

Knowledge of the law about withholding or withdrawing life-sustaining treatment by intensivists and other specialists

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Almost 40 000 adult deaths are estimated to occur each year in Australia after a medical decision in favour of withholding or withdrawing life-sustaining treatment (WWLST).¹ These decisions are an important part of practice in intensive care (IC).²⁻⁵ Usually these decisions are made for patients who lack decision-making capacity; only about 5% of patients are competent when a WWLST decision is made,^{4,5} and one study found that 73% of all patients being cared for in the intensive care unit are not competent.³ Most countries have laws that establish frameworks for these decisions that permit, for example, the completion of advance directives (ADs) and the appointment of substitute decision makers.⁶⁻¹⁰ These laws aim to safeguard patient interests (including autonomy), protect doctors acting within the law and establish a process for resolving intractable disputes.⁸

This means that intensivists have a legal as well as a clinical role when providing end-of-life care. This includes assessing a patient's decision-making capacity,⁹ determining the legally authorised decision maker and the scope of their power,¹⁰ and knowing whether an AD is valid.¹ The legal role played by intensivists is further evidenced by the consideration of law that occurs in various IC guidelines for end-of-life decision making.¹¹⁻¹⁴

Despite this, there is a growing body of evidence that medical specialists, including intensivists,¹⁵ lack legal knowledge.¹⁶⁻¹⁸ In their systematic review, Visser and colleagues identified a "lack of knowledge about the relevant legal framework" as one of the "barriers to the provision of good end-of-life care to patients in the ICU".¹⁹ Studies in the United States have found that poor legal knowledge increases unnecessary fear of legal liability, resulting in the practice of defensive medicine.^{17,18} Although formal engagement with the legal system is rare, the "shadow of the law" can still influence decisions at the bedside.²⁰ A lack of legal knowledge also poses risks for patients in either not receiving needed treatment (eg, refusal by a substitute decision maker who lacks legal power to do so) or receiving unwanted treatment (eg, when lawful refusal of such treatment by a substitute decision maker or in an AD is ignored).¹⁶

Our research examined the attitudes, knowledge and practice of intensivists and six other medical specialties involved in end-of-life care in relation to the law that deals with WWLST for adults who lack capacity. We focused on intensivists because of their central role in end-of-life care. This perspective is also critical not only because the ICU is

ABSTRACT

Objective: Decisions about withholding or withdrawing life-sustaining treatment (WWLST) from adults who lack capacity are an integral part of intensive care (IC) practice. We compare the knowledge, attitudes and practice of intensivists in relation to the law about WWLST with six other specialties most often involved in end-of-life care.

Design, setting and participants: We used a cross-sectional postal survey of medical specialists in the three most populous Australian states, and analysed responses from 867 medical specialists from the seven specialties most likely to be involved in WWLST decisions in the acute-care setting (emergency, geriatric, palliative, renal and respiratory medicine, medical oncology and IC).

Main outcome measures: Attitudes to, and knowledge and practice of, the law relating to end-of-life care.

Results: Of 2702 surveys sent to eligible practitioners, 867 completed questionnaires were returned. There was an overall response rate of 32% and an IC response rate also of 32% (125/388). Intensivists performed better than average in legal knowledge but important knowledge gaps remain. Intensivists had a more negative attitude to the role of law in this area than other specialty groups but reported being seen as a leading source of information about legal issues by other medical specialists and nurses. Intensivists also reported being the specialists most frequently making decisions about end-of-life treatment.

Conclusions: Improved legal knowledge and open engagement with the law can help manage the risk of harm to patients and protect intensivists from liability. IC guidelines and continuing professional development are important strategies to address these issues.

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different from other parts of the acute care setting²¹ but because, as our study shows, intensivists report that they are seen as repositories of legal knowledge and so may play an important legal advisory role for other members of the profession.

