228	Age Comparison of two universities Ethnicity Gender* Religion* Year of study	none	Association between attitudes and knowledge Attitudes towards EUT Exposure to EUT Knowledge towards EUT Readiness to assist decision-making on EUT	-	-	-	-	41.2%	-
[53]	EUT PAS	Poland	N/A	cross-sectional survey, 18-item questionnaire	21–41 (24.71 ± 1.81)	59.26%/40.79%	94.1%	659	Place of residence*	none	Access to palliative care/pain therapy decreases EUT Active participation in EUT/PAS Attitudes towards legalisation Claiming EUT/PAS for oneself Ethical context Knowledge about EUT/PAS Personal arguments for claiming EUT/PAS for oneself Personal arguments for practicing EUT Risk of abuse Teaching Palliative Care Values in contact with patients	-	-	-	-	25.9%	34.4% (EUT)
[64]	PAS	Germany	2020	cross-sectional study, self-administered 10-item questionnaire	mean 24.5 (± 3.5)	62%/38%	82%	271 (4th year)	N/A	none	Active participating in PAS Attitudes towards PAS Claiming PAS for oneself Teaching PAS Knowledge regarding legislation	-	93%	-	-	-	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[44]	AE EUT PAS	India	2020	cross-sectional survey, self-administered questionnaire	N/A	61.5%/38.5%	N/A	400 (1st, 2nd, 3rd and final year)	Gender	none	Attitude towards EUT/PAS Knowledge towards EUT Legalisation of EUT/AE Person controlling EUT/ Person deciding over EUT Reasons to support/oppose EUT Risk of abuse	-	38%	-	-	72%	61% (AE) 75% (PE)
[49]	PAS	New Zealand	2018	mixed-methods online survey	18–40	61.8%/38.2%	28%	326 (2nd to 5th year)	Ethnicity Gender Religiosity* Year of study*	none	Attitudes towards legalisation of PAS	-	-	-	-	-	56% (AE)
[52]	AE	Serbia	2017	cross-sectional survey, paper-based 10-item questionnaire	N/A	N/A	N/A	107	N/A	none	Acceptance/ refusal of AE in hypothetical scenarios Attitudes towards AE Claiming AE for oneself Ethical acceptance of AE Legalisation of AE Personal arguments for claiming AE	-	-	-	57%	-	44% (AE)
[37]	AE PAS PE	Turkey	2018 - 2019	cross-sectional survey, paper-based 11-item questionnaire	18–40	57.9%/42.1%	78.9%	242 (1st & 6th year)	Gender Year of study*	none	Active participating in EUT Arguments in favour/against EUT Attitudes towards AE/ PAS/PE Ethical justification of EUT Legalisation of EUT Risk of abuse	-	28.9%	27.3% (PE)	35.9%	-	33.4% (EUT)

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[43]	AE EUT PE	Iran	2016	cross-sectional study, self-administered questionnaire	18–28 (mean 22.12 ± 2.35)	60.5%/39.5%	N/A	152	Age* Gender Year of study*	none	Active participating in EUT Attitudes towards AE/PE	-	-	44.7% (PE)	30.9%	-	-
[42]	EUT	India	N/A	cross-sectional study, semi-structured 10-item questionnaire	N/A	N/A	N/A	96	N/A	none	Attitudes towards EUT Current legislation on EUT Knowledge about EUT Legalisation on EUT	-	-	-	-	41.7%	83.3% (EUT)
[30]	PAS	Canada	2016 - 2017	cross-sectional survey, self-administered, anonymous online 47-item questionnaire	18–30 +	N/A	12%	1210	Age Birthplace* Frequency of religious attendance* Gender Parental education Educational background Province of Canada* Religion* Urban/rural upbringing Year of study	none	Active participating in PAS	-	71%	-	-	-	-
[59]	AE TW PS	UK	N/A	cohort study, paper-based, self-completion questionnaire with 5 scenarios	18–44 (mean 22.7)	59.8%/40.2%	79%	400 (1st and final year)	Age* Gender Graduate status* Personal belief* Religious background* Year of study*	none	Active participation in AE Attitudes towards AE/TW/PS	-	28%	58%	16%	-	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[47]	EUT PAS	South Africa	2016 - 2017	semi-quantitative survey, modified [57] paper-based 16-item questionnaire	N/A	N/A	69.3%	277 (3rd, 4th and 5th year)	Religion	none	Acceptance/refusal of EUT/PAS in hypothetical scenarios Active participating in EUT/PAS Attitudes towards EUT/PAS Personal arguments in favour and against EUT/PAS	-	35%	-	-	47.7%	52.7% (EUT/PAS)
[29]	AE PE	Mexico	N/A	cross-sectional survey, modified [34, 77] 9-item questionnaire	17–30	54.7%/43.3%	N/A	1319	Age Gender* Importance of religiosity and spirituality* Religion* Year of Study	none	Arguments in favour/against AE/PE Attitudes towards PE/AE Claiming AE for oneself Legalisation of AE/PE	-	-	52.1% (PE)	44.4%	-	-
[38]	EUT[2]	Turkey	2017	cross-sectional survey, 13-item online questionnaire	N/A	N/A	N/A	125	N/A	none	Arguments in favour/against EUT Attitudes towards (paediatric) EUT Conditions under which paediatric EUT is acceptable Level of agreement with legalisation Person controlling EUT/Person deciding over EUT Risk of abuse	-	-	-	-	32%	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[48]	EUT PAS TW	South Africa	2016	cross-sectional study, adapted [78] 12-item questionnaire	17–25	58.7%/41.3%	71.6%	481	Comparison of preclinical (1st and 2nd year) vs. clinical (3rd, 4th and 5th year) students	none	Active participating in PAS Attitudes towards EUT/PAS Claiming PAS for oneself Legalisation of PAS Person controlling PAS/Person deciding over PAS	-	36.2%	69.8%	-	30.1%	43.0% (AS)
[28]	AE EUT PAS	Canada	2015	exploratory cross-sectional survey, self-administered, 16-item questionnaire	N/A	57.3%/42.7%	87.1%	405	Gender Spirituality Year of study	none	Acceptance/refusal of EUT/PAS in hypothetical scenarios Active participating in PAS/AE Arguments in favour/against PAS Legalisation of PAS Person controlling/practicing PAS	-	61%	-	38%	-	88% (AS)
[50]	EUT PAS PE	Germany	N/A	case vignette study	mean 24 (± 2.8)	68.5%/31.5%	80%	241 (4th year)	Age Gender	none	Assumed permissibility for PS/PAS/AE Attitudes towards PS/PAS/AE Comparison physical vs. emotional suffering Ethical acceptability of PS/PAS/AE Knowledge about legal norms Rates of consent to different types of practice	83.8%	51.2%	-	-	19.2%	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[60]	EUT PS	Belgium	2012	cross-sectional study, self-administered 22-item questionnaire	N/A	N/A	45.1%	335	Gender Philosophy of life*	none	Arguments accepting/supporting EUT Attitudes towards EUT Attitudes towards EUT law Claiming EUT/PS for oneself Knowledge about EUT/PS Personal experience with EUT/PS	-	-	-	-	31.8%	95.9% (EUT)
[58]	EUT PAS	Norway	2012	cross-sectional study, paper-based questionnaire	N/A	65.5%/34.5%	59%	531 (5th and 6th year)	Gender Religion	none	Active participating in EUT Attitudes towards EUT/PAS Legalisation of EUT/PAS	-	-	-	-	-	19.4% (EUT) 31.2% (PAS)
[32]	EUT TW	Brazil	2010 - 2011	cross-sectional survey, adapted [79–81] 43-item questionnaire	mean 22.5 (± 4.6)	53.8%/46.2%	61.0%	3630	Age Believe in soul* Gender Income* Location of the university (urban vs. rural)* Number of medical students* Religion* Religious affiliation* Religious attendance* Year of school foundation*	none	Attitude towards EUT/TW	-	-	45.7%	-	41.4%	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[34]	AE PAS TW	Mexico	2007	cross-sectional survey, adapted [77] 9-item questionnaire	18–25	54%/46%	N/A	99 (3rd and 4th year)	Age Comparison of religiously and lay-administered medical schools* Gender Importance of religion Religion	none	Acceptance/refusal of PAS in hypothetical scenarios Attitudes towards AE/PAS/TW Claiming PAS for oneself Legalisation of PAS	-	52%	61%	-	-	-
[56]	EUT PAS	Poland	2008 - 2009	cross-sectional survey intervention study, anonymous self-administered 12-item questionnaire	mean 24.44 (± 1.13)	67.35%/32.65%	90.5%	588 (5th and 6th year)	Age Comparison of 2 universities* Gender* Intervention Place of residence Religion*	palliative medicine course with symptom management, psychological, social and spiritual support	Attitudes towards EUT/PAS Attitudes towards EUT/PAS law Claiming EUT/PAS for family member or friends Claiming EUT/PAS for oneself Knowledge towards EUT/PAS Legalisation of EUT Personal arguments in favour EUT practice Risk of abuse	-	-	-	-	11.7%	29.6% (EUT/AS)
[57]	EUT PAS	Poland	2001 - 2002	cross-sectional survey, anonymous 13-item questionnaire	mean 23.1 (± 2.2)	72%/28%	N/A	401 (3rd year)	Comparison of physicians and medical students*	none	Active participating in EUT Attitudes towards EUT Claiming EUT/PAS for family member or friends Claiming EUT/PAS for oneself Legalisation of EUT/PAS Personal definitions of EUT	-	12%	-	-	12%	26% (EUT)

