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ORIGINAL

Clinician discomfort with life support plans for mechanically ventilated patients

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Abstract *Objective:* To examine the incidence and predictors of clinician discomfort with life support plans for ICU patients. *Design and setting:* Prospective cohort in 13 medical-surgical ICUs in four countries. *Patients:* 657 mechanically ventilated adults expected to stay in ICU at least 72 h. *Measurements and results:* Daily we documented the life support plan for mechanical ventilation, inotropes and dialysis, and clinician comfort with these plans. If uncomfortable, clinicians stated whether the plan was too technologically intense (the provision of too many life support modalities or the provision of any modality for too long) or not intense enough, and why. At least one clinician was uncomfortable at least once for 283 (43.1%) patients, primarily because plans were too technologically intense rather than not intense enough (93.9% vs. 6.1%). Predictors of discomfort because plans were too intense were: patient age, medical admission, APACHE II score, poor prior functional status, organ dysfunction, dialysis in ICU, plan to withhold dialysis, plan to withhold mechanical ventilation, first week in the ICU, clinician, and city. *Conclusions:* Clinician discomfort with life support perceived as too technologically intense is common, experienced mostly by nurses, variable across centers, and is more likely for older, severely ill medical patients, those with acute renal failure, and patients lacking plans to forgo reintubation and ventilation. Acknowledging the sources of discomfort could improve communication and decision making

Keywords Clinician discomfort predictors · Life support plans · Mechanically ventilated patients

Introduction

Decisions about life support for critically ill patients are made daily in the intensive care unit (ICU). Treatment plans for mechanical ventilation, inotrope or vasopressor agents, and dialysis are usually formulated by a multidisciplinary team of clinicians led by an attending physician, in consultation with patients and, more commonly, their families. Since life support decision making is complex, dynamic, and emotionally challenging, these treatment plans may cause clinician discomfort. The End of Life in Critical Care Working Group has identified the understanding of life support decision making as a research priority [1].

Discomfort with treatment plans may ultimately create conflict among clinicians and between clinicians and families when life support decisions are being made. Investigators have studied conflict about end of life care using both qualitative and quantitative methods. In one qualitative study semistructured interviews with 406 ICU nurses and physicians caring for 102 critically ill patients for whom withholding or withdrawing of life support was being considered identified conflict about the decision to withhold or withdraw treatment for 63% of patients [2]. In a study of recommendations for withdrawing and withholding life support in 2 ICUs Prendergast and Luce [3] found that once discussions had commenced, it took more than 48 h for medical staff to reach consensus on the recommendations for 16% of the patients. In 5% of cases patients and families refused recommendations to limit life support; when families and physicians differed, physicians invariably deferred to the perceived wishes of patients as expressed through their families.

Previous research has yielded valuable information about overt disagreement and conflict about forgoing life support. Studies have not examined covert discomfort with life support plans, experiences of the health care team longitudinally, or independent factors leading to this discomfort. The objective of this study was to examine the incidence and predictors of discomfort among ICU nurses, ICU residents, and physicians about advanced life support plans for mechanically ventilated critically ill patients. To obtain a more comprehensive view of clinician discomfort we studied patients throughout their ICU stay, evaluating the commencement, continuation, withholding and withdrawal of three types of advanced life support: mechanical ventilation, inotropes or vasopressor agents, and dialysis.

Methods

Patients

We prospectively followed consecutive, mechanically ventilated adults expected to be in the ICU for at least 72 h, as reported in a multicenter study of withdrawal of mechanical ventilation [4]. Patient enrollment continued for a minimum of 3 months between May 1995 and September 1998 in closed multidisciplinary university-affiliated ICUs in urban centers (ten in Canada, one in the United States, one in Sweden, and one in Australia); the number of patients per ICU ranged from 21 to 87 (median 50). For patients admitted twice we included only the second ICU admission. At each center institutional review boards approved the protocol and waived the need for informed consent. The study included a total of 657 critically ill patients, 267 (40.6%) of whom were female; ages ranged from 18 to 94 years (mean 60.4±18.0). The mean Acute Physiology and Chronic Health Evaluation (APACHE) II score was 22.2±8.5. ICU primary admitting diagnostic categories were: cardiovascular (19.8%), respiratory (30.9%), central nervous system (13.9%), gastrointestinal (13.7%), sepsis (7.9%), trauma (6.1%), and other diagnoses (7.8%). Patients contributed between 1 and 64 days of data (median 6).

