The Sequence of Withdrawing Life-Sustaining Treatment from Patients

David A. Asch, MD, MBA, Kathy Faber-Langendoen, MD, Judy A. Shea, PhD,
Nicholas A. Christakis, MD, MPH, PhD

PURPOSE: To describe the observed sequence of withdrawal of eight different forms of life-sustaining treatment and to determine whether aspects of those treatments determine the order of withdrawal.

SUBJECTS AND METHODS: We observed 211 consecutive patients dying in four midwestern US hospitals from whom at least one of eight specific life-sustaining treatments was or could have been withdrawn. We used a parametric statistical technique to explain the order of withdrawal based on selected characteristics of the forms of life support, including cost, scarcity, and discomfort.

RESULTS: The eight forms of life support were withdrawn in a distinct sequence. From earliest to latest, the order was blood products, hemodialysis, vasopressors, mechanical ventilation, total parenteral nutrition, antibiotics, intravenous fluids, and tube feedings ($P < 0.0001$). The sequence was almost identical to that observed in a previous study based on hypothetical scenarios. Forms of life support that were perceived as more artificial, scarce, or expensive were withdrawn earlier.

CONCLUSION: The preference for withdrawing some forms of life-sustaining treatments more than others is associated with intrinsic characteristics of these treatments. Once the decision has been made to forgo life-sustaining treatment, the process remains complex and appears to target many different goals simultaneously. **Am J Med. 1999;107:153–156.** ©1999 by Excerpta Medica, Inc.

There is an established ethical consensus that patients may forgo unwanted life-sustaining treatments (1–5). Although physicians generally accept these choices (6–14), empiric evidence suggests that attitudes and practices vary substantially among physicians. This variation may be explained by differences in physicians' experience (6,9,15), specialty (12,15,16) preferences for risk (11), religion (15), or other biases in the way they make decisions (10).

Most patients who require one form of life-sustaining treatment also require others. For this reason, a decision to withhold or withdraw life support typically involves decisions about several interventions. Rather than forgo all forms of life support at once, physicians often withdraw or withhold life support in sequence, or forgo some forms of life support while retaining others (17,18). For example, we previously found that among a cohort of patients who died in midwestern hospitals, 84% of the deaths were preceded by decisions to withdraw or withhold some form of life-sustaining treatment. Patients had an average of almost four potentially life-sustaining interventions forgone before death, often at different times (19).

Other studies also show that some physicians have strong preferences about which forms of life support to withdraw, preferring to withdraw those required because of an underlying disease rather than an iatrogenic complication, regardless of the form of life support involved (10). However, preferences also appear to be related to characteristics of the forms of life support, for example, their scarcity, invasiveness, or expense (20). In general, physicians prefer to withdraw blood products and prefer not to withdraw intravenous fluids. These preferences are in part associated with the perceived scarcity of blood products. Finally, physicians have a relative preference for withdrawing forms of life support associated with their subspecialty (16). However, these studies of physician preference were based on the responses of internists to hypothetical situations. They did not reflect actual clinical decisions. In the current study, we observed the sequence of the withdrawal of life-sustaining treatments among our cohort of patients dying in hospitals and compared it with the sequence predicted by earlier work using hypothetical situations.

Table 1. Observed Sequence of Withdrawing Eight Forms of Life Support in 211 Patients

Form of Life Support	Number Receiving Treatment (%)	Rank	Odds Ratio (95% confidence interval*)	Rank from Study of Hypothetical Scenarios[†]
Blood products	32 (15%)	1	14 (2.8–70)	1
Hemodialysis	18 (9%)	2	3.0 (1.1–7.9)	2
Vasopressors	60 (28%)	3	2.1 (1.0–4.6)	3
Mechanical ventilation	30 (14%)	4	2.0 (0.9–4.5)	7
Total parenteral nutrition	33 (16%)	5	1.4 (0.6–3.5)	4
Antibiotics	140 (66%)	6	reference	5
Intravenous fluids	156 (74%)	7	0.5 (0.3–1.0)	8
Tube feedings	28 (13%)	8	0.2 (0.1–0.6)	6

* Confidence intervals that include 1.0 imply that there was not a statistically significant difference between the preference for the withdrawal of a form of life support and the preference for the withdrawal of antibiotics, the reference category.
[†] Based on reference 20.

