

Andrés Esteban
Federico Gordo
José Felipe Solsona
Inmaculada Alía
José Caballero
Carmen Bouza
Juan Alcalá-Zamora
Deborah J. Cook
Juan M. Sanchez
Ricardo Abizanda
Gloria Miró
María J. Fernández del Cabo
Eva de Miguel
Jose A. Santos
Begoña Balerdi

Withdrawing and withholding life support in the intensive care unit: a Spanish prospective multi-centre observational study

Received: 3 November 2000
Final revision received: 4 July 2001
Accepted: 3 September 2001
Published online: 12 October 2001
© Springer-Verlag 2001

A. Esteban (✉) · F. Gordo · I. Alía ·
J. Caballero
Hospital Universitario de Getafe,
Carretera de Toledo Km 12,500,
Getafe 28905, Madrid, Spain
E-mail: aesteban@hug.es
Phone: +34-91-6834982
Fax: +34-91-6832095

L. F. Solsona · G. Miró
Hospital del Mar, Passeig Maritim 25–29,
Barcelona, Spain

C. Bouza · M. J. Fernández del Cabo
Hospital Gregorio Marañón,
Doctor Esquerdo 46, Madrid, Spain

J. Alcalá-Zamora · E. de Miguel
Hospital Universitario de la Princesa,
Diego de León 62, Madrid, Spain

D. J. Cook
McMaster University,
Department of Medicine,
St. Joseph's Hospital,
50 Charlton Avenue East, Hamilton,
Ontario, Canada

J. M. Sanchez · J. A. Santos
Hospital de la Santa Creu i Sant Pau,
Avenida Sant Antoni Maria Claret 167,
Barcelona, Spain

R. Abizanda · B. Balerdi
Hospital General de Castellón,
Avenida Benicasim, s/n. Castellón, Spain

Abstract *Objective:* To determine how frequently life support is withheld or withdrawn from adult critically ill patients, and how physicians and patients families agree on the decision regarding the limitation of life support.

Design: Prospective multi-centre cohort study.

Setting: Six adult medical-surgical Spanish intensive care units (ICUs).
Patients and participants: Three thousand four hundred ninety-eight consecutive patients admitted to six ICUs were enrolled.

Measurements and results: Data collected included age, sex, SAPS II score on admission and within 24 h of the decision to limit treatment, length of ICU stay, outcome at ICU discharge, cause and mode of death, time to death after the decision to withhold or withdraw life support, consultation and agreement with patient's family regarding withholding or withdrawal, and the modalities of therapies withdrawn or withheld. Two hundred twenty-six (6.6%) of 3,498 patients had therapy withheld or withdrawn and 221 of them died in the ICU. Age, SAPS II and length of ICU stay were significantly higher in patients dying patients who had therapy withheld or withdrawn than in patients dying despite active treatment. The proposal to withhold or withdraw life

support was initiated by physicians in 210 (92.9%) of 226 patients and by the family in the remaining cases. The patient's family was not involved in the decision to withhold or withdraw life support therapy in 64 (28.3%) of 226 cases. Only 21 (9%) patients had expressed their wish to decline life-prolonging therapy prior to ICU admission.

Conclusions: The withholding and withdrawing of treatment was frequent in critically ill patients and was initiated primarily by physicians.

Keywords Withdrawal of life support · Withholding of life support · Intensive care unit

Introduction

While advances in basic and advanced life support have saved lives and improved the short- and long-term quality of life of many seriously ill patients, there is an increasing recognition of the social and humanistic goals of critical care medicine, particularly for dying patients. Such goals include understanding and honouring patient wishes regarding levels of care, limiting the use of technology which may prolong the dying process, withdrawing and withholding life support when appropriate and integrating principles of palliative care into practice [1, 2, 3, 4]. Guidelines to aid physicians in deciding when life support may be withheld or withdrawn have been reported in several papers, particularly from the United States [5, 6, 7, 8, 9], but are quite limited in Europe.

Studies on withdrawal and withholding of life support from critically ill patients include surveys analysing the attitudes of health care workers concerning issues such as informed consent, family participation in decisions about levels of care, resuscitation and limiting therapeutic interventions [10, 11, 12, 13], and prospective or retrospective studies describing clinical practice patterns concerning active withdrawal or withholding of life support therapy [14, 15, 16, 17, 18, 19, 20].