Data collection

Upon ICU admission we recorded age, sex, admitting diagnosis, APACHE II score [5], organ dysfunction (cardiovascular, respiratory, renal, central nervous system, hepatic, and hematological) using the Multiple Organ Dysfunction Score (MODS) [6], preadmission functional status, ability of the patient to participate in decision making as judged by the ICU physician, and the cardiopulmonary resuscitation directive. Daily we documented MODS, ability to participate in decision making, the need for mechanical ventilation, inotropic agents or hemodialysis, and whether cardiopulmonary resuscitation directives were established.

Daily we also recorded the ICU team's plan for three types of life support: mechanical ventilation, inotropes or vasopressor agents, and dialysis. These plans were those generated by the physician-led multidisciplinary ICU team on morning ICU rounds. Although these plans were comprehensive and addressed all aspects of caring for the critically ill, the focus of this report is on these three types of advanced life support. We used five categories to describe the life support options. For mechanical ventilation they were to (a) continue ventilation, (b) wean ventilation in anticipation of improvement, (c) ventilate if necessary, (d) withhold ventilation, or (e) withdraw ventilation in anticipation of death. For inotropes and/or vasopressors the categories were: (a) continue inotropes and/or vasopressors, (b) wean inotropes and/or vasopressors in anticipation of improvement, (c) use inotropes and/or vasopressors if necessary, (d) withhold inotropes and/or vasopressors, or (e) withdraw inotropes and/or vasopressors in anticipation of death. For dialysis the categories were: (a) continue dialysis, (b) wean dialysis in anticipation of improvement, (c) use dialysis if necessary, (d) withhold dialysis, or (e) withdraw dialysis in anticipation of death. Each day on morning rounds three clinicians (the bedside nurse, ICU resident, and attending physician) were asked to record how comfortable they were with the life support plan: (a) basically comfortable, (b) mildly uncomfortable, (c) moderately uncomfortable, or (d) very uncomfortable. We considered uncomfortable to represent options b, c, and d; if clinicians were uncomfortable with the plan (options b, c, or d), we asked whether they thought the plan was too technologically intense If uncomfortable, clinicians stated whether the plan was too technologically intense (the provision of too many life support modalities or the provision of any modality for too long) or not intense enough, and why. We then asked clinicians to record the reason(s) why, based on their judgment alone, they were uncomfortable, using nine possible responses: (a) patient and family over or underestimating survival, (b) patient and family over or underestimating future quality of life, (c) inappropriately prolonging/hastening death, (d) ICU team using/not using resources appropriately, (e) ICU team over or underestimating survival, (f) ICU team over or underestimating future quality of life,

(g) plan inconsistent with patient and family wishes, (h) fear of family complaint, and (i) fear of legal action. Each clinician independently completed data collection forms blinded to data from every other clinician every day throughout the study; thus the information collected was not discussed with the ICU team, patient, or family in this noninterventional study. These data were collected for the duration of the ICU stay; patients were followed until death or ICU discharge.

Statistical analysis

To study the incidence of clinician discomfort with the advanced life support plan we examined both the individual occurrences of discomfort and the number of patients for whom clinicians expressed discomfort at any time during the patient's ICU stay. To evaluate predictors of clinician discomfort with the advanced life support plan we used hierarchical logistic modeling [7, 8]. Hierarchical logistic modeling takes into account repeated measures on the same patients, and considers the clustering of patients within centers. The dependent variable was any clinician discomfort with the advanced life support plan because the life support plan was too intense vs. no discomfort with the life support plan. Each patient contributed a different number of observations to the analysis, reflecting the duration of their ICU stay.