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[55]	EUT PAS	Poland	N/A	cross-sectional intervention study, anonymous 28-item questionnaire	N/A	32.8%/67.2%	N/A	320 (final year)	Comparison of medical and nursing students* Effect of training program*	Effect of pilot training program within paediatric-palliative care (PPC)	Attitudes towards EUT Evaluation of satisfaction from educational program Knowledge towards PPC Legalisation of EUT Opinions on special problems of EUT	-	-	-	-	11.5% (BI) 9.5% (AI)	2.5% (BF) 3.5% (AF)
[40]	AE EUT	Pakistan	2011 - 2012	cross-sectional survey, modified [82, 83] questionnaire	N/A	"3:1"	N/A	493	Comparison of two universities (private and public) Gender* Religion* Year of study*	none	Active participation in EUT Attitude towards AE Knowledge about EUT Legalisation of AE/EUT	-	-	-	32.9%	-	27% (EUT)
[63]	AE	Austria	2001 (I) 2003/04 (II) 2008/09 (III)	repetitive cross-sectional study, questionnaire	25.4 (I) 25.6 (II) 27.5 (III)	60.8%/39.2% (I) 62.2%/37.8% (II) 63.6%/36.4% (III)	91.7%	694	Survey phases*	none	Active participation in AE Attitude towards AE Personal motivation regarding acceptance/objection	-	-	-	30.8%	-	-
[54]	EUT PAS TW PS	Greece	N/A	cross-sectional survey, self-administered, anonymous paper-based 20-item questionnaire	mean 24.7 (± 1.8)	44.6%/55.4%	94.4%	251 (final year)	Gender*	none	Attitudes towards EUT/PAS/TW/PS Claiming PAS for family member or friends Claiming PAS for oneself Factors influencing attitudes towards PAS Factors influencing deciding EUT/PAS Legalisation of EUT/PAS Request for PAS is evidence of a mental disorder	53.3%	69.7%	79.2%	-	52.0%	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
											Requirements to be fulfilled for PAS Risk for medical practice						
[39]	AE TW	China	N/A	cross-sectional survey, online & paper based, modified [84] 19-item questionnaire	mean 21.2 (SD 1.0)	61.2%/37.8%	62.9%	312 (1st, 2nd, 3th and 5th year)	Comparison medical vs. non-medical students Gender Religion Year of study*	none	Acceptance/refusal of AE/TW in hypothetical scenarios Attitudes towards AE/TW Participants deciding over AE/TW Person controlling EUT	-	-	56%	44%	-	-
[51]	AE PAS PE PS	Germany	N/A	cross-sectional survey, anonymous mail survey, self-administered 13-item questionnaire	22–31 (25.0 ± 2.4)	69.9%/30.1%	25%	113 (2nd & 6th year)	Age Comparison of two universities Gender Religion Year of study*	none	Access to palliative care/pain therapy decreases AE Active participation in EA Anxiety in caring for non-curable patients Arguments for claiming AE Arguments for practicing AE Attitudes towards AE Claiming AE for oneself Knowledge about AE/PAS/PE/PS Knowledge about legal norms AE/PAS/PE/PS Legalisation of AE Medical education is preparation for carrying the dying Risk of abuse	-	-	-	29.2%	-	32.7% (AE)