Methods

We conducted a postal survey of medical specialists who practised in acute care in the three most populous Australian states, New South Wales, Victoria and Queensland (77% of all doctors in Australia practise in these states²²). The survey

Figure 1. Questions about perspectives on the law

SECTION
A

Your perspectives on the law

1 Please indicate your level of agreement with the following statements in relation to the WWLST law* for adults who lack capacity and its role in medical practice.

(Please circle only one number for each statement)

	STRONGLY DISAGREE	DISAGREE	UNSURE	AGREE	STRONGLY AGREE
a. The law is not relevant to making these decisions	1	2	3	4	5
b. The law provides a useful framework for decision-making	1	2	3	4	5
c. The law is out of touch with medical practice	1	2	3	4	5
d. The law is helpful when making these decisions	1	2	3	4	5
e. Resolving disputes through legal processes takes too long	1	2	3	4	5
f. The law promotes good relationships between doctors and their patients and families	1	2	3	4	5
g. Following the law can lead to inappropriate treatment decisions	1	2	3	4	5
h. The law has a place in the practice of medicine	1	2	3	4	5
i. The law impinges on doctors' professional autonomy	1	2	3	4	5
j. The law supports good medical practice	1	2	3	4	5
k. Medical and family consensus matters more than the law	1	2	3	4	5

2 Please indicate your level of agreement with the following statements in relation to knowing and following the WWLST law* for adults who lack capacity.

(Please circle only one number for each statement)

	STRONGLY DISAGREE	DISAGREE	UNSURE	AGREE	STRONGLY AGREE
a. It is important for me to know the law	1	2	3	4	5
b. It is important for me to follow the law	1	2	3	4	5
c. I worry about legal risk	1	2	3	4	5
d. Following the law is the right thing to do	1	2	3	4	5
e. The law is too complex	1	2	3	4	5
f. Knowing the law would help me manage legal risk	1	2	3	4	5
g. Knowing the law better would help me follow it	1	2	3	4	5
h. I am too busy to find time to know the law	1	2	3	4	5
i. I would like to know more about the law	1	2	3	4	5
j. The law is unclear	1	2	3	4	5
k. Acting in accordance with good medical practice will be lawful	1	2	3	4	5

*WWLST law is the law that governs decisions about whether to withhold or withdraw life-sustaining treatment.

Australia's most comprehensive and accurate doctor database and has been used for other major studies of Australian doctors.²⁷

AMPCo Direct administered the survey mail-out from July 2012. Strategies to improve response rates included having the survey instrument professionally designed, providing incentives (continuing professional development [CPD] points, educational material and a chance to win one of six bottles of prestige wine), engaging with the colleges and societies of target specialties, and publishing editorials in relevant professional journals to request participation in the study, where possible.^{28,29} Two follow-up requests were sent to non-responders and the survey closed on 31 January 2013.

Our project was approved by the human research ethics committees at the Queensland University of Technology, the University of Queensland and Southern Cross University. All participants provided informed consent to the study by completing the survey.

Measures

The survey instrument (available on request from the authors) included sections on perspectives about the law, legal knowledge, practice and experience in end-of-life decisions, and participant characteristics.

Perspectives on the law were examined through two questions that asked

respondents to rate their level of agreement with a series of statements on a five-point scale from "strongly disagree" to "strongly agree", with "unsure" as the middle option (Figure 1). One question contained 11 statements about the *role of law* in this area of medicine, and the second question contained 11 statements about specific aspects of *knowing and following the law*. For each question, items were scored from 1 to 5, with 5 representing a positive attitude, and the 11 item scores were added to produce a score from 1 to 55 for attitude to the role of law. Item scores were added to produce a score from 1 to 50 for attitude to knowing and following the law (one item was omitted as it was considered neutral in attitude).

instrument, developed over 18 months, was informed by a detailed review of the law in each state,^{1,23,24} focus groups, pretesting and pilot testing with doctors. The accuracy of the legal questions (which varied slightly between states to take account of different laws) and responses was confirmed by independent experts. A more detailed description of the development of the survey instrument, and the wider project methodology, has been published elsewhere.²⁵