The independent variables were classified in four categories. The first category included baseline patient factors (age, sex, medical vs. surgical status, APACHE II score, MODS, prior functional status, and ability to participate in decision making). The second category included daily illness severity and treatment factors from the previous day [MODS, ability to participate, advanced life support (dialysis, inotropic agents, mechanical ventilation)], whether the plan that day was to withhold or withdraw any type of life support, whether there was a do-not-resuscitate directive in place, and whether the patient had been in the ICU for more than 1 week. The third category included clinician factors (bedside nurse, resident, physician), and the fourth category was geographic (city).

We analyzed each independent variable univariately. All variables with a p value less than 0.10 were considered for multivariable regression. We included factors from all four categories into one final model using a backward step-wise approach to determine which variables were independently predictive of clinician discomfort. We present the odds ratios, 95% confidence intervals (CIs) and the corresponding p values. We used the SAS® macro GLIMMIX to fit the hierarchical models [9].

Results

Of 16,354 responses from ICU clinicians (representing 97.8% of all possible patient-days of observation), 1,322 (8.1%) indicated some discomfort with the life support plan. Discomfort occurred most often during the first week of a patient's ICU stay (Fig. 1). Despite this high level of overall comfort (91.9% of responses) at least one ICU clinician was at some time during the patient's admission uncomfortable with the plan for 283 (43.1%) patients. When discomfort occurred, it was reported most often by bedside nurses (n=551, 41.7%), followed by physicians (n=459, 34.7%) and residents (n=312, 23.6%). The hospital mortality of patients for whom no clinician or one, two, or three clinicians experienced discomfort on the same day was 130 of 368 (35.3%), 103 of 185 (55.7%), 57 of 76 (75.0%), and 16 of 19 (84.2%), respectively.

Table 1 presents clinical characteristics for patients with and without clinician discomfort regarding their life support plan. Clinicians were more likely to express discomfort about older patients, medical patients with more severe illness, and patients with worse prior functional status. These patients also had a significantly longer length of ICU stay, required more life support, more often had life support withdrawn, and had higher ICU and hospital mortality.

Clinician discomfort with the life support plan occurred much more often when the plan was too intense than when the plan was not intense enough (1,241/1,322, 93.9%, vs. 81/1,294, 6.1%, p<0.001). Figure 2 presents the reasons for discomfort with the life support plan when it was considered too intense. These reasons included perceptions that the patient and family were overestimating the patient's chance for survival (637, 51.7%), the patient and family were overestimating the patient's future quality of life (564, 45.8%), that life support was inappropriately prolonging the dying process (438,

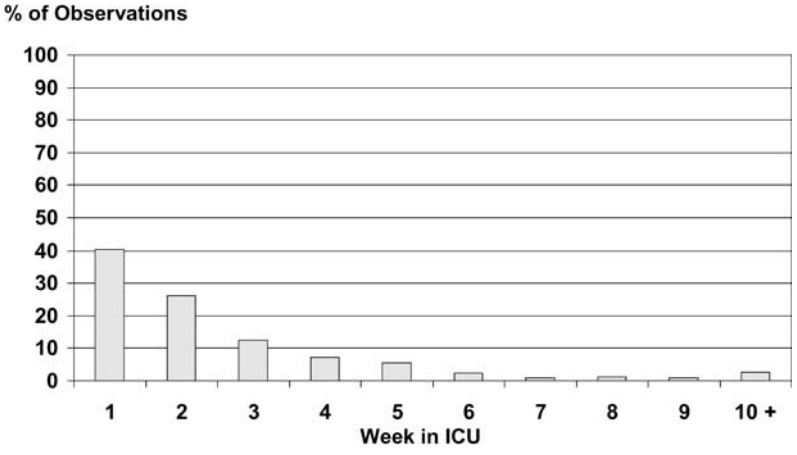

Fig. 1 The timing of clinician discomfort with advanced life support plans over the course of the ICU stay

Table 1 Clinical characteristics of 657 mechanically ventilated patients included in this study admitted to 13 ICUs in Canada, United States, Australia, and Sweden (*APACHE II* Acute Physiology and Chronic Health Evaluation II, *LOS* length of stay, *IQR* interquartile range)