METHODS

Patients

A university and a community hospital in Minnesota and a university and a community hospital in Missouri were selected to provide diversity of reimbursement, socioeconomic and political settings, physician characteristics, and cultural background. Patients were recruited sequentially (19). The charts of all acute-care patients dying in these institutions during the study period were reviewed by one author (KF-L) and a research assistant. The study period for the university hospital in Minnesota was May 1 to June 30, 1989, during which time there were 73 deaths. The study period for the other hospitals was from June 30, 1992, until 75 deaths occurred at each institution. Of the 298 requested charts, 291 (98%) were available for review. Of these, 17 patients were admitted directly to hospice or extended care beds and were excluded; 229 of the remaining 274 patients died after a decision to forgo life-sustaining treatment.

Nursing and physician chart notes, order sheets, medication records, and ventilator flow charts were reviewed to determine the time at which each decision to forgo treatment was made. Ties were allowed. To make our observations comparable with those collected in the studies using hypothetical situations, we considered only decisions to withdraw eight potentially life-sustaining treatments (Table 1) and restricted the sample to the 211 patients who were receiving one or more of those treatments, and thus could have had a treatment withdrawn. For each patient, each form of life support could have been withdrawn, continued until death, or not received; those that were withdrawn were ranked in the order of withdrawal. Forms of life support that were continued until death were ranked at the end of the list. Those that were not received were considered as missing data.

Attributes of Forms of Life Support

We developed a list of 13 attributes that could characterize the forms of life support, such as "cost," "pain upon withdrawal," "scarcity," and "invasiveness." Using the responses of an expert panel composed of 23 critical care physicians, we developed numerical ratings for each form of life support using a 1 to 10 scale for each of the 13 attributes, anchoring the form of life support scoring highest at 10 and the form of life support scoring lowest at 1 (20). For example, critical care physicians who believed that a certain form of life support was the most painful to withdraw were asked to rate that form of life support as a 10 for the attribute "pain on withdrawal."

Statistical Analysis

We analyzed the rank-ordered data using a parametric statistical model, called the "exploded logit model," developed for this purpose (21). When subjects rank items, they provide more information about their preferences than when they select the most preferred item, including information about many possible pairwise comparisons. The method can identify determinants of the rankings, as well as odds ratios (with 95% confidence intervals) for preferring to withdraw one form of life support compared with a reference category. Using this technique, we examined the observed sequence of withdrawal for the eight forms of life support, and we compared that sequence with the one based on hypothetical cases (20). We then incorporated the attribute ratings into the model to determine whether the characteristics of the forms of life support were associated with the observed sequence of withdrawal. Statistical analyses were performed using SAS version 6.11.

RESULTS

Of the 211 patients, the most common diagnoses were cancer, cardiovascular disease, and sepsis (Table 2). Most

Table 2. Characteristics of the 211 Patients

Characteristic	Number (percent) or Mean ± SD
Age (years)	66 ± 23
Female sex	101 (48%)
Race*	
African-American	45 (28%)
Caucasian	115 (71%)
Native-American	1 (1%)
Length of stay (days)	18 ± 22
Primary diagnosis	
Cancer	49 (23%)
Cardiovascular disease	50 (24%)
Sepsis	43 (19%)
Gastrointestinal disease	19 (9%)
AIDS	8 (4%)
Other	43 (20%)
Number of life-sustaining therapies	
1	55 (26%)
2	68 (32%)
3	60 (28%)
4	18 (9%)
5	7 (3%)
6	2 (1%)
7	1 (<1%)

* Data are missing for 50 patients from one hospital that did not characterize patients by race.

patients (74%) were receiving more than one life-sustaining treatment.