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[62]	EUT PAS TW	Croatia	2003 / 2004	cross-sectional intervention study, 20-item questionnaire	mean 19	61%/39%	97% (2003) 93% (2004)	115 (1st year)	Age Gender High school education Influence of educational course* Parental education Religious belief* Residence*	Medical ethics and Bioethics course: lectures with religious and cultural aspects of dying, sociology of death, definitions and classification of death and dying, and hospice and palliative care	Attitudes towards EUT/PAS/TW Legalisation of EUT/AE	-	85.2%	83.5%	-	-	80% (EUT)
[61]	PAS	Germany	2002 - 2003	cross-sectional study, self-administered, paper-based questionnaire	mean 25.5	60.0%/37.6%	83.3%	85 (5th year)	Age Gender Religion	none	Claiming PAS for oneself Ethical perspectives on PAS Knowledge about PAS Legalisation of PAS Personal experience with PAS	-	24.7%	-	-	-	36.5% (AS)
[33]	EUT PAS PS	Puerto Rico	2004	cross-sectional study, self-administered, paper-based 17-item questionnaire	N/A	N/A	N/A	152	Comparison between students, residents and members of medical faculties* Gender* Religious affiliation	none	Active participation/engagement in PAS Attitudes towards PAS/EUT Legalisation of PAS Oppose engaging others in PAS	76.3%	13.2%	-	-	27.6%	46.1% (PAS)
[69]	EUT	Poland	N/A	cross-sectional, self-administered 5-item questionnaire	N/A	N/A	N/A	50	Comparison of medical students, law students and general public	none	Acceptance/refusal of EUT Active participation in EUT Attitudes towards EUT law Claiming EUT for family member Claiming EUT for oneself	-	-	-	-	36%	-

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
[68]	AE EUT PAS	Switzerland	2005	cross-sectional study, anonymous questionnaire	N/A	N/A	100%	140 (1st and 2nd year)	Comparison of oncology clinicians, palliative care specialists and medical students	none	Active participating in AE/PAS Attitudes towards AE/EUT/PAS Claiming AE/PAS for oneself Legalisation of AE/PAS Person controlling EUT/Person deciding over EUT	-	64%	-	55%	-	70% (AE) 77% (PAS)
[46]	EUT	Sudan	2002	cross-sectional survey, paper-based questionnaire	23–27	43.5%/58.6%	83.5%	152 (final year)	Gender Religiosity	none	Active participation in EUT Arguments in favour and against EUT Attitude towards EUT Ethical justification of EUT Knowledge about EUT Legalisation of EUT Teaching EUT	-	-	-	-	23.4%	23.4% (EUT)
[31]	PAS	Canada	2004	cross-sectional survey, paper-based, 13-item questionnaire	20–29 +	56.2%/43.8%	53%	124 (1st & 4th year)	Age Gender* Year of study*	none	Active participation in PAS Attitudes towards PAS Claiming PAS for oneself Factors influencing decision-making regarding PAS Level of agreement with legalisation	-	37%	-	-	-	39% (PAS)
[36]	AE EUT PE	Malaysia	1998 - 1999	cross-sectional design, self-administered 12-items questionnaire	N/A	N/A	100%	400	Comparison of pre-clinical vs. clinical students Ethnic background	none	Active participating in EUT Arguments in favour and against PE/AE Attitudes towards PS/AE Claiming EUT for oneself Knowledge about EUT Legalisation of EUT	-	-	52% (PE)	27%	-	33% (EUT)

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
											Person controlling EUT Reasons against PE/AE Risk of abuse						
[71]	EUT AS	Poland	N/A	cross-sectional survey, anonymous online self-administered 22-item questionnaire	19–33 (22.49 ± 2.56)	68.5%/30.6%	N/A	108 (1st to 4th year)	Age Gender Religion* Place of residence	none	Attitudes towards EUT/AS Claiming EUT/AS for oneself Knowledge about EUT/AS Knowledge about EUT/AS Legalisation of EUT/AS Personal experience Readiness to assist decision-making on EUT/AS	-	-	-	-		68.7% (EUT) 38% (AS)
[72]	PAS	Ireland	2023	cross-sectional survey, online 13-item questionnaire	18–26 +	62%/37%	20.9%	200	Gender* Religion Year of study	none	Acceptance/refusal of PAS Attitude towards PAS Arguments in favour and against PAS Attitude towards legalisation Factors influencing attitudes towards PAS Teaching PAS Personal arguments in favour and against Readiness to assist in decision-making on PAS	-	59.5%	-	-	-	-
[74]	EUT	Poland	2018	cross-sectional survey, anonymous	18–24	65.5%/34.5%	77.6%	281 1st year	Age Gender Grandparents living with the family	None	Attitude towards EUTS Attitude towards legalisation Risk of abuse	-	-	-	-	18.2%	27.6% (EUT)

Table 1 (continued)

Reference	Type of practice[1]	Country	Year of study	Study design	Age range (mean;SD)	Female/Male	Response Rate	Sample Size	Type of predictors investigated (* = sign.)	Intervention	Study Outcome	consent to palliative sedation	consent to (physician-) assisted suicide	consent to withdrawal of active therapy (PE/TW)	consent to active euthanasia	consent to euthanasia	consent to legalisation of EUT/PAS/AE
				35-item questionnaire					Number of siblings* Place of residence Religious engagement*								
[73]	EUT	Poland	N/A	cross-sectional survey, anonymous 35-item questionnaire	N/A	N/A	N/A	280	Comparison of psychology, economic-technical and medical students*	None	Attitude towards EUT Acceptance/Refusal of EUT Risk of abuse	-	-	-	-	18.2%	-
[45]	EUT PAS	Pakistan	2023	cross-sectional survey	17–26	N/A	N/A	316	Religion* Gender Year of study*	None	Attitude towards EUT/PAS Attitudes towards legalisation Risk of abuse	-	21.5%	-	-	19.2%	-
[75]	EUT	Serbia	2017	cross-sectional survey, 10-item questionnaire	N/A	64.4%/35.4%	94.4% 97.6%	551 (2nd & 5th year)	Comparison of two universities Gender Parental education level Socio-economic status Year of study	None	Attitude towards EUT Attitude towards legalisation Person deciding over EUT Risk of abuse	-	-	-	-	-	57.9% (EUT)
[76]	AS	Germany	2021—2022	online evaluation	N/A	N/A	66.1%	37	N/A	Elective course on AS in palliative care with theoretical knowledge and practical simulations with standardised patients to improve communication, knowledge and compassionate care	Attitude towards AS Teaching palliative Care	-	68%	-	-	-	-