Patient characteristics	Patients for whom there was never clinician discomfort (*n*=374)	Patients for whom there was clinician discomfort (*n*=283)	*p*
Age (years)	58.9±18.3	62.3±17.3	0.02
Sex: female	142 (38.0%)	125 (44.2%)	0.11
ICU admission status: medical	268 (71.7%)	235 (83.0%)	0.0006
APACHE II score	20.8±8.6	24.2±8.1	<0.0001
Prior functional status			0.02
Good	241 (64.4%)	150 (53.0%)	
Moderate	76 (20.3%)	73 (25.8%)	
Poor	32 (8.6%)	39 (13.8%)	
Unknown	25 (6.7%)	21 (7.4%)	
Able to participate in decisions	85 (23.4%)	52 (18.9%)	0.18
Life support at ICU admission			
Dialysis	20, 5.4%	26, 9.2%	0.06
Mechanical ventilation	374, 100%	283, 100%	–
Inotrope or vasopressor agents	146, 39.0%	131, 46.3%	0.06
ICU LOS: range/median (IQR)	1–66/6 (4–10)	1–101/11 (6–18)	<0.0001
ICU mortality	104 (27.8%)	151 (53.4%)	<0.0001
Hospital mortality	130 (35.3%)	176 (62.9%)	<0.0001
Ever requiring life support during ICU admission			
Dialysis	42 (11.2%)	55 (19.4%)	0.003
Mechanical ventilation	374 (100%)	283 (100%)	–
Inotrope or vasopressor agents	185 (49.5%)	186 (65.7%)	<0.0001
Life support withdrawn			
Dialysis	2 (4.8%)	14 (25.5%)	0.007
Mechanical ventilation	36 (9.7%)	62 (21.9%)	<0.0001
Inotrope or vasopressor agents	19 (10.3%)	32 (17.2%)	0.07

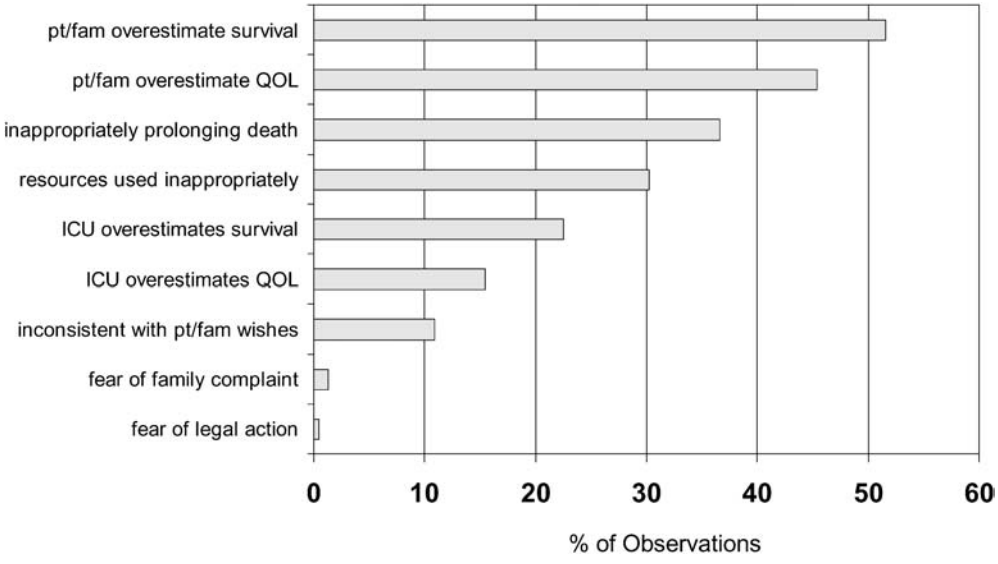

Fig. 2 The reasons for discomfort with advanced life support plans because the plans were too technologically intense. Clinicians could endorse more than one reason. *pt* Patient; *fam* family; *QOL* quality of life; *ICU* intensive care unit

35.6%), and that resources were being used inappropriately (373, 30.3%).