A prospective survey carried out in 131 American ICUs to determine the frequency of withdrawal of life support showed that 48% of 5,910 patients dying in the ICU had life support withheld or withdrawn [21]. Ferrand et al. [22] have recently published the results of a large survey of practices in withholding and withdrawal of life-sustaining treatments in 113 French ICUs and have shown that 53% of 1,175 deaths in the ICU were preceded by a decision to limit life-supporting therapies. The Ferrand's study is the first one reporting the frequency of withdrawing and withholding therapy in western European ICUs. The only published data about the issue of forgoing life support in Spanish ICUs are those reported by Vincent [10, 11] and Abizanda et al. [23] on the results of questionnaires that were sent to intensivists to provide information on current practices and ethical viewpoints. The main limitation of questionnaire surveys is that they represent physician-reported, rather than actual, practice. This study was therefore undertaken to determine how frequently life support is withheld or withdrawn from adult critically ill patients in Spanish ICUs.

Methods

This is a prospective multi-centre study conducted in six adult medical-surgical ICUs of six publicly funded, tertiary care hospitals in Spain. All patients admitted to the studied ICUs over a 9-month period in 1996 were eligible for this study and were evaluated prospectively. All patients had a special form completed by

one or two designated physicians trained in the forms of the study at each participating ICU. All other members of the medical staff were unaware that a study was in progress to minimise any behaviour change in the decision-making process about withdrawing and withholding life support while they were being observed. The form included the following information: age, sex, the Simplified Acute Physiological Score (SAPS II), dates of ICU admission and ICU discharge, outcome at ICU discharge (dead or alive), cause of death and mode of death (death despite active treatment, withdrawal of life support, withholding of life support). In daily clinical rounds, physicians responsible for data collection identified all information relating to or bearing on the question of forgoing life-sustaining treatments. Additional data were recorded for patients for whom decisions to withhold or withdraw life-sustaining treatments were taken: SAPS II score within 24 h preceding the decision to limit treatment, time to death after the decision to withhold or to withdraw life support was taken, the modalities of medical therapies withdrawn or withheld, and information provided to the family about the decision to forgo life-sustaining treatment.

During the study period, the primary physician responsible for the patient's care or any other ICU physician, on their own initiative or after a proposal from the patient's family, raised the issue of restricting therapy or withdrawing treatment. If the proposal was accepted by the other members of the medical staff, treatment was withheld or withdrawn. If the decision was not universally accepted by all physicians belonging to the medical staff, all therapeutic measures were continued. Nurses were never involved in the decision to withhold or withdraw life support therapy but they were always informed when a decision was taken by the medical staff.

The following definitions were used to characterise the decisions about the removal or cessation of medical interventions:

1. *Withdrawal of life support*: The cessation and removal of an ongoing medical therapy with the explicit intent not to substitute an equivalent, alternative treatment and knowing that the patient will die following the change in therapy.
2. *Withholding of life support*: The considered decision not to institute a therapy that, although medically appropriate and potentially beneficial in a usual patient, would be unable to modify the outcome in a patient terminally ill. Do-not-resuscitate (DNR) orders were also considered in the category of withholding of life support.

Patients who had both withholding and withdrawal of life support were classified as having withdrawal.

With respect to the information provided to the family about the decision to forgo life-sustaining treatment, the following definitions were used:

1. *Direct agreement*: Physician and patient's family talked about the patient's prognosis and agreed that medical therapy was unlikely to restore the patient to health, and decided either not to administer or to remove medical interventions with the understanding that the patient's death might occur as a result.
2. *Indirect agreement*: Prognosis information was provided and the physician and patient's family talked about the futility of medical therapy but the decision to withhold or withdraw the medical interventions was not overtly expressed.
3. *No consultation*: The decision to withhold or withdraw life support was exclusively taken by the medical ICU staff.