The sample comprised all specialists who identified their main specialty as being in IC, medical oncology, emergency, geriatric, palliative, renal or respiratory medicine; and who were listed in the AMPCo Direct database²⁶ at the time the survey instrument was distributed ($N = 2858$). These specialties were determined, by literature review, interviews and an analysis of pilot results, to be most likely to be involved in decisions about WWLST. AMPCo Direct (AMPCo is a subsidiary of the Australian Medical Association) has

The knowledge section contained two questions, with a total of seven items. The first question comprised six statements in relation to relevant state law: three items concerned the validity of an AD, two concerned consent

Table 1. Mean score (SD) for positive attitudes to role of law in medicine (out of 55) and to knowing and following the law (out of 50), by specialty

Specialty (n)	Role of law in medicine (n = 810)*	Knowing and following the law (n = 809)†
Intensive care (124)	31.5 (7.1)‡	34.4 (3.8)
Emergency medicine (269)	32.0 (5.9)§	33.9 (3.7)
Renal medicine (80)	32.3 (5.7)	34.1 (3.5)
Respiratory medicine (98)	33.0 (6.8)	33.7 (3.8)
Medical oncology (80)	33.5 (5.8)	33.6 (3.4)
Geriatric medicine (107)	34.6 (5.7)¶	35.3 (3.8)**
Palliative care (52)	36.2 (5.7)¶	36.4 (3.6)**
Overall (810)	32.9 (6.3)	34.3 (3.8)

* Two respondents (one intensive care and one emergency medicine specialist) had missing attitude scores. † Three respondents (one intensive care and two emergency medicine specialists) had missing attitude scores. ‡ Although intensive care had the lowest actual mean score, the smaller number in that sample meant that the result only approached significance ($P = 0.08$). § Mean score for emergency medicine (given the higher number of respondents) was significantly lower than the overall score ($P = 0.05$). ¶ Mean scores for geriatric medicine and palliative care were significantly higher than the overall score ($P = 0.008$ and 0.0003 , respectively). ** Mean scores for geriatric medicine and palliative care were significantly higher than the overall score ($P = 0.008$ and 0.0001 , respectively).

from and the authority of substitute decision makers, and one dealt with both issues. The response options were “true”, “false” or “don’t know”. The second question in the knowledge section involved a scenario asking which of four plausible decision makers had legal authority to make medical decisions for an adult patient without capacity. Participants could score 0–7 correct responses (“don’t know” was counted with incorrect responses).

Practice and experience in end-of-life decision making was measured by asking participants how many WWLST decisions they had been directly involved with as a member of the treating team in the previous 12-month period, including instances when such decisions were considered but treatment was ultimately provided or continued. Participants were also asked how often people (eg, other specialists or nurses) asked them about issues relevant to this area of law, and respondents were presented with the options “never”, “seldom”, “sometimes”, “often” and “very often”.

Statistical analysis

We coded the questionnaires, double-entered the data into an Access database (Microsoft) and transferred the data to SPSS, version 20 (IBM) and SAS, version 9.3 (SAS Institute) for analysis. Preliminary analyses examined descriptive statistics and bivariate associations between

Table 2. Mean correct responses out of 7 (SD) to knowledge of law questions, and number of respondents scoring ≥ 4 , by specialty

Specialty* (n)	Mean correct score (SD)	No. of respondents scoring ≥ 4 (%)
Intensive care (125)†	3.48 (1.35)	63 (50.4%)
Emergency medicine (270)‡	3.09 (1.27)	103 (38.1%)
Renal medicine (80)	3.37 (1.13)	37 (46.3%)
Respiratory medicine (98)‡	2.72 (1.34)	25 (25.5%)
Medical oncology (80)	3.07 (1.23)	29 (36.3%)
Geriatric medicine (107)§	3.89 (1.28)	61 (57.0%)
Palliative care (52)§	3.71 (1.49)	27 (51.9%)
Overall (812)	3.26 (1.32)	365 (42.1%)