Factors associated with discomfort when the life support plan was too intense are presented in Table 2. In the multivariable analysis we found that clinicians were more likely to be uncomfortable because the plan was too intense for older patients [odds ratio (OR) 1.16, 95% CI 1.04–1.29 for each 10-year interval), medical patients (OR 2.39, 1.51–3.78), seriously ill patients (OR 1.26, 1.13–1.41 for each 5 point APACHE II score interval), and for patients with poor prior functional status (3.36, 1.92–5.89 compared to good functional status). Considering factors measured daily in the ICU, patients with worse organ dysfunction (OR 1.64, 1.33–2.03 for each 5-point MODS interval), patients requiring dialysis (OR 2.53, 1.73–3.71) or for whom there was a plan to withhold dialysis (OR 2.04, 1.58–2.62) and patients during the first week of their ICU stay (1.81, 1.46–2.25) were more likely

Table 2 Factors associated with clinician discomfort when the advanced life support plan was too technologically intense: results of the univariable and multivariable hierarchical logistic regression analysis. Each factor associated with clinician discomfort regarding the advanced life support plan being too intense is represented by its estimated odds ratio, 95% confidence interval, and *p* value. Cities are alphabetized to retain anonymity (*OR* odds ratio, *APACHE II* Acute Physiology and Chronic Health Evaluation II, *MODS* Multiple Organ Dysfunction Score, *CNS* central nervous system, *DNR* do-not-resuscitate, *Ino/vaso* intrope or vasopressor agents)

	Univariable analysis		Multivariable analysis	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Baseline factors				
Age (10 years)	1.20 (1.08–1.33)	0.0005	1.16 (1.04–1.29)	0.006
Sex (female vs. male)	1.33 (0.92–1.93)	0.12	–	–
Admission (medical vs. surgical)	2.41 (1.52–3.82)	0.0002	2.39 (1.51–3.78)	0.0002
APACHE II score (5 points)	1.44 (1.30–1.60)	<0.0001	1.26 (1.13–1.41)	<0.0001
Prior functional status		<0.0001		0.0001
Poor vs. good	3.47 (1.96–6.16)		3.36 (1.92–5.89)	
Moderate vs. good	2.20 (1.43–3.38)		1.72 (1.12–2.66)	
Unknown vs. good	1.95 (0.93–4.10)		1.82 (0.86–3.85)	
Unable to participate	1.61 (1.01–2.56)	0.04	–	0.20
MODS (5 points)	1.28 (1.04–1.59)	0.02	–	0.80
Illness Severity factors				
Daily MODS (5 points)	1.73 (1.43–2.10)	<0.0001	1.64 (1.33–2.03)	<0.0001
Unable to participate	0.73 (0.55–0.95)	0.02	–	0.51
Life support used				
Dialysis	3.39 (2.34–4.91)	<0.0001	2.53 (1.73–3.71)	<0.0001
Mechanical ventilation	1.29 (0.90–1.85)	0.16	–	–
Ino/vaso agents	1.36 (1.07–1.71)	0.01	–	0.21
Life support plans				
Withdraw dialysis	0.60 (0.04–8.47)	0.71	–	–
Withhold dialysis	2.23 (1.75–2.83)	<0.0001	2.04 (1.58–2.62)	<0.0001
Withdraw mechanical ventilation	0.65 (0.26–1.67)	0.38	–	–
Withhold mechanical ventilation	0.40 (0.15–1.10)	0.08	0.24 (0.09–0.67)	0.006
Withdraw ino/vaso agents	0.91 (0.29–2.86)	0.87	–	–
Withhold ino/vaso agents	1.56 (1.08–2.26)	0.02	–	0.81
DNR directive	1.17 (0.78–1.73)	0.45	–	–
Time (1 week vs. >1 wk)	1.76 (1.43–2.17)	<0.0001	1.81 (1.46–2.25)	<0.0001
Clinician factors		<0.0001		<0.0001
Nurse vs. resident	1.98 (1.81–2.16)		1.97 (1.81–2.16)	
Physician vs. resident	1.65 (1.51–1.80)		1.66 (1.52–1.81)	
Geographical factors				
City (vs. A)		0.02		0.0006
B	0.47 (0.12–1.92)		0.40 (0.13–1.20)	
C	0.62 (0.18–2.10)		0.53 (0.22–1.30)	
D	0.42 (0.12–1.42)		0.61 (0.26–1.45)	
E	0.54 (0.18–1.61)		0.79 (0.35–1.76)	
F	0.93 (0.32–2.66)		0.97 (0.46–2.07)	
G	0.90 (0.33–2.47)		1.00 (0.47–2.12)	
H	3.70 (1.09–12.56)		2.90 (1.24–6.74)	