All patients who met criteria for brain death were excluded from the analysis. The study was approved by the research ethics com-

Table 1 Characteristics and outcomes of 3498 patients admitted to the studied ICUs over the study period. Results are presented as median and interquartile range or numbers of patients and proportions

	ICU 1 <i>n</i> = 540	ICU 2 <i>n</i> = 1,227	ICU 3 <i>n</i> = 638	ICU 4 <i>n</i> = 528	ICU 5 <i>n</i> = 207	ICU 6 <i>n</i> = 358	Total <i>n</i> = 3,498
Age (years)	61 (46, 72)	63 (51, 71)	63 (49, 73)	62 (48, 71)	65 (54, 73)	59 (40, 70)	62 (48, 71)
Males, <i>n</i> (%)	362 (67.0)	801 (65.3)	404 (63.3)	359 (68.0)	125 (60.4)	251 (70.1)	2,302 (65.8)
SAPS II on ICU admission	27 (16, 42)	27 (20, 37)	33 (22, 47)	20 (13, 29)	35 (26, 46)	29 (21, 37)	27 (19, 39)
Length of stay in the ICU (days)	2 (1, 7)	2 (1, 4)	4 (2, 7)	3 (1, 7)	7 (4, 13)	6 (3, 11)	3 (1, 7)
In-ICU mortality, <i>n</i> (%)	100 (18.5)	121 (9.9)	167 (26.2)	99 (18.7)	48 (23.2)	109 (30.4)	644 (18.4)
Death brain, <i>n</i> (%)	8 (1.5)	17 (1.4)	15 (2.3)	8 (1.5)	0 (0)	14 (3.9)	62 (1.8)
Withholding of therapy ^a , <i>n</i> (%)	9 (1.7)	19 (1.5)	16 (2.5)	8 (1.5)	12 (5.8)	14 (3.9)	78 (2.2)
Withdrawal of therapy ^a , <i>n</i> (%)	31 (5.7)	23 (1.9)	69 (10.8)	11 (2.1)	7 (3.4)	7 (1.9)	148 (4.2)

^a Patients with death brain are excluded

Table 2 Age, SAPS II score at the ICU admission and length of ICU stay in patients dying during hospitalisation according to treatment received. Patients with death brain are excluded. Results are expressed as median and interquartile range

	ICU 1 <i>n</i> = 92	ICU 2 <i>n</i> = 103	ICU 3 <i>n</i> = 152	ICU 4 <i>n</i> = 91	ICU 5 <i>n</i> = 48	ICU 6 <i>n</i> = 95	Total <i>n</i> = 582
Age (years)							
Withholding-withdrawal	70 (59, 77)	68 (59, 74)	73 (60, 76)	72 (68, 77)	70 (63, 74)	51 (38, 71)	70 (59, 76)
Active treatment	70 (57, 75)	69 (62, 74)	66 (54, 73) ^a	61 (52, 73) ^b	73 (65, 77)	64 (50, 71)	68 (55, 74) ^b
SAPS II at the ICU admission							
Withholding-withdrawal	55 (43, 68)	55 (43, 67)	51 (40, 67)	42 (32, 53)	49 (38, 64)	40 (35, 52)	51 (39, 65)
Active treatment	56 (42, 71)	52 (38, 66)	55 (41, 74)	32 (23, 44)	48 (40, 60)	35 (29, 47)	45 (33, 62) ^a
Length of ICU stay (days)							
Withholding-withdrawal	11 (6, 17)	3 (2, 12)	8 (2, 16)	7 (2, 18)	11 (7, 19)	9 (5, 13)	8 (2, 16)
Active treatment	3 (0, 17)	2 (0, 7)	2 (1, 5) ^a	5 (1, 12)	10 (7, 25)	3 (1, 10)	3 (1, 10) ^a

^a $p < 0.01$, ^b $p < 0.05$ for the difference between patients having life-sustaining therapy withheld or withdrawn in ICU and patients receiving active treatment

mittee at each institution. Since no additional intervention was performed, the need for informed consent was waived by the institutional review board.

In the statistical analysis, the data are presented as medians and interquartile range and proportions as appropriate. The Fisher's exact test was used to compare categorical variables and the Student's *t*-test or ANOVA were used to compare continuous data. Statistical significance was represented by a *p* value less than 0.05.

Results

A total of 3,498 patients were admitted to the six ICUs over the study period and 644 (18.4%) of them died in the ICUs. Among these 644 patients, 62 (9.6%) had brain death, 361 (56.0%) died despite active treatment and 221 (34.3%) patients died following the withholding or withdrawal of life-sustaining treatment. Five patients for whom a decision to withhold or withdraw life support therapy was taken were discharged alive from the ICU, but died during hospitalisation after ICU discharge. The characteristics of patients, ICU mortality rate, ICU length of stay and number of patients having limitation of life-sustaining therapy in each ICU are shown in Table 1.