* There were no missing data for this question, as missing responses were interpreted as incorrect. † Scores for intensive care did not differ significantly from the overall mean. ‡ Scores for emergency medicine and respiratory medicine were significantly lower than the overall mean ($P = 0.03$ and $P < 0.001$, respectively). § Scores for geriatric medicine and palliative care were significantly above the overall mean ($P < 0.001$ and $P = 0.03$ respectively).

categorical variables by χ^2 tests. Scores were analysed as means with SDs, because only limited distinct scores could be attained but the overall distributions were approximately normal. Formal comparison of mean scores and proportions of responses with particular attitudes were performed using a generalised linear model, incorporating state as a covariable, and assuming a normal distribution for scores or using a logistic model for proportions. Mean scores and proportions for subgroups were compared with the sample average, using the Nelson–Hsu method, within the procedure GENMOD in SAS, which also adjusts for multiple comparisons. We used χ^2 tests to compare specialties and the frequency of being asked about issues relating to WWLST. A two-sided alpha level of 0.05 was used to define statistical significance.

Results

Response rates

The final sample, after deleting specialists who were not at the contact address or not currently or previously in the relevant discipline, was 2702, and 867 completed questionnaires were returned (response rate, 32%). Fifty-five questionnaires were excluded from this analysis because the respondents did not indicate their main specialty, or indicated a specialty outside the designated groups, which resulted in a net sample of 812.

The response rate of intensivists was 32% (125 from 388) and specialty response rates ranged from 52% (palliative care) to 24% (medical oncologists). A comparison

Table 3. Number of decisions on WWLST in past 12 months, by speciality

Specialty (n)	Number of WWLST decisions in past 12 months, n (%)						Mean number of decisions (SD)
	0	1–10	11–30	31–50	51–100	> 100	
Intensive care (125)*	4 (3%)	20 (16%)	43 (34%)	27 (22%)	19 (15%)	12 (10%)	38.7 (32.3)
Emergency medicine (269)	12 (4%)	108 (40%)	90 (33%)	31 (12%)	20 (7%)	8 (3%)	22.6 (24.8)
Renal medicine (79)†	4 (5%)	54 (68%)	16 (20%)	4 (5%)	1 (1%)	0	10.9 (12.0)
Respiratory medicine (97)†	12 (12%)	50 (52%)	22 (23%)	10 (10%)	3 (3%)	0	14.0 (16.2)
Medical oncology (79)†	6 (7%)	43 (54%)	22 (28%)	5 (6%)	3 (4%)	0	14.1 (16.0)
Geriatric medicine (107)	8 (7%)	32 (30%)	33 (31%)	13 (12%)	13 (12%)	8 (7%)	30.2 (32.1)
Palliative care (51)*	5 (10%)	13 (25%)	9 (18%)	11 (22%)	7 (14%)	6 (12%)	37.1 (36.0)
Overall (807)‡	51 (6%)	320 (40%)	235 (29%)	101 (13%)	66 (8%)	34 (4%)	23.4 (26.8)

WWLST = withholding or withdrawing life-sustaining treatment. * Intensive care and palliative care had significantly higher than average numbers of decisions ($P < 0.001$ in both cases). † Renal medicine, respiratory medicine and medical oncology had significantly lower than average numbers of decisions ($P = 0.001$, $P < 0.001$, and $P < 0.001$, respectively). ‡ Five respondents did not answer the question on WWLST decisions, giving $n = 807$.

of respondents with the original AMPCo Direct sample by age, sex, speciality and state found that respondents were similar in most comparison variables, except that there were fewer younger doctors among respondents than in the sample population (Appendix Table S1, online at cicm.org.au/Resources/Publications/Journal).