The rank order for the observed sequence of withdrawing the eight forms of life support was very similar to those found using hypothetical questions (Table 1), except that mechanical ventilation moved from number 7 to number 4 in rank, and intravenous fluids and tube feedings reversed their order. The odds ratios permit an assessment of the magnitude of physician preferences among the items. The odds of withdrawing hemodialysis before antibiotics, for example, was about twice as great as the odds of withdrawing total parenteral nutrition before antibiotics and six times as great as the odds of withdrawing intravenous fluids before antibiotics. For the entire rank list, there was strong evidence ($P < 0.0001$) suggesting that the observed sequence was nonrandom.

We examined the associations between each of the 13 attributes of a form of life support with the sequence of withdrawing the eight forms of life support (Table 3). In general, each of the attributes was associated with earlier withdrawal. For example, the more "artificial" a form of life support was thought to be, the more likely it was to be withdrawn from patients; each one-point increase (on a 1 to 10 scale) in this characteristic increased by 30% the odds that the form of life support would be withdrawn. The sequence of withdrawal did not appear to be influenced by whether a form of life support was uncomfort-

able when withdrawn or required continuous administration.

DISCUSSION

These results identify a distinct and consistent sequence for the withdrawal of various forms of life support. Moreover, the observed sequence was remarkably similar to that based on asking internists hypothetical questions. If the withdrawal of life-sustaining treatment signals a major shift in therapeutic goals, for example, from cure or prolonging life to concern for comfort or acceptance of death, one might expect that life-sustaining treatments would be withdrawn simultaneously. In contrast, the observed stepwise retreat reveals a complexity of decision making. This complexity may have been influenced by patient, surrogate, or physician ambivalence, or the desire to affect the time of death. Moreover, our results suggest that even when decisions to withdraw life support have been made, the process reflects other moral, social, and clinical goals, including a desire to withdraw forms of treatment that physicians perceive as expensive, scarce, or artificial.

This study has several limitations. First, although our goal was to evaluate the sequence of withdrawing life-sustaining treatment in clinical settings, no patient received all eight forms of life support, and most received only two or three. Thus 95% confidence intervals for the odds ratios of adjacent and near-adjacent forms of life support often overlap, either because of missing data for

Table 3. Association between Attributes of a Therapy and Likelihood of Its Withdrawal

Attribute	Odds Ratio*	95% Confidence Interval†
Artificial	1.3	1.2–1.5
Causes death rapidly when withdrawn	1.2	1.1–1.3
Causes patient discomfort	1.1	1.0–1.2
Emotionally taxing for patients	1.2	1.1–1.3
Expensive	1.3	1.1–1.4
High technology	1.2	1.1–1.3
Invasive	1.2	1.1–1.3
Requires an active intervention to withdraw	1.2	1.1–1.4
Requires an intensive care unit	1.1	1.1–1.2
Requires continuous administration	1.0	0.9–1.1
Scarce	1.3	1.2–1.5
Uncomfortable when withdrawn	1.1	1.0–1.2
Unnatural	1.4	1.2–1.6

* Odds ratio that a therapy will be withdrawn per unit increase in the attribute (on a 1 to 10 scale).
† Confidence intervals that include 1.0 are not significant at the 0.05 level.

some comparisons or because effect sizes were similar. Multivariable models designed to control for effects of several attributes produced unstable parameter estimates, most likely because of sparse data. Second, the patients in this study were drawn from four university and community hospitals in Minnesota and Missouri. and the practice patterns we observed may not apply elsewhere. Third, we observed only activities related to withdrawing life support. Thus, the ranking we observed (Table 1) differs from that when decisions to withhold life-sustaining treatment are included (19). Such differences suggest that decisions to withhold or to withdraw life-sustaining treatments are not made the same way, although they may target similar goals.