to generate clinician discomfort. In contrast, for those mechanically ventilated patients who were subsequently extubated, the plan to withhold future mechanical ventilation predicted comfort with the life support plan (OR 0.24, 0.09–0.67). The odds ratio less than 1 indicates that clinicians were less uncomfortable when there was a plan to forgo reintubation and ventilation of extubated patients. Bedside nurses were more likely than physicians, who were more likely than residents to express discomfort with the life support plan. We also found over a sevenfold difference among cities in the extent to which clinicians experienced discomfort with the life support plan (odds ratio of 2.9 divided by odds ratio of 0.4=7.25).

Discussion

This longitudinal multicenter observational study of mechanically ventilated patients found that at least one clinician was uncomfortable with the life support plan for almost half of the patients at some point during their ICU stay. Of the 16,354 responses, 1,322 (8.1%) indicated discomfort with the life support plan. Discomfort was much more likely when the plan was perceived as too intense than when the plan was not intense enough. The main reasons for clinician discomfort because the life support plan was too intense included patient and family's overestimation of the probability of survival and future quality of life, and perceptions that the ICU team was inappropriately prolonging the dying process. The fact that almost 40% of patients about whom clinicians had discomfort survived to hospital discharge illustrates how factors other than clinician discomfort determine decisions to withdraw life support and underscores how end of life decisions should not be made hastily by a solitary physician. Discomfort arose more often due to the perception that the ICU team overestimated the patient's chance of survival or future quality of life than due to the

perception that the ICU team underestimated the patient's chance of survival or future quality of life.

Decision making in the context of acute renal failure in these mechanically ventilated patients was strongly associated with clinician discomfort, as manifest both by plans to either administer dialysis (odds ratio of 2.5) or to withhold dialysis (odds ratio of 2.0). This might reflect clinician appreciation of the substantial increase in mortality for ICU patients who develop acute renal failure [10]. On the other hand, for patients who were mechanically ventilated but were then extubated a subsequent decision to withhold further mechanical ventilation was associated with substantially less clinician discomfort (odds ratio of 0.2). For these patients in the absence of an easily reversible process such a decision may reflect the reality that reinstitution of mechanical ventilation can prolong the dying process, particularly for patients with severe chronic illness predating their hospital admission.

Differences in physician characteristics, such as age [11], subspecialty [12], and practice style (interventionalist vs. noninterventionalist) [13] can influence physician preferences and thus plans for administering, withholding and withdrawing life support. Physicians and nurses may also have differing views of these plans. We found that nurses were more likely to experience discomfort than attending physicians, who were more likely to experience discomfort than residents. Disagreement among clinicians is underscored by one study in which conflict was identified between physicians and nurses for 48% of the patients undergoing withdrawal or withholding of life support; in addition, there was conflict between the ICU team and families in 48% of instances [2]. A survey of French ICU nurses and physicians found that physicians were significantly more often satisfied than nurses with decisions to forgo life-sustaining treatment [14]. In a survey of nurses in the United States Asch et al. [15] identified considerable discomfort among ICU nurses with life sustaining treatment, which in extreme cases was reported to lead to euthanasia. Discrepant attitudes regarding a sense of team work among ICU nurses and physicians indicate that nurses often find it is difficult to express their views, and that better communication skills and conflict resolution are needed within the ICU team [16].

In contrast, in a Canadian survey residents, nurses, and physicians reported no significant differences in recommendations to withdraw life support [17]. However, residents have previously reported lack of experience and lack of confidence with the process of withdrawing life support during their ICU rotation [18]. This lack of familiarity with life support technology may explain why in the current study we found that residents were less likely to express discomfort with the life support plans than the more experienced nurses and physicians. These results underscore the importance of effective communication, sharing of experiences, and formal training among members of the ICU team [19]. For example, physician on-call rotas and nursing assignments can jeopardize the continuity of care and make consensus development about appropriate treatment plans challenging.