[1] Type of end-of-life practice: AE: active euthanasia; PAS: physician assisted suicide; PS: palliative sedation; PE: passive euthanasia; TW: treatment withdrawal/withholding

[2] on pediatric patients

*were significant factors in the respective study

Table 2 Summary of Qualitative Results

Reference	Type of practice[1]	Country	Year of study	Type of survey	Age range (mean)	Female/ Male	Participants/ Response Rate	Sample Size"medical students"	Purpose	study design	Intervention	Data analysis	Study Outcome/ Main findings	attitudes towards EUT
[49]	PAS	New Zealand	2018	mixed-methods online survey	18–40	61.8%/38.2%	28%	326 (2nd to 5th year)	Explore how students view PAS and if their views differ in different stages of medical education	Written responses to open-ended questions	none	Thematic analysis using general inductive approach	Supporting law change: Relieving suffering, Autonomy, dignified death, financial reasons, relief for family Opposing law change: Potential for misuse, sanctity of life, slippery slope, not the role of doctor, palliative care as an alternative, personal values Unsure about law change: Potential for misuse, not the role of doctor, general uncertainty, relieving suffering, undermines palliative care, autonomy	Supporting EUT/PAS: Death of family member/friend, experience in rest home, medical teaching, public discussion/personal study, experience in clinical training, death/suffering of family member/friend Opposing EUT/PAS: medical teaching, discussion with friends/family, death/suffering of family member or friends, discussion with doctors, public discussion/personal study Unsure about EUT/PAS: medical teaching, public discussion/personal study, experience in rest home, death/suffering of family/friend, discussion with family/friends

Table 2 (continued)

Reference	Type of practice[1]	Country	Year of study	Type of survey	Age range (mean)	Female/ Male	Participants/ Response Rate	Sample Size"medical students"	Purpose	study design	Intervention	Data analysis	Study Outcome/ Main findings	attitudes towards EUT
[35]	AE	Mexico	2008–2009	paper based survey	17–26	56.1%/43.9%	N/A	444	Explore psychological meaning and positive/ negative attitudes toward AE	Sheet with"I think euthanasia is…"and a table in which to write down at least five words that define AE, then rank each word according to how closely it defines the term	none	Semantic networks technique	Psychological meaning of EA (in descending order): choice, respectable, calm, convenient, murder, unethical, help, voluntary, illegal, relief, suffering, controversial, , compassionate and ethical	Attitudes towards EA: positive 52.1%, ambivalent 24.3%, negative 14.9% and neutral 8.7%
[67]	EUT	Sweden	2001/2003	2001: mail survey 2003: paper-based survey	19–40	61.3%/38.7%	44%	165 (1st and 5th year)	Describe students' attitudes and arguments toward EUT	Explorative qualitative study with written responses to open-ended questions, such as:"Do you favour legalisation of euthanasia? Why or why not?"	none	Qualitative content analysis without predetermined categories	34% had a positive opinion towards EUT, 52% a negative and 13% were undetermined 5 categories opposing EUT 2 categories supporting EUT Person controlling EUT/ Participants deciding over EUT	2 categories supporting EUT (1) Autonomy (2) Relief of suffering due to: Severe symptoms and diagnosis; reduced integrity and autonomy; Hopelessness; Social factors; Complications of old age 5 categories opposing EUT (1) Morally wrong (2) Slippery slope (3) Guilt and strain (4) Not a true wish to die (5) Not a task for health-care system

Table 2 (continued)

Reference	Type of practice[1]	Country	Year of study	Type of survey	Age range (mean)	Female/ Male	Participants/ Response Rate	Sample Size"medical students"	Purpose	study design	Intervention	Data analysis	Study Outcome/ Main findings	attitudes towards EUT
[66]	EUT	Sweden	2001/2003	2001: mail survey 2003: paper-based survey	19–40	61.3%/38.7%	44%	165 (1st and 5th year)	Explore and describe students' definitions of a dignified death	Explorative qualitative study with written responses to the open-ended question:"What meaning do you ascribe to the term a dignified death?"	none	Qualitative content analysis without predetermined categories	Five categories of death: (1) Without suffering (2) With limited medical interventions (3) With a sense of security (4) With respect of autonomy (5) With acceptance	Medical science pursues life at any cost and can prolong the dying process; this could be a reason for promoting euthanasia as a means to a dignified death
[65]	PE	UK	cohort design started 1996	vignette survey	24 mean	N/A	N/A	162 (before year 1) 111 (after year 1) 85 (after year 3) 62 (after year 5)	Examine attitudes and potential behaviour to PE; before/after year 1, after year 3 and 5; analyse reasons and knowledge change during curriculum	Case vignette with patients' request for PE; responses are consent or refusal, including written personal justification	During medical curriculum/ changes through curriculum	Comparing multi-choice responses at the four times Classifying written justifications with data reduction method into 5 categories (C1 - 5)	C 1: Based on consensus reasoning of experts in the field of medical ethics, legal requirements on practitioners, or on policies issued by relevant professional institutions C 2: Based on the subject's personal values/morality C 3: Influenced by other non-medical/legal value systems C 4: Although based on moral argument, it is not consistent with the profession's normative values C 5: Indeterminate	Answers are consistent with professional consensus opinion pre- and post-curriculum; with progressing curriculum, more responses considered issues of the underlying principle of patient autonomy

Table 2 (continued)