Perspectives on law

Intensivists had the lowest (and therefore most negative) attitude score of all specialties towards the role of law in this area of medicine (Table 1), although the difference from the overall score only approached significance ($P = 0.08$). In terms of the individual statements comprising this attitude score, the two statements distinguishing intensivists were “the law is out of touch with medical practice” and “the law provides a useful framework for decision-making”, with intensivists much more likely than the overall group to agree or strongly agree with the first statement ($P < 0.001$) and less likely than the overall group to agree or strongly agree with the second statement ($P = 0.06$). Intensivists were the only speciality, through these two statements, to have “negative attitudes” towards the role of law that were of, or approached, significance in this item.

By contrast, compared with their attitude to the role of law, intensivists had a more positive attitude to knowing and following the law. They were not significantly different from colleagues in other specialties on this measure (Table 1).

Knowledge of the law

IC was the third-best performing of the seven specialties by both mean correct responses to the legal knowledge questions and the proportion of specialists who got four or more of the seven questions correct (this latter score reflecting the traditional pass mark of $> 50\%$ correct). Although they performed significantly better than the other

six specialties combined, their mean score was still below 3.5 correct (50%), and about 50% of intensivists answered only three or fewer knowledge questions correctly (Table 2).

Practice and experience of end-of-life decisions and law

Intensivists recorded the highest mean for decisions about WWLST they were directly involved with in the previous 12 months (Table 3). Twenty-five per cent of intensivists had made more than 50 such decisions during this period.

Intensivists also reported being seen by others as a source of advice for issues relevant to this area of law. Intensivists were more likely than other specialties to report being consulted on this “often” or “very often” by other medical specialties and by nurses (Table 4).

Discussion

Intensivists reported that they were a key repository of legal knowledge for medical specialist colleagues and nurses, yet their knowledge of law in this area is limited. Although they performed better than some other specialties, intensivists achieved only a mean result of 50% on the legal knowledge questions. This is of particular concern given our findings that intensivists report that they make decisions about WWLST more frequently than other specialists. Also of concern is their negative attitude towards the role of law in this area, with intensivists more likely than other respondents to regard the law as irrelevant and out of touch with medicine. Interestingly, though, this attitude (relative to other specialties) did not carry through to attitudes about knowing and following the law. This may reflect a pragmatic approach by intensivists who do not like the intrusion that the law makes on clinical practice but nevertheless recognise that the law increasingly affects clinical decisions at the end of life and feel able to navigate that legal landscape and manage its impact on clinical decision making.

Table 4. Number (%) who are “often” or “very often” asked by others about issues relating to WWLST law, by specialty

Specialty (n)*	Other medical specialists (n = 799)	Interns/residents/registrars (n = 801)	Medical students (n = 797)	Nurses (n = 800)	Patients/families (n = 803)
Intensive care (124)	42 (34%)	57 (46%)	32 (26%)	59 (48%)	44 (35%)
Emergency medicine (267)	36 (14%)	121 (45%)	52 (20%)	87 (33%)	81 (30%)
Renal medicine (78)	13 (17%)	23 (29%)	7 (9%)	21 (27%)	18 (23%)
Respiratory medicine (97)	12 (12%)	29 (30%)	11 (11%)	14 (14%)	28 (29%)
Medical oncology (79)	3 (4%)	15 (19%)	6 (8%)	9 (11%)	18 (23%)
Geriatric medicine (107)	18 (17%)	53 (50%)	30 (28%)	34 (32%)	44 (41%)
Palliative care (51)	10 (20%)	32 (63%)	25 (49%)	21 (41%)	22 (43%)
Overall (803)	134 (17%)	330 (41%)	163 (20%)	245 (31%)	255 (32%)
P (χ^2 test)	< 0.001	< 0.001	< 0.001	< 0.001	0.025

* Maximum n for any specialty (varies across columns due to missing responses).