A unique feature of this study is our description of clinician discomfort with advanced life support plans for critically ill patients as they evolve over the ICU stay. This longitudinal perspective allowed for evaluation of both baseline and time-dependent factors as predictors of discomfort. These factors can help to identify patients for whom there is a high risk of clinician discomfort or disagreement with the care plan. In practice, discomfort with a life support plan may reflect uncertainty or discordance among the ICU team, which could trigger useful dialogue among ICU team members regarding the goals of intensive care, cardiopulmonary resuscitation preferences and initiatives to confirm or modify the life support plan. Other strengths of this study include our use of logistic hierarchical modeling that resulted in conservative significance testing, taking into account hierarchies and correlations within the dataset. The large sample size allowed analysis of the relationship between discomfort with the treatment plan and patient, clinician, and geographical factors. We enrolled a heterogeneous, critically ill population, 39% of whom died, but over one-half of whom were eventually weaned from mechanical ventilation. Thus we did not exclusively focus on conflict regarding technology for dying patients.

This study is limited in that we used quantitative methods to record clinician discomfort rather than qualitative methods to understand perceptions and experiences. Our data are likely generalizable to other closed university-affiliated ICUs but may not reflect practice in open ICUs, nonteaching institutions or communities within different health care systems. This study was not designed to analyze differences between countries, although we found higher levels of discomfort in some cities than others, possibly reflecting differences in medical and social culture, health care systems, and propensity to litigate. Geographical differences both within and among countries have been demonstrated in end-of-life practices such as cardiopulmonary resuscitation directives [20, 21] and withdrawal of life support [17, 22] even between countries with similar health care systems [23]. By focusing on disagreement, discordance, and discomfort on the ICU team we did not interview family members, whose views are obviously also important.

Interventions to address the impact of end of life disagreements are now emerging. For example, in a randomized controlled trial in which patients were allocated to ethics consultations vs. usual management Schneiderman et al. [24] reported a shorter duration of ventilation and ICU stay for those receiving the ethics consultation; 87% of the physicians involved in the study indicated they would seek ethics consultation when treatment conflict arose in the future. Others have suggested methods to resolve end-of-life decisional conflict, including having

consistent and open lines of communication with the patient and among staff, maintaining continuity of care, and remaining compassionate and flexible [25, 26]. A qualitative study of decision making involving 15 critically ill patients and their families highlighted the centrality of patient wishes as a platform for consensus building about withdrawing or withholding life support [16].

We found that clinicians often experience discomfort about life support plans for mechanically ventilated patients. Such discomfort should prompt discussion among the ICU team members, and with patients and their families; this dialogue may result in either affirmation or appropriate changes to management plans. We also found over a sevenfold variability in the odds of discomfort across cities. Examining differences between ICUs with high and low levels of discomfort may provide insights into the best ways of avoiding unproductive discordance about advanced life support. Labeling, understanding and resolving discomfort among clinicians has the potential to encourage more appropriate, compassionate, and harmonious care for critically ill patients.