Reference	Type of practice[1]	Country	Year of study	Type of survey	Age range (mean)	Female/ Male	Participants/ Response Rate	Sample Size"medical students"	Purpose	study design	Intervention	Data analysis	Study Outcome/ Main findings	attitudes towards EUT
[70]	PAS	UK	2024	online survey/ written workshop evaluation	N/A	N/A	N/A	40 (1st year)	Investigate perspectives on PAS and its potential legalisation; explore the ethical complexities of PAS	Roleplay (patient and GP) of a case history in a Goldfish bowl with discussion from the students	none	N/A	Reasons for legalisation PAS: autonomy – it's my choice, fear of future, burden to others, suffering – prolonged dying, able to be open about suicidal ideas, dignity-maintaining a positive perspective of self, avoid travelling to Switzerland, cost, stimulate better healthcare Reasons against legalisation PAS: irreversible, slippery slope, people and circumstances might change, loss of trust in doctors, depression/ mental illness, emotional toll on doctors, vulnerable people at risk-pressure on people with disabilities, coercion, sanctity of life	Before the workshop, 55% supported PAS legalisation, 30% opposed it, and 15% were unsure. After the workshop, 25% reported a change in view, with 10 of 11 students who initially supported PAS shifting toward uncertainty or opposition

[1] Type of end-of-life practice: *AE* active euthanasia, *PAS* physician assisted suicide, *PS* palliative sedation, *PE* passive euthanasia, *TW* treatment withdrawal/withholding

Consent for withdrawal of active therapy

Studies investigating attitudes towards treatment withdrawal among students reveal a notable trend: a substantial proportion of students worldwide support this approach. Notably, surveys in diverse countries such as Malaysia (52%) [41], Mexico (52.1% [34] and 61% [39] in two separate studies), China (56%) [44], the UK (58%) [64], and South Africa (69.8%) [53] demonstrate significant backing for treatment withdrawal. Even higher levels of support were observed in Greece (79.2%) [59] and Croatia (83.5%) [67]. In contrast, relatively lower proportions of students in Turkey (27.3%) [42], Iran (44.7%) [48], and Brazil (45.7%) [37] expressed support for treatment withdrawal.

Consent for voluntary active euthanasia

Attitudes towards Active Euthanasia (AE) reveal a striking disparity, with consistently lower approval rates compared to other end-of-life decisions across numerous studies [33, 34, 41, 44, 48, 64, 73]. Notably, only two studies reported approval rates exceeding 50% [57, 73], with Akbayram's study [42] being the sole instance where medical students expressed greater support for AE (36%) over PE (27.3%).

A global analysis of medical students' opinions on AE reveals a stark contrast between countries where the practice is illegal and those where it is legal. In countries with prohibitive laws, approval rates are predominantly below 50%, ranging from 16% in the UK [64] to 57% in Serbia [57], with most countries, such as Malaysia (27%) [41], Turkey (35.9%) [42], and Germany (29.2%) [56], showing limited support. In contrast, countries with permissive laws exhibit higher consent rates, spanning from 38% in Canada [33] to 55% in Switzerland [73].

Consent for Euthanasia (EUT)

In some studies, euthanasia has been defined as "the deliberate ending of life of a patient suffering from an incurable and painful disease"[51]. However, this definition cannot be assigned to voluntary active euthanasia or (physician-)assisted dying. Therefore, all consent rates that could not be classified as voluntary active euthanasia, (physician-)assisted suicide, passive euthanasia, or palliative care were combined under the term "euthanasia" (EUT).

The global overview of medical students revealed a diverse range of opinions on EUT. While some countries reported low levels of agreement, others showed surprisingly high consent rates. For instance, India topped the list with 72% [49] of medical students in favor of EUT, closely followed by Greece (52%) [59] and South Africa (47.7%) [52]. In contrast, Poland reported the lowest consent rates, ranging from 11.7% [42], over 18.2% [78, 79] to 25.95% [58] and 36% [74]. Other countries, such as Germany (19.2%) [55], Sudan (23.4%) [51], and Turkey (32%) [43], fell somewhere in between. Notably, Hong Kong (41.2%) [46], Puerto Rico (27.6%) [38], and Belgium (31.8%) [65] also showed moderate levels of agreement.

Consent to legalisation

The acceptance rates for the legalisation of euthanasia vary considerably across countries, reflecting diverse cultural, social, and legal contexts. Research indicates that approval rates range from 19% in Norway [63], to 23.4% in Sudan [51], and increase to 83.3% in India [47] and 95.9% in Belgium [65]. In Turkey, 33.4% of the medical students surveyed support EUT legalisation [42], while in Croatia, approval stands at 80% [67]. In contrast, only 27% of the students asked in Pakistan support EUT legalisation [45], with similar figures in Malaysia (33%) [41], and Serbia (57.9%) [80].

For active euthanasia (AE), Serbia reports a 44% approval rate [57], Germany has 32.7% [56], and New Zealand stands at 56% [54]. South Africa's approval rates are 52.7% for both EUT and physician-assisted suicide (PAS) [52], while 43% support AS [53]. Puerto Rico reports 46.1% approval for PAS legalisation [38].

In Poland, the approval rates show significant variability, with 26% [62], 27.6% [79], 34.42% [58], 68.7% [76], and 29.6% for EUT/AS [61], and 38% for assisted suicide [76]. In Norway, support for the legalisation of EUT is 19%, while 31.2% favour PAS legalisation [63]. Among medical students in India, 61% support AE, and 75% support passive euthanasia [49].

On average, countries where end-of-life practices are legal tend to show higher approval rates. Canada, for instance, has an 88% approval rate for AS [33], and Belgium reports 95.9% for EUT [65]. In Germany, the approval rate for AS is 36.5% [66], while in Canada, prior to the legalisation of PAS, approval stood at 39% [36]. In Switzerland, the consent rate for AE legalisation is 70%, and for PAS, it is 77% [73].

Moreover, a study examining the impact of training programmes in paediatric palliative care demonstrated an increase in consent rates for the legalisation of euthanasia from 2.5% to 3.5% following the intervention [60].

Types of investigated and influencing factors

A total of 36 survey studies investigated the factors shaping attitudes toward end-of-life decisions, uncovering the significance of variables such as age, professional or educational stage, ethnicity, gender, religiosity, and year of study (Table 1). Among these, four intervention studies stood out for their focus on transformative training programs: pilot initiatives in pediatric palliative care [60],

courses in palliative medicine [61], medical and bioethics modules [67], and electives integrating theoretical learning with practical patient simulations to foster empathy, communication, and expertise in palliative care [81].

Age

Age was not a significant factor in shaping attitudes toward end-of-life interventions in most studies [34–37, 39, 46, 55, 56, 61, 66, 67, 76, 79]. Exceptions included an Iranian study, where older individuals were less likely to support voluntary active euthanasia [48], and a UK study, where older students showed slightly greater agreement with actions that hasten death [64].