These results pose challenges for intensivists, their colleges and societies, and their patients. The law is one part of the environment in which ICU practice occurs, and a failure to engage with it gives rise to risks for doctors and patients.¹⁶ A lack of legal awareness also means the role of the law in providing a framework for resolving intractable disputes may not be used effectively. These risks cannot be managed and potential benefits realised if the law is not known or, even if it is, the attitudes to it mean it is bypassed or not considered.

One response to this is for IC colleges, societies and other professional medical groups to produce IC guidelines about end-of-life care that adopt an educative and legitimising approach to law. A recent example of an educative and legitimising approach is the revised Australian and New Zealand Intensive Care Society *Statement on care and decision-making at the end of life for the critically ill*.¹¹ The Statement contains detailed engagement with law (eg, Chapter 2 is devoted entirely to legal issues) and urges intensivists to be familiar with the relevant law in their jurisdiction. Our survey was undertaken before release of the Statement, and it would be interesting to repeat it to see what impact the Statement may have had on the legal knowledge of intensivists. There are also other national and international IC guidelines that provide instruction on the law and/or make clear the importance of knowing, and being educated about, the relevant legal framework.¹²⁻¹⁴

For the educative purpose, guidelines should include a statement of relevant law, and that statement needs to be legally accurate and expressed in terms that are accessible and relevant to the decisions that intensivists need to make. Such guidelines should also adopt a position that accepts, and even endorses, that the law has a legitimate role in this area. The law can be seen as a reflection, through parliament, of community values,³⁰ and it is appropriate

that the community has an interest in how these life-and-death decisions are made, and that this is seen to be the case.

This is not to say that the law and its operation cannot be criticised. The medical profession has a vital role to play in advocating for law reform where it believes the law is not working.³¹ But we argue that it is important to recognise the institutional role of law granted by parliaments in this area. We also suggest that the law should be seen by doctors as having some utility as a source of dispute resolution for situations in which conflict has become intractable.³¹

However, even high-quality guidelines can have limited impact on clinical practice.³² This points to the need for IC colleges, societies and other professional medical groups to reflect these educative and legitimising approaches to law in their wider engagement with the specialty, including in the implementation and promulgation of such guidelines. One possible action is to attempt to fill gaps in legal knowledge with relevant and ongoing CPD. Recent CPD training in this area of law has been shown to increase knowledge.¹⁶

A limitation of our research is the low response rate (32%), which is common to survey research involving doctors, for whom response rates are low and declining.³³ Non-response bias cannot be ruled out, although comparisons of respondents with the wider sample support their representativeness (Appendix Table S1). Any potential bias in our study may overestimate legal knowledge and underestimate more neutral attitudes to the law, because non-responders are less likely to be legally knowledgeable and less likely to hold strong opinions about the law (whether negative or positive). However, we note that our sample, which included all doctors from the seven specialties most likely to be involved in end-of-life decision making in the three most populous Australian states, is more representative than previous related studies examining

law in medical practice. Those studies have generally been drawn from participants in specified training courses or cohorts,³⁴⁻³⁶ specific health facilities^{17,18,37} or a single specialty and/or society.^{15,38-42} A final limitation is that our results may not be generalisable to other jurisdictions without comparable law, as the nature of the regulatory framework affects knowledge of and attitudes to it.

Conclusions

Intensivists play an integral role in delivering end-of-life care, and self-report as being a leading source of advice for other specialists and health professionals on the law in this area. However, there are significant gaps in their legal knowledge and they are negatively disposed towards the role of the law in their practice. Leadership from within the specialty, particularly through IC guidelines and their active implementation, together with CPD, is needed to ensure that the legal aspects of WWLST are known and considered in decision making to avoid harms to patients and doctors.

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Competing interests

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Authors' contributions

All authors were responsible for the study concept and design, acquired the data and interpreted it. Ben White and Lindy Willmott drafted the manuscript. Colleen Cartwright, Malcolm Parker and Gail Williams critically revised the manuscript for important intellectual content. Gail Williams and Colleen Cartwright were responsible for the statistical analysis. Ben White and Lindy Willmott supervised the study. All authors read and approved the final manuscript.