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References

1. Rubenfeld GD, Curtis JR, for the End-of-Life Care in the ICU Working Group (2001) End-of-life care in the intensive care unit: a research agenda. Crit Care Med 29:2001–2006
2. Breen CM, Abernethy AP, Abbott KH, Tulsky JA (2001) Conflict associated with decisions to limit life-sustaining treatment in intensive care units. J Gen Intern Med 16:283–289
3. 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
4. Cook DJ, Rocker G, Marshall J, Sjokvist P, Dodek P, Griffith L, Freitag A, Varon J, Bradley C, Levy M, Finfer S, Hamielec C, McMullin J, Weaver B, Walter S, Guyatt GH, for the Level of Care Study Investigators and the Canadian Critical Care Trials Group (2003) Withdrawal of mechanical ventilation in anticipation of death in the intensive care unit. N Engl J Med 349:1123–1132
5. Knaus WA, Draper EA, Wagner DP, Zimmerman JE (1985) APACHE II: a severity of disease classification system. Crit Care Med 13:818–825
6. Marshall JC, Cook DJ, Christou NV, Bernard GR, Sprung CL, Sibbald WJ (1995) The Multiple organ Dysfunction (MOD) score: a reliable descriptor of a complex clinical outcome. Crit Care Med 23:1638–1652
7. Goldstein H (2003) Multilevel statistical models, 3rd edn. Hodder Arnold. London
8. Singer JD (1998) Using SAS PROC MIXED to fix multilevel models, hierarchical models, and individual growth models. J Educ Behav Stat 24:323–355
9. Wolfinger R, O'Connell M (1993) Generalized linear mixed models: a pseudo-likelihood approach. J Stat Comput Simul 48:233–243
10. Guerin C, Raphaele G, Selli J, Perdrix J, Ayzac L, for the Rhone-Alps Area Study Group on Acute Renal Failure (2000) Initial versus delayed acute renal failure in the intensive care unit. Am J Respir Crit Care Med 161:872–879
11. Asch DA, Christakis NA (1996) Why do physicians prefer to withdraw some form of life support over others? Intrinsic attributes of life-sustaining treatments are associated with physicians' preferences. Med Care 34:103–111
12. Christakis NA, Asch DA (1995) Medical specialists prefer to withdraw familiar technologies when discontinuing life support. J Gen Intern Med 10:491–494
13. Elstein AS, Christensen C, Cottrell JJ, Polson A, Ng M (1999) Effects of prognosis, perceived benefit, and decision style on decision making and critical care on decision making in critical care. Crit Care Med 27:58–65
14. Ferrand E, Lemaire F, Regnier B, Kuteifan K, Badet M, Asfar P, Jaber S, Chagnon JL, Renault A, Robert R, Pochard F, Herve C, Brun-Buisson C, Duraldestin P for the French RESSENTI Group (2003) Discrepancies between perceptions by physicians and nursing staff of intensive care unit end of life decisions. Am J Respir Crit Care Med 167:1310–1315
15. Asch DA (1996) The role of critical care nurses in euthanasia and assisted suicide. N Engl J Med 334:1374–1379
16. Miller D, Coe RM, Hyers TM (1992) Achieving consensus on withdrawing or withholding care for critically ill patients. J Gen Intern Med 7:475–480

17. Cook DJ, Guyatt GH, Jaeschke R, Reeve J, Spanier A, King D, Molloy DW, Willan A, Streiner D, for the Canadian Critical Care Trials Group (1995) Determinants in Canadian health care workers of the decision to withdraw life support from the critically ill. JAMA 273:703–708
18. Stevens L, Cook D, Guyatt G, Griffith L, Walter S, McMullin J (2002) Education, ethics, and end-of-life decisions in the intensive care unit. Crit Care Med 30:290–296
19. Danis M, Federman D, Fins JJ, Fox E, Kasterbaum B, Lanken PN, Long K, Lowenstein E, Lynn J, Rouse F, Tulsky J (1999) Incorporating palliative care into critical care education: principles, challenges, and opportunities. Crit Care Med 27:2068–2069
20. Cook DJ, Guyatt G, Rocker G, Sjokvist P, Weaver B, Dodek P, Marshall J, Leasa D, Levy M, Varon J, Fisher M, Cook R, for the Canadian Critical Care Trials group (2001) Cardiopulmonary resuscitation directives on admission to intensive care unit: an international observational study. Lancet 358:1941–1945
21. Mello M, Jenkinson C (1998) Comparison of medical and nursing attitudes to resuscitation and patient autonomy between a British and American teaching hospital. Soc Sci Med 46:415–424
22. Vincent JL (1999) Forgoing life support in western European intensive care units: the results of an ethical questionnaire. Crit Care Med 27:1626–1633
23. Sjokvist P, Cook DJ, Berggren L, Guyatt G (1998) A cross-cultural comparison of attitudes toward life support limitation in Sweden and Canada. Clin Intensive Care 9:81–85
24. Schneiderman LJ, Gilmer T, Teetzel HD (2000) Impact of ethics consultations in the intensive care setting: a randomized, controlled trial. Crit Care Med 28:3920–3924
25. Prendergast TJ (1997) Resolving conflicts surrounding end-of-life care. New Horiz 5:62–71
26. Edwards BS (1993) When the physician won't give up. Am J Nurs 93:34–37