Comparison of pre-clinical and clinical students

Both studies observed notable differences in attitudes towards euthanasia between preclinical and clinical medical students. Clinical students were more likely to support the legalization of assisted dying and expressed greater willingness to perform or request such procedures themselves [53]. Similarly, students with clinical experience were more open to both passive and active euthanasia, which was attributed to their exposure to patient suffering and terminal illness [41]. While these trends suggest a shift in attitudes with clinical exposure, neither study reported whether the observed differences were statistically significant.

Religion

Religious beliefs significantly influence medical students'attitudes toward euthanasia (EUT) and physician-assisted dying (PAS). Factors such as belief in the soul, religious attendance, intrinsic religiosity, and spirituality strongly correlate with opposition to EUT [37, 45, 67, 79], PAS [54], and the withdrawal of treatment [37]. A Brazilian study across 12 universities (n = 3630) found religious attendance and intrinsic religiosity were significant predictors of objections to euthanasia and artificial life support withdrawal [37]. Students from Muslim backgrounds were particularly opposed to actions hastening death [50, 64], while Catholic students were more conditionally accepting compared to secular humanists [65].

Students in lay-administered medical schools showed greater support for PAS and TW than those in religious-affiliated institutions, although religion was not always a significant factor in end-of-life decisions [39]. Non-religious, atheist, and agnostic students expressed the highest willingness to participate in PAS [35], with lower religiosity linked to stronger acceptance of active euthanasia [34], passive euthanasia [34], EUT [46, 61, 76], and assisted suicide [76]. In the UK, nonbelievers were more likely to support actions that hasten death [64]. However, several studies found no significant differences in attitudes based on religion or spirituality [33, 38, 39, 44, 51, 52, 56, 63, 66, 77].

Gender

Gender differences in attitudes toward end-of-life decisions reveal mixed findings. Most studies show that men are more likely than women to support the legalisation of PAS [36], have positive attitudes toward AE [34], PE [34], and EUT [46], and express greater willingness to comply with EUT or PAS requests [38, 61]. For instance, in one scenario involving a terminally ill patient requesting a lethal dose, 47.4% of male students supported the decision, while 59% of female students opposed it [45]. However, one study found a higher percentage of men opposed to PAS compared to women [77].

Women are more likely to attribute their attitudes to religious beliefs and to express concern about the potential misuse of PAS and EUT among disadvantaged groups [59]. Conversely, men are more inclined to view requests for PAS as indicative of mental disorders, such as depression [59]. Despite these patterns, the majority of studies report no statistically significant gender differences in attitudes toward AE, EUT, PE, PAS, or treatment withdrawal [33, 35, 37, 39, 42, 44, 48–51, 54–56, 63–67, 76, 79, 80].

Ethnic background

Most surveys found no statistically significant ethnic differences in students'attitudes toward AE, PE, or PAS [41, 46, 54].

Comparison across universities

Studies have compared attitudes toward end-of-life decisions across various universities [46, 56, 61, 80], private vs. public institutions [45] and religiously affiliated vs. secular schools [39]. However, many studies found no significant differences in response patterns between certain groups, including universities [45, 46, 56, 80].

Further, the characteristics of medical schools—such as the number of students, the age of the institution, its location, and whether it was public or private—were highly correlated with opinions on end-of-life decisions. Students from non-traditional, urban, larger, and public universities tended to have more supportive opinions on controversial ethical issues [37]. Moreover, medical students from non-religiously affiliated schools were generally more supportive of physician-assisted suicide, treatment withdrawal, and active euthanasia compared to their peers in religiously affiliated schools [39].

Year of study

Medical students' attitudes toward end-of-life decisions vary with the year of study. Those with more medical training demonstrate differing views on information delivery, admission practices to intensive care, limitations of life-support therapy, and cardiopulmonary resuscitation for patients with limited prognoses [44]. Opposition to euthanasia and physician-assisted suicide tends to increase with advanced training [42, 54]. Higher levels of education are associated with improved understanding of euthanasia definitions [45], but confusion about its practices also increases steadily from first to final year [50].

Significant differences have been noted: in Canada, fourth-year students were less willing than first-year students to participate in PAS [36], while in higher semesters (e.g., 6 th vs. 2nd year), students increasingly believed adequate palliative pain management could negate the need for active euthanasia [56]. In the UK, older and final-year students were more likely to support acts that hasten death [64]. Conversely, in Iran, clinical-phase students were nearly five times more likely to support active euthanasia compared to those in basic sciences [48].

However, some studies report no significant differences in attitudes toward end-of-life decisions across years of study or training [33–35, 46, 77, 80].

Geographic predictors

Geographic factors have been explored as predictors of attitudes toward euthanasia (EUT) and physician-assisted suicide (PAS). Studies have examined birthplace, urban or rural upbringing, and place of residence [35, 58, 61, 67, 76]. Medical students from non-traditional, urban, public, and larger universities were more likely to support EUT [37]. In Croatia, students from areas with fewer than 50,000 inhabitants held significantly more negative views on EUT than their urban counterparts [67].

A survey of 659 students across countries found that continent of origin significantly influenced attitudes. North American and Asian students showed stronger support for legalising EUT, with 46.67% and 45.28%, respectively, willing to perform euthanasia if legal. In contrast, most Polish (79.17%) and other European students (74.42%) emphasised expanding palliative care services to reduce euthanasia demand [58].

However, factors like urban or rural upbringing and current residence did not significantly correlate with willingness to provide EUT [35, 61, 76, 79].

Family and socio-economic background (number of siblings, parental education, educational background, income)

Family size also played a role, with students from large families (three or more children) more likely to evaluate euthanasia negatively compared to those from smaller families [79]. The relationship between socioeconomic factors and attitudes toward euthanasia, physician-assisted suicide, and passive euthanasia has been examined in several studies. Parental education and educational background showed no significant influence on these attitudes in the different samples [35, 67, 80]. However, one study found a significant association between income and attitudes toward EUT and treatment withdrawal, with higher-income students being more likely to express no objection to these practices [37].