Age, SAPS II on ICU admission and length of ICU stay were significantly lower in patients dying despite active treatment than in patients in whom a decision to withhold or withdraw life support therapy was taken (Table 2). Patients in whom therapeutic interventions were withheld or withdrawn had a significantly higher SAPS II score in the 24 h period before the decision to withhold or withdraw was taken as compared with the SAPS II score at the time of ICU admission (60.1 ± 16.0 versus 53.0 ± 18.7 , $p < 0.001$). The mean time to death after the decision to withhold or to withdraw therapeutic management was taken was 1.0 ± 1.7 days.

A decision to withhold or withdraw life support was taken in 65.4% of patients dying because of non-traumatic coma, 52.3% of patients dying due to end-stage COPD, 36.1% of patients dying because of sepsis and multiple organ dysfunction syndrome and 33.4% of patients dying due to severe cardiac failure.

The proposal to withhold or withdraw life support was initiated by physicians in 210 (92.9%) of 226 patients and by the patient's family in the remaining cases. Only 21 (9.3%) of the patients having life support withheld or withdrawn had expressed, prior to the ICU ad-

Table 3 Characteristics of patients forgoing life-sustaining therapy according to whether medical treatment was withdrawn or withheld. Results are median and interquartile range

	Withdrawal (<i>n</i> = 148)	Withholding (<i>n</i> = 78)	<i>p</i> value
Age (years)	71 (60, 76)	68 (51, 74)	0.10
SAPS II at the moment of decision to withdraw or withhold therapy	62 (51, 73)	55 (43, 64)	0.001
Time from forgoing life care to death (days)	0 (0, 1) ^a	1 (0, 2) ^a	< 0.001

^a Zero days corresponds to less than 24 h and 1 day corresponds to more than 24 h and less than 48 h

Table 4 Therapeutic interventions withdrawn or withheld from patients in the six ICUs studied

	Withdrawal (<i>n</i> = 148)	Withholding (<i>n</i> = 78)	<i>p</i> value
Advanced life support			
Vasoactive drugs, <i>n</i> (%)	121 (81.7)	42 (53.8)	< 0.001
Mechanical ventilation, <i>n</i> (%)	84 (56.7)	11 (14.1)	< 0.001
Dialysis, <i>n</i> (%)	46 (31.1)	40 (51.3)	< 0.01
Basic life support			
Supplemental oxygen, <i>n</i> (%)	94 (63.5)	28 (35.9)	< 0.001
Antibiotics, <i>n</i> (%)	44 (29.7)	15 (19.2)	0.07
Enteral or parenteral nutrition, <i>n</i> (%)	36 (24.3)	18 (23.1)	0.83
Sedatives ^a , <i>n</i> (%)	5 (3.4)	2 (2.6)	0.73

^a Sedatives were never withdrawn or withheld in conscious patients

mission, their wish to refuse life-prolonging therapy, but none of them had written advance directives. No patients had decision making capacity at that moment.

The family was not involved in the decision-making process of withholding or withdrawing life support in 64 (28.3%) of 226 patients. For the remaining 162 patients, the physicians and patient's family talked about the patient's prognosis. In 92 (40.7%) patients, both the family and the physicians decided to withhold or withdraw life support (direct agreement), in 6 (2.6%) patients the family was unwilling to accept the poor prognosis and demanded that the patient had life-sustaining therapy indefinitely, and in 62 (27.4%) patients the physicians and the family talked about the futility of medical therapy but the decision to withhold or withdraw life support was not overtly expressed (indirect agreement).

Life support treatment was withdrawn from 148 (65.5%), and withheld from 78 (34.5%), of 226 patients. Patients in whom treatment was withdrawn were sicker than patients in whom treatment was withheld during the 24 h preceding the decision, and the time from the decision to end-of-life until death was significantly shorter when treatment was withdrawn than when it was withheld (Table 3). The therapeutic interventions more frequently withdrawn were vasoactive drugs and supplemental oxygen. The interventions more frequently withheld were vasoactive drugs and dialysis (Table 4). The most advanced life support therapies, such as mechanical ventilation and vasoactive drugs, were withdrawn in 84 (56.7%) and 121 (81.7%) of the patients, respectively.