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Appendix

This appendix was part of the submitted manuscript and has been peer reviewed. It is posted as supplied by the authors.

Additional files

File name: Additional file 1 – Supplementary material

Description of data: Additional results not shown in the main article.

File name: Additional file 2 – STROBE Statement checklist

Description of data: Checklist that outlines how the article was written in accordance with the STROBE Statement.

Additional file 1 – Supplementary material

Intensive care specialists' knowledge, attitudes and practice relating to the law about withholding and withdrawing life-sustaining treatment: a cross-sectional study comparing intensive care with other specialties involved in end-of-life decision-making

Comparison of AMPCo and study samples

AMPCo provided marginal distributions by gender, age and main specialty for each state, based on the information in the AMPCo database for the selected specialties. The numbers of questionnaires sent to each specialty group were also recorded. We could not calculate exact response rates by each characteristic as responses could not be linked to the individual doctors selected. It is also possible that variable values differed in the AMPCo records and study questionnaire responses. Table S1 shows the marginal distributions of state, gender, age and specialty for the original sample from the AMPCo database and the study responses.

Table S1: Comparison of AMPCo database and study sample by state, gender, age and main specialty

Characteristic	Total Surveyed	Total Responses
	N = 2858 n (%) AMPCo	N = 867 n (%) Study
State and Gender		
Queensland Males	461 (72)	148 (68)
Females	175 (28)	69 (32)
NSW Males	814 (66)	221 (66)
Females	420 (34)	114 (34)
Victoria Males	655 (66)	198 (63)
Females	333 (34)	115 (37)
Missing gender	0	2
Age		
Less than 40 years	827 (29)	177 (20)
40 to 49 years	1047 (37)	336 (39)
50 to 59 years	568 (20)	219 (25)
60 years or older	266 (9)	117 (13)
Missing age	150 (5)	18 (2)
Main Specialty		
Emergency Medicine	1147 (40)	270 (31)
Geriatric Medicine	253 (9)	107 (12)
Intensive Care	428 (15)	125 (14)
Medical Oncology	338 (12)	80 (9)
Palliative Care	105 (4)	52 (6)
Renal Medicine	253 (9)	80 (9)
Respiratory Medicine	334 (12)	98 (11)
Missing specialty	0	55 (6)

Additional file 2 – STROBE Statement checklist

Intensive care specialists’ knowledge, attitudes and practice relating to the law about withholding and withdrawing life-sustaining treatment: a cross-sectional study comparing intensive care with other specialties involved in end-of-life decision-making

STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Item No	Recommendation
Title and abstract	<p>1 (a) Indicate the study’s design with a commonly used term in the title or the abstract</p> <p>See page 1 (Title page)</p> <hr/> <p>(b) Provide in the abstract an informative and balanced summary of what was done and what was found</p> <p>See pages 2-3 (Abstract)</p>
Introduction	
Background/rationale	<p>2 Explain the scientific background and rationale for the investigation being reported</p> <p>See page 4-5. End-of-life decision-making is an integral part of intensive care (IC) practice, particularly for adults who lack capacity. There are legal frameworks that govern these decisions and this means that Intensivists have not only a clinical role but a legal role as well. Yet there is evidence that medical specialists generally (including Intensivists) lack legal knowledge. This paper examines Intensivists’ attitudes, knowledge and practice in relation to law that deals with withholding and withdrawing life-sustaining treatment (WWLST) for adults who lack capacity, and compares them with other specialists.</p>
Objectives	<p>3 State specific objectives, including any prespecified hypotheses</p> <p>See page 5. The objectives of this study were to examine Intensivists’ attitudes, knowledge and practice in relation to law that deals with WWLST for adults who lack capacity. Our central hypothesis was that despite making these decisions often, there would be gaps in Intensivists’ legal knowledge in this area.</p>
Methods	
Study design	<p>4 Present key elements of study design early in the paper</p> <p>See pages 5-6</p>
Setting	<p>5 Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection</p> <p>See pages 5-6</p>
Participants	<p>6 (a) Give the eligibility criteria, and the sources and methods of selection of participants</p> <p>See pages 5-6</p>
Variables	<p>7 Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable</p> <p>See pages 7-8</p>

Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group See pages 7-8
Bias	9	Describe any efforts to address potential sources of bias We considered the possibility that those responding to our survey may not be representative of the wider sample of doctors. For example, those more interested in law may have been more likely to participate. We were also conscious of possible non-response bias due to our response rate. To ascertain the representativeness of our sample we compared it with the original AMPCo sample (by age, gender, specialty, and state) and found that respondents were similar on most comparison variables except that there were fewer younger doctors among respondents than in the sample population (see page 9 and Table S1).
Study size	10	Explain how the study size was arrived at The study sample comprised all eligible doctors in the relevant specialties in the three target states who were on the AMPCo database (see pages 5-6).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why See page 7-8. Quantitative variables were treated as continuous and not grouped, except for the knowledge score which was categorised as below 4 or 4 and above.
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding See page 8 where this is described under “Statistical analysis”. Regression models (linear or logistic) were used to control for confounding by state, with adjustment made for multiple comparisons. <hr/> (b) Describe any methods used to examine subgroups and interactions <hr/> No subgroup analyses or tests of interaction were undertaken. <hr/> (c) Explain how missing data were addressed Fifty-five respondents did not indicate their main specialty, or indicated a specialty outside the designated groups, and they were excluded from the analysis as we were comparing Intensivists with other specialties. There were only relatively small amounts of other missing data, so no adjustments were made for this. Information on missing items is included in the tables. <hr/> (d) If applicable, describe analytical methods taking account of sampling strategy The regression models include variables state and specialty which defined the sample strata. <hr/> (e) Describe any sensitivity analyses No sensitivity analyses were undertaken.
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed See page 9 detailing response rates. All respondents in the denominator population were included in analyses.

(b) Give reasons for non-participation at each stage.

The main study only had one stage. The study was conducted as an anonymous questionnaire survey and the research team had no contact details to allow follow-up. Although technically it would have been possible for AMPCo to follow-up non-responders about reasons for non-participation, this could have seemed like harassment. Therefore we did not explore reasons for non-participation so cannot give these reasons.

(c) Consider use of a flow diagram

Not applicable.

Descriptive data	14*	<p>(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders</p> <p>Demographic information on age, gender, specialty, and state of study participants is available in Table S1.</p> <p>(b) Indicate number of participants with missing data for each variable of interest</p> <p>See 12c above.</p>
Outcome data	15*	<p>Report numbers of outcome events or summary measures</p> <p>Pages 9-11 report on the key measures for this component of the study: perspectives on law; knowledge of law; and practice and experience with WWLST decisions and law.</p>
Main results	16	<p>(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included.</p> <p>Unadjusted estimates have been given in the paper, with adjustment for state being used to calculate P-values for significance. Adjustment for state made little difference to the effect estimates.</p> <p>(b) Report category boundaries when continuous variables were categorized</p> <p>See 11 above.</p> <p>(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period</p> <p>Not applicable.</p>
Other analyses	17	<p>Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses</p> <p>Not applicable – see 12 (b).</p>
Discussion		
Key results	18	<p>Summarise key results with reference to study objectives</p> <p>See page 11.</p>
Limitations	19	<p>Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias</p> <p>See pages 13-14.</p>
Interpretation	20	<p>Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence</p> <p>See pages 12-14.</p>

Generalisability 21 Discuss the generalisability (external validity) of the study results

See pages 13-14.

Other information

Funding 22 Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

See "Acknowledgements" on page 16.

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.