Educational intervention studies

Educational interventions have shown mixed effects on medical students' attitudes toward euthanasia and physician-assisted suicide. A Croatian study demonstrated a significant shift toward more positive attitudes following an ethics and bioethics course, which initially elicited predominantly negative views [67]. Similarly, an Austrian longitudinal study revealed a marked increase in EUT acceptance, rising from 16.3% in 2001 to 49.5% in 2008/2009, alongside a growing willingness to practice EUT [68]. A pediatric palliative care program effectively enhanced students' knowledge of end-of-life care, significantly improving their understanding from a low baseline [60]. However, not all educational programs yield changes; some studies report no significant differences in attitudes following such educational interventions [61].

Qualitative results

The six qualitative studies and one mixed-methods study used different study designs and data analyses to analyse medical students'attitudes towards euthanasia and end-of-life decisions (see Table 2). In a Mexican study, the researchers explored the psychological meaning and attitudes towards AE. The study revealed that the main words related to euthanasia were"choice", "respectable", "calm", and "convenient", which implies that the positive psychological aspects of euthanasia prevailed over the negative ones.

In a UK sample, consistent views were found throughout the curriculum, with little movement from pre- to post-curriculum [70]. As the curriculum progressed, more responses addressed issues related to the underlying principle of patient autonomy and its preconditions of competence and informed consent.

According to a Swedish study, medical students perceive that the medical system is over-treating patients and sometimes causing harm to dying patients [71]. This highlights a possible misunderstanding and contradiction regarding death without suffering and the use of necessary palliative interventions. Medical students'arguments against EUT are often based on slippery slopes and moral-based reasoning, whereas those supporting EUT

are based on the principles of autonomy and alleviation of suffering [72].

In the mixed-methods study from New Zealand, the predominant themes found in the qualitative results suggest that medical students support or oppose EUT and PAS for similar reasons as the general population does [54]. The study identified a number of factors that influence medical students'attitudes towards EUT and PAS, such as personal experiences with the death of a family member or friend, experience in a rest/care home, formal medical school teaching, and the death and suffering of a family member or friend [54].

Another UK-based study examined medical students' views on PAS and its potential legalisation [75]. Using an innovative workshop format, which combined a goldfish bowl roleplay simulation and facilitated group discussions, the study immersed students in the ethical, emotional, and practical complexities of PAS. This interactive approach prompted students to explore both the arguments for and against PAS legalisation through open dialogue. Supporters emphasised autonomy, the fear of future suffering, burden on others, dignity, and the freedom to discuss suicidal thoughts openly. They also raised concerns about healthcare costs, potential improvements in care, and the desire to avoid traveling to Switzerland for PAS. Opponents, however, pointed to the irreversible nature of PAS, the slippery slope argument, the risk of coercion, the emotional toll on physicians, and potential harm to vulnerable groups, such as individuals with mental illnesses or disabilities. Additionally, they voiced concerns about the erosion of trust in doctors and the sanctity of life.

Discussion

This systematic review explored medical students' attitudes towards end-of-life interventions, including active and passive euthanasia, physician-assisted suicide, palliative sedation, and treatment withdrawal/withholding, analysing approval rates over 24 years and identifying influencing factors. A notable disparity emerged between student support for legalising such interventions and their willingness to perform them. While legalisation of euthanasia garnered approval rates ranging from 19.4% in Norway [63] to 83% in India [47], where euthanasia is illegal, support soared in countries where it is already legal, reaching 88% in Canada [33] and 97.4% in Belgium [65]. This discrepancy highlights the influence of socio-legal contexts on student perspectives, suggesting that legalised frameworks may foster greater acceptance by alleviating ethical and legal concerns. Indeed, some students viewed euthanasia as ethically justifiable even while legally prohibited [55], suggesting that legalisation can serve as a mechanism for managing moral dilemmas rather than reflecting a fundamental shift in ethical beliefs.

Interestingly, medical students' declared willingness to *perform* euthanasia consistently lagged behind their support for its legalisation. This disparity underscores a critical challenge for medical education: bridging the gap between abstract ethical reasoning and the emotional and practical realities of end-of-life care. Students may endorse euthanasia conceptually while feeling unprepared or unwilling to participate directly [55]. This tension necessitates educational strategies that equip future physicians to navigate the complexities of end-of-life decision-making, moving beyond theoretical debates to address the psychological and interpersonal dimensions of these challenging situations.

While demographic factors like age [34–37, 39, 46, 55, 56, 61, 66, 67, 76, 79], gender [33, 35, 37, 39, 42, 44, 48–51, 54–56, 63–67, 76, 79, 80], and ethnicity [41, 46, 54] largely lacked predictive power, clinical experience emerged as a significant factor [41, 53]. Clinical students, particularly those exposed to intractable suffering, demonstrated greater support for certain interventions compared to their pre-clinical counterparts. This suggests that direct patient contact can influence attitudes, potentially by confronting students with the limitations of current palliative care options. Curriculum design should therefore integrate opportunities for guided reflection on these experiences, encouraging students to critically analyse the ethical and emotional implications of end-of-life care.

Religiosity was a significant factor shaping students views, with stronger religious beliefs correlating with opposition to end-of-life interventions [34, 35, 37, 45, 46, 50, 54, 61, 64, 66, 76, 79]. However, this relationship is more nuanced than simple religious affiliation, with factors such as religious attendance and intrinsic religiosity playing crucial roles in shaping perspectives. Future research should explore how specific religious doctrines and personal interpretations of those doctrines influence attitudes towards end-of-life care, providing a more nuanced understanding of this complex factor.

Qualitative insights revealed the profound internal conflict students experience when navigating the dual roles of alleviating suffering and potentially hastening death [30, 59]. The desire to respect patient autonomy while upholding the sanctity of life creates a moral tension that must be addressed within medical training. Students identify systemic issues, such as the perceived overtreatment of dying patients [71]. At the same time, their arguments for and against euthanasia reflect broader societal debates about balancing patient autonomy and suffering prevention against concerns about potential misuse and moral implications [72]. These findings suggest a need for enhanced education in palliative care and communication skills, equipping students to engage in

compassionate, patient-centred discussions about end-of-life options and promoting dignified deaths.