These findings provide a compelling reminder of the complexity of end-of-life decisions. The care that dying patients receive in US hospitals has come under harsh criticism. One way to interpret our results is to see them as providing additional evidence that nonclinical and potentially irrelevant factors influence decisions at the end of life. An alternative interpretation is that the results of this study reflect the multiple goals that clinicians and patients apparently target simultaneously at the end of life.

REFERENCES

1. President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research. *Deciding to Forego Life-Sustaining Treatment: Ethical, Medical, and Legal Issues in Treatment Decisions.* Washington, DC: US Government Printing Office, 1983.
2. The Hastings Center. *Guidelines on the Termination of Life-Sustaining Treatment and the Care of the Dying.* Bloomington, IN: Indiana University Press, 1987.
3. *Current Opinions of the Council on Ethical and Judicial Affairs of the American Medical Association: Withholding or Withdrawing Life-Prolonging Treatment.* Chicago, IL: American Medical Association, 1992.
4. American Thoracic Society Bioethics Task Force. Withholding and withdrawing life-sustaining therapy. *Am Rev Respir Dis.* 1991;144:726–731.
5. American College of Physicians. American College of Physicians Ethics Manual, part 2: the physician and society; research; life-sustaining treatment; other issues. *Ann Intern Med.* 1989;111:327–335.
6. Pearlman RA, Inui TS, Carter WB. Variability in physician bioethical decision making. *Ann Intern Med.* 1982;97:420–425.
7. Von Preyss-Friedman SM, Uhlmann RF, Cain KC. Physicians' attitudes toward tube feeding chronically ill nursing home patients. *J Gen Intern Med.* 1992;7:46–51.
8. Fried TR, Stein MD, O'Sullivan PS, Brock DW, Novack DH. Limits of patient autonomy. Physician attitudes and practices regarding life-sustaining treatments and euthanasia. *Arch Intern Med.* 1993;153:722–728.
9. Caralis PV, Hammond JS. Attitudes of medical students, house-staff, and faculty physicians toward euthanasia and termination of life-sustaining treatment. *Crit Care Med.* 1992;20:683–690.
10. Christakis NA, Asch DA. Biases in how physicians choose to withdraw life support. *Lancet.* 1993;342:642–646.
11. Nightingale SD, Grant M. Risk preference and decision making in critical care situations. *Chest.* 1988;93:684–687.
12. Solomon MZ, O'Donnell L, Jennings B, et al. Decisions near the end of life: professional views on life-sustaining treatments. *Am J Public Health.* 1993;83:14–23.
13. The Society of Critical Care Medicine Ethics Committee. Attitudes of critical care medicine professionals concerning forgoing life-sustaining treatments. *Crit Care Med.* 1992;20:320–326.
14. Asch DA, Hansen-Flaschen J, Lanken PN. 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 Resp and Crit Care Med.* 1995;151:288–292.
15. Christakis NA, Asch DA. Physician characteristics associated with decisions to withdraw life support. *Am J Pub Health.* 1995;85:367–372.
16. Christakis NA, Asch DA. Medical specialists prefer to withdraw familiar technologies when discontinuing life support. *J Gen Intern Med.* 1995;10:491–494.
17. Smedira NG, Evans BH, Grais LS, et al. Withholding and withdrawal of life support from the critically ill. *N Engl J Med.* 1990;322:309–315.
18. Faber-Langendoen K, Bartels DM. Process of forgoing life-sustaining treatment in a university hospital: an empirical study. *Crit Care Med.* 1992;20:570–577.
19. Faber-Langendoen K. A multi-institutional study of care given to patients dying in hospitals. Ethical and practice implications. *Arch Intern Med.* 1996;156:2130–2136.
20. Asch DA, Christakis NA. Why do physicians prefer to withdraw some forms of life support over others? Intrinsic attributes of life-sustaining treatments are associated with physicians' preferences. *Med Care.* 1996;34:103–111.
21. Allison PD, Christakis NA. Logit models for sets of ranked items. *Sociol Method.* 1994;24:199–228.