Discussion

Prendergast and Luce [16] in American ICUs and McLean et al. [24] in Canadian ICUs have reported an increase in withdrawal of life support from 51% to 90% and 44% to 74%, respectively, in the period between 1988 and 1993. Several studies carried out between 1992 and 1996 reported that forgoing life-sustaining treatment occurs in 4–13% of patients admitted to the ICU and in 46–91% of patients dying in the ICU [18, 19, 20, 21, 25]. The frequency of decisions to withhold and withdraw life-sustaining treatments have rarely been reported from western Europe. Very recently Ferrand et al. [22] have reported the results of a large prospective study in France in which 53% of the ICU deaths were preceded by a decision to withhold or withdraw life-support therapies. The main finding of our study is that withholding and withdrawing life support from critically ill patients is common in Spanish ICUs, but the frequency of limiting life support therapy is a little lower than that reported in studies from other countries [18, 19, 20, 21, 22, 25]. That finding suggests that the attitude of physicians towards limiting life support therapy in these Spanish ICUs is conservative relative to other centres and countries. The observed rate of withdrawal and withholding in the ICUs studied is consistent with data reported from southern countries (Greece, Portugal, Italy and Spain) in two European surveys of attitudes surrounding end-of-life decisions showing that these intensivists, compared to those in northern countries, were less prone to write "do-not-resuscitate" orders, with-

draw therapy and deliberately administer drugs until death ensues [10, 11].

The rates of withholding or withdrawing life support therapy varied considerably across the six ICUs studied from 21 % to 56 % of deaths. Great differences in attitudes and practices of forgoing life-support therapy have been reported in different units within a country, and they have been studied to attempt to explain their dimensions, determinants and consequences, focusing on variations in patient and doctor characteristics. Keenan et al. [18] reported a greater proportion of patients dying as a result of withholding life support in community hospitals than in teaching hospitals in Canada (11.9 % versus 3.8 %, $p = 0.004$). By contrast, Bach et al. [26] reported that university-based intensivists were more likely to write do-not-resuscitate orders and to withdraw life-sustaining therapy than community-based intensivists (59 % versus 33 % and 12 % versus 2 %, respectively). Prendergast et al. [21] reported a range of withholding life support of 0–67 % of deaths, and a range of 0–79 % of deaths for life support withdrawal that was not related to ICU type, hospital type, number of admissions or ICU mortality. In the study by Ferrand et al. [22], the mean rate of withholding or withdrawal of therapy was 11.3 % of patients admitted to the ICU with extreme values of 0 % and 26.1 %, and these differences were not related to the structural characteristics of the units (size, type or number of physicians per unit). Kollif and Ward [27] showed that, among patients dying in the ICU, those without a private attending physician were more likely to undergo withdrawal of life-sustaining therapies than patients with a private attending physician (81 % versus 30 %, $p < 0.001$).

The most important factors in the decision to withdraw care are the likelihood of the patient surviving hospitalisation, the patient's advance directives, the pre-morbid cognitive function, the quality of life as viewed by the patient and the long-term survival [12, 13, 16, 28]. In the study by O'Callahan et al. [15] no family or physician cited limited health care resources or costs as a factor in the decision, and in the study by Ferrand et al. [22] the high cost was cited as a reason for withholding or withdrawal of life support therapy in only 5 % of the patients. The results of a questionnaire survey about limitation of life support carried out among Spanish critical care professionals showed that only 10 % of the nurses and physicians asked thought that financial costs is a major factor in the decision to forgo treatment [29]. In this study, our goal was not to elicit the reasoning used by physicians for their recommendations to forgo life support. Participating hospitals were part of the National Health System and therefore under a global health care budget, making distinctions between perceptions of the relative importance of economic influences difficult to understand in an observational study such as ours.