This review highlights the critical need to integrate comprehensive end-of-life training into medical curricula. Such training should cover the legal and ethical frameworks surrounding end-of-life decisions while providing opportunities for students to explore their own values, biases, and emotional responses. By fostering critical reflection and open dialogue, medical education can better prepare future physicians to navigate the complexities of end-of-life care with compassion, competence, and ethical integrity. Engaging students with ethical dilemmas through specialised ethics courses can provide valuable insights into end-of-life decisions and palliative care principles, preparing them for the ethical challenges they will face in practice. Research shows that palliative care professionals often encounter dilemmas related to sedation, opioid use, and institutional policies, requiring them to prioritise values such as truth-telling, justice, and professional humility [82–84]. These courses should also teach students fundamental values underpinning palliative care, such as dignity, empowerment, compassion, equity, and respect for patients and their families [85]. Communication skills and effective relationships with patients and families are essential, as ethical issues arise in these interactions, underscoring the need for advanced ethical communication skills [86, 87].

Ethical decision-making in end-of-life care involves balancing respect for life with the dying process, guided by principles such as autonomy, beneficence, nonmaleficence, and justice [88, 89]. In addition to sedation and treatment withdrawal, students should explore ethical challenges such as resuscitation decisions, artificial nutrition and hydration, and terminal sedation [90]. Training programs grounded in the ethics of care framework can help healthcare professionals navigate these challenges by emphasising relational values and patient-centred approaches [86]. Moreover, targeted education on ethical communication and decision-making, including controversial topics like palliative sedation and life-sustaining treatment, can empower professionals to uphold ethical standards [84, 88]. Cultural competence is also crucial, enabling students to recognise and respond to the needs of diverse cultural groups in palliative care [91]. Legal considerations, such as advance directives and proxy decision-making, should be included in these courses, ensuring students understand relevant legal issues in end-of-life care. Physicians often serve as educators and mentors for patients and families, and nurses face distinct ethical challenges in communication and decision-making [82, 87]; integrating these elements into focused training equips healthcare professionals with the skills needed to reduce moral distress and care quality.

The legalisation of euthanasia and assisted dying raises ethical questions that go beyond the concept of individual autonomy. Critics argue that these practices may lead to misuse, with individuals potentially facing pressure. There is concern that legalisation could devalue human life, with vulnerable individuals being regarded as burdens rather than receiving appropriate care and support, which may undermine trust in physicians. Moreover, there is a fear that the economisation of medicine, which emphasises cost efficiency over life prolongation, could undermine patient-centred care and reduce focus on adequate alternatives like palliative care.

End-of-life decisions also highlight the need for equitable access to options such as euthanasia, ensuring that all patients have equal opportunities for terminal care. This requires fair resource allocation, particularly for those who would benefit most from medical interventions. Disparities in physicians support for end-of-life interventions can lead to inequalities, exacerbating socioeconomic imbalances and potentially exploiting vulnerable patient groups. Additionally, the lack of comprehensive medical education in the legal and ethical aspects of end-of-life care contributes to uncertainties, which can undermine the quality and fairness of patient care in these critical situations.

Limitations

The primary limitation of this systematic review is the ambiguous and confusing terminology used regarding euthanasia and end-of-life interventions. Euthanasia often serves as an umbrella term for various end-of-life decisions, from voluntary active euthanasia to the withdrawal or withholding of treatment. This ambiguity, where "euthanasia" encompasses both assisted suicide and voluntary active euthanasia [46, 53], can lead to misinterpretation of findings. Studies devoted to euthanasia usually include two modalities, namely active and passive [92], with the active component involving deliberate actions to end a patient's life to alleviate suffering. Ethics committees in several countries have attempted to clarify the concept of euthanasia [92].

The European Association for Palliative Care (EAPC) has issued a position paper advocating for the elimination of terms such as "passive euthanasia" and "indirect euthanasia", arguing that they are irrelevant in the context of criminal law. The EAPC further recommends using only the term "euthanasia", rather than "active euthanasia", to address legal and ethical uncertainties more effectively [93]. Nevertheless, until these recommendations are fully integrated at all relevant levels, it remains essential for physicians to be familiar with these terms, their

definitions, and their significance under criminal law to navigate their professional responsibilities effectively.

Therefore, it is crucial to clarify and distinguish euthanasia from other end-of-life decisions, such as withholding or withdrawing treatment, where the primary goal is to alleviate suffering or respect the patient's wishes, not to cause death [20]. Importantly, terminology can also vary, and the distinction between passive euthanasia and treatment withdrawal and withholding may not always be strictly apparent.

Moreover, how euthanasia is defined and presented in surveys can affect participants' responses, potentially misrepresenting their true attitudes towards each specific form of euthanasia. To improve research in this field, future studies should distinguish between different forms of euthanasia and end-of-life decisions, assessing public acceptance of each one separately.

Most surveys on medical students' attitudes toward euthanasia have been conducted at a single university and among students from a specific academic generation, limiting the generalisability of the results to all undergraduate medical students. Local characteristics and teaching methods within the medical curriculum likely influenced these findings.

Additionally, some high approval rates for euthanasia may be due to questions focused on terminal illness and limited life expectancy, while questions about euthanasia for patients with mental illness or multiple co-morbidities and normal life expectancies were rarely included. It is also important to differentiate between support for legalising euthanasia and the willingness to perform euthanasia personally. Medical students might support euthanasia as a legal option for patients but oppose performing it themselves as future physicians.

Importantly, the methodologies and sample sizes used in studies on medical students' attitudes towards euthanasia vary, so the findings should be interpreted with caution. Factors such as personality, the value system, and emotional state, which may influence attitudes, were not systematically assessed. Additional research is needed to investigate these underlying factors and the ethical and legal implications of medical students` attitudes towards euthanasia for end-of-life decision-making.

Conclusion

The findings of this systematic review underscore the importance of refining ethics education in medical curricula. Students should be guided to thoroughly consider all pertinent ethical principles and adopt a comprehensive ethical perspective when facing dilemmas. Additionally, they must develop a clear understanding of their legal obligations concerning treatment withdrawal and be equipped to provide well-reasoned ethical arguments either in support of complying with these laws or, if circumstances demand, in defence of violating them to protect their patients.

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

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Authors' contributions

Authors'contributions: JG was responsible for the systematic review concept, data collection and data synthesis. The inclusion and exclusion criteria were defined by JG and AH. The first draft of the manuscript was written by JG. JG, MR, CT, AAP, and AH made substantial contributions to the manuscript and critically revised it for important intellectual content. All the authors read and approved the final manuscript.

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Data availability

The datasets used in the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The Ethics Committee of the Medical University of Vienna waived a formal vote for this study, as it did not involve any procedures or interventions that necessitate ethical review according to the institution's guidelines.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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