The role of the patient's family in the decision-making process of limiting life support is different all over the world. Physicians in North America usually work in settings in which patient autonomy is upheld, and the patient's decisions to undergo or refuse treatment are considered to be fundamental rights, accepted as such by the medical profession. Asch et al. [30] performed a questionnaire survey in which physicians practising in adult ICUs in the United States were asked to report their experience in withholding and withdrawing life-sustaining treatment and found that only 12–14 % of 879 respondents reported withdrawing or withholding life-sustaining treatment without the knowledge of a surrogate. In contrast, most European physicians believe that issues such as withholding and withdrawing life support are predominantly biomedical, ethical issues, and that such decisions should be made by physicians [10, 11, 31]. Two descriptive studies from Swedish ICUs have shown that nearly half of the decisions to withhold or withdraw life support were made without a documented discussion with the patient or the family [32, 33]. In the study by Ferrand et al. [22], families were informed in only 59 % of the cases. In our study, the decision to withhold or withdraw life-support therapy was taken with the agreement (direct or indirect) of the family in 156 (69 %) patients, but this percentage varied from 54 % to 90 % among the six ICUs studied.

No patient in our study had written advance directives and only 9 % of patients dying in the ICU had expressed to their relatives that they did not want advanced life support if they developed critical illness with little or no chance of regaining a reasonable quality of life. The above data are very similar to that reported in other European studies. For example, Ferrand et al. [22] reported that the patient's willingness to limit his or her own care was known in only 8 % of cases, and in none of the patients in the study by Manara et al. [25] was a written advance directive available. Our findings demonstrate relatively less societal interest in predefining or collaborating in life-sustaining treatment decisions in Spain, where, by contrast, many people have written, documented evidence of their desire to be organ donors [34, 35]. Further advances in our understanding of death in the ICU should focus on improving the process and outcomes of this care, and its relationship to palliative care [4]. Although basic principles about the optimal quality of end-of-life care may transcend time, the most useful guidelines and policies should be individualised to each patient, culturally appropriate and adapted to the local environment for which they are intended.

Acknowledgements The authors thank Fernando Burgos for fruitful discussions.

References

- Ayres SM (1991) Who decides when care is futile? *Hosp Pract* 30: 41–53
- Truog RD, Brett AS (1992) The problem with futility. *N Engl J Med* 326: 1560–1564
- Schneiderman L, Jecker S, Jonsen AR (1990) Medical futility: its meaning and ethical implications. *Ann Intern Med* 112: 949–953
- Danis M, Federman D, Fins JJ, Fox E, Kastenbaum B, Lanken PN, et al. (1999) Incorporating palliative care into critical care education: principles, challenges and opportunities. *Crit Care Med* 27: 2005–2013
- American College of Chest Physicians/Society of Critical Care Medicine Consensus Panel (1990) Ethical and moral guidelines for the initiation, continuation and withdrawal of intensive care. *Chest* 97: 949–961
- Task Force on Ethics of The Society of Critical Care Medicine (1990) Consensus report on the ethics of forgoing life-sustaining treatments in the critically ill. *Crit Care Med* 18: 1435–1439
- NIH Workshop Summary (1986) Withholding and withdrawing mechanical ventilation. *Am Rev Respir Dis* 134: 1327–1330
- American Thoracic Society Bioethics Task Force (1991) Withholding and withdrawing life-sustaining therapy. *Am Rev Respir Dis* 144: 726–731
- Ethics Committee of the Society of Critical Care Medicine (1997) Consensus statement of the Society of Critical Care Medicine's Ethics Committee regarding futile and other inadvisable treatments. *Crit Care Med* 25: 887–891
- Vincent JL (1990) European attitudes towards ethical problems in intensive care medicine results of an ethical questionnaire. *Intensive Care Med* 16: 256–264
- Vincent JL (1999) Forgoing life support in western European intensive care units: the results of an ethical questionnaire. *Crit Care Med* 27: 1626–1633
- The Society of Critical Care Medicine Ethics Committee (1992) Attitudes of critical care medicine professionals concerning forgoing life-sustaining treatments. *Crit Care Med* 20: 320–326
- Cook DJ, Guyatt H, Jaeschke R, Reeve J, Spanier A, King D, et al. (1995) Determinants in Canadian health care workers of the decision to withdraw life support from the critically ill. Canadian Critical Care Trials Group. *JAMA* 273: 703–708
- Rapoport J, Teres D, Lemeshow S (1996) Resource use implications of do not resuscitate orders for intensive care unit patients. *Am J Respir Crit Care Med* 153: 185–190
- O'Callahan JG, Fink C, Pitts LH, Luce JM (1995) Withholding and withdrawing of life support from patients with severe head injury. *Crit Care Med* 23: 1567–1575
- Prendergast TJ, Luce JM (1997) Increasing incidence of withholding and withdrawal of life support from the critically ill. *Am J Respir Crit Care Med* 155: 15–20
- Wood GG, Martin E (1995) Withholding and withdrawing life-sustaining therapy in a Canadian intensive care unit. *Can J Anaesth* 42: 186–191
- Keenan SP, Busche KD, Chen LM, Esmail R, Inman KJ, Sibbald WJ, for The Southwestern Ontario Critical Care Research Network (1998) Withdrawal and withholding of life support in the intensive care unit: a comparison of teaching and community hospitals. *Crit Care Med* 26: 245–251
- Turner JS, Michel WL, Morgan CJ, Benatar SR (1996) Limitation of life support: frequency and practice in a London and a Cape Town intensive care unit. *Intensive Care Med* 22: 1020–1025
- Eidelman LA, Jakobson DJ, Pizov R, Geber D, Leibovitz L, Sprung CL (1998) Foregoing life-sustaining treatment in an Israeli ICU. *Intensive Care Med* 24: 162–166
- Prendergast TJ, Claessens MT, Luce JM (1998) A national survey of end-of-life care for critically ill patients. *Am J Respir Crit Care Med* 158: 1163–1167
- Ferrand E, Robert R, Ingrand P, Lemaire F for the French LATAREA group (2001) Withholding and withdrawal of life support in intensive care units in France: a prospective survey. *Lancet* 357: 9–14
- Abizanda R, Almendros Corral L, Balerdi Pérez B (1994) Aspectos éticos de la medicina intensiva. Resultados de una encuesta de opinión. *Med Clin (Barc)* 102: 521–526
- McLean RF, Tarshis J, Mazer CD, Szalai JP (2000) Death in two Canadian intensive care units: institutional difference and changes over time. *Crit Care Med* 28: 100–103
- Manara AR, Pittman JAL, Braddon FEM (1998) Reasons for withdrawing treatment in patients receiving intensive care. *Anaesthesia* 53: 523–528
- Bach PB, Carson SS, Leff A (1998) Outcomes and resource utilization for patients with prolonged critical illness managed by university-based or community-based subspecialists. *Am J Respir Crit Care Med* 158: 1410–1415
- Kollef MH, Ward S (1999) The influence of access to a private attending physician on the withdrawal of life-sustaining therapies in the intensive care unit. *Crit Care Med* 27: 2125–2132
- Sjokvist P, Berggren L, Cook DJ (1999) Attitudes of Swedish physicians and nurses towards the use of life-sustaining treatment. *Acta Anaesthesiol Scand* 43: 167–172
- Abizanda Campos R, Almendros Corral L, Balerdi Pérez B, Socias Crespi L, Lopez Ferré J, Valle Herráez FX (1992) Limitación del esfuerzo terapéutico. Encuesta sobre el estado de opinión de los profesionales de la Medicina Intensiva. *Med Intensiva* 18: 100–105
- Asch DA, Hansen-Flaschen J, Lanken PN (1995) Decisions to limit or continue life-sustaining treatment by critical care physicians in the United States: conflicts between physicians' practices and patients' wishes. *Am J Respir Crit Care Med* 151: 288–292
- Sjokvist P, Nilstun T, Svantesson M, Berggren L (1999) Withdrawal of life support – who should decide? Differences in attitudes among the general public, nurses and physicians. *Intensive Care Med* 25: 949–954
- Sjokvist P, Sundin PO, Berggren L (1998) Limiting life support. Experiences with a special protocol. *Acta Anaesthesiol Scand* 42: 232–237
- Melltorp G, Nilstun T (1996) Decisions to forgo life-sustaining treatment and the duty of documentation. *Intensive Care Med* 22: 1015–1019
- Miranda B, Matesanz R, Fernández Lucas M, Naya MT, Felipe C (1996) Organ donation in Spain: Evolution of organ donor characteristics. *Transplant Proc* 28: 175–176
- Navarro A (1996) Brain death epidemiology: the Madrid study. *Transplant Proc* 28: 103–104