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Why Do Physicians Prefer to Withdraw Some Forms of Life Support over Others?

Intrinsic Attributes of Life-Sustaining Treatments Are Associated with Physicians' Preferences

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Some physicians caring for critically ill patients have preferences for withdrawing some forms of life support over others, even after the decision to withdraw life support has already been made. Past research has attempted to explain these preferences by variations in clinical circumstances. The authors wondered whether differences in the forms of life support themselves might be important, and whether these differences would reveal implicit goals that physicians attempt to achieve. Four hundred fifty-six university-affiliated internists were surveyed and their rank-ordered preferences for withdrawing eight different forms of life support were assessed. The authors then sought to explain these preferences on the basis of intrinsic characteristics of the eight forms of life support determined by an expert panel of critical care physicians. In general, the physicians studied prefer to withdraw forms of life support that are scarce, expensive, invasive, artificial, unnatural, emotionally taxing, high technology, and rapidly fatal when withdrawn. They prefer not to withdraw forms of therapy that require continuous rather than intermittent administration, and forms of therapy that cause pain when withdrawn. Even when a decision has been made to withdraw life-sustaining treatment from a patient, many physicians have preferences for the manner in which this is accomplished. These preferences may reflect perceived intrinsic characteristics of different forms of life support that are consistent across physicians. Key words: critical care; decision making; life support care; ethics; euthanasia; methodology. (Med Care 1996;34:103–111)

There is a growing ethical consensus that patients may forgo life-sustaining treatments they do not wish.[1–5] Although physicians usually accept these choices,[6–14] an enlarging body of empirical evidence also suggests that physicians' own preferences are important in these decisions. Indeed, physicians' attitudes and practice vary greatly in this area, and

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this variation may be explained by differences in physicians' rank or experience,[6,9,15] specialty,[12,15] preferences for risk,[11] religion,[15] or specific biases in the way they make their decisions.[10]

Most patients who require one form of life-sustaining treatment also require others. For this reason, once a decision to withdraw life support has been made, it also must be decided how to do so. This decision is typically entrusted to physicians, and there is evidence that rather than withdraw all forms of life support at once, physicians often withdraw life support in sequence, or withdraw some forms of life support while retaining others.[16]

In a previous study, we reported that some physicians have strong preferences when given a choice among different forms of life support to withdraw.[10] Some of these preferences reflect differences in the surrounding clinical circumstances. For example, some physicians prefer to withdraw forms of life support required because of an underlying disease process over those required because of an iatrogenic complication, regardless of the form of life support involved. Some prefer to withdraw treatments that support organs that have failed acutely rather than chronically, regardless of the form of life support involved. However, preferences for some forms of life support remain even when the clinical circumstances are held constant. For example, in general, physicians tend to prefer to withdraw blood products and tend not to prefer to withdraw intravenous fluids. These preferences reflect differences intrinsic to the form of life-support, and may also reflect differences in physicians' personal or professional characteristics.

Indeed, forms of life-sustaining treatment vary along many different dimensions. Some, like blood products, may be perceived as scarce. Some, like mechanical ventilation, may be perceived as expensive, invasive, or uncomfortable. Others, like intravenous fluids, may appear basic or natural. We suspected that preferences among different forms of life support reflect physician attitudes toward such deeper attributes. By determining which attributes are important to physicians we can learn what physicians value in this area, and how these values influence their choices among forms of life support. The purpose of this study was to identify these underlying motivations. To our knowledge, these motivations have not been reported previously.

Methods

Expert Panels

Our first task was to identify attributes of different forms of life support that might underlie physicians' preferences. To do so, we performed a modified Delphi survey of seven internists and asked them to identify aspects of eight forms of life support that might provide reasons for withdrawing one form of life support over another. The eight forms of life support we examined were antibiotics, blood products, hemodialysis, intravenous fluids, intravenous vasopressors, mechanical ventilation, total parenteral nutrition, and tube feedings and fluids. Physicians identified attributes such as "cost," "pain upon withdrawal,""scarcity,""invasiveness," and the like. In subsequent rounds of the survey we invited panelists to review the entire panel's masked responses and to add, eliminate, or combine responses. The end result was a list of 13 attributes.

There are no objective standards by which forms of life support can be rated as scarce, painful, or the like. Therefore, we asked 23 critical care physicians to provide a numerical rating of each of the 8 forms of life support along each of the 13 attributes using a scale of 1 to 10, anchoring the form of life support scoring highest at 10 and the form of life support scoring lowest at 1. For example, physicians feeling that a certain form of life support is the most painful to withdraw were asked to give that form of life support

a 10 along the attribute "pain on withdrawal." We refer to these items as ratings along attributes. We assessed the stability of ratings across different panelists with Kendall's coefficient of concordance.[17] This measure varies from 0 to 1 and reflects the extent to which subjects agree in the order of their scoring along each attribute.

Physician Survey

Our next objective was to assess the degree to which ratings along these attributes are associated with physicians' preferences for the withdrawal of different forms of life support. We performed a mail survey of the 862 residents, fellows, and attending physicians affiliated with the Department of Medicine at the University of Pennsylvania. A detailed description of our methods has been reported previously.[10,15] The survey assessed physicians' attitudes toward the withdrawal of different forms of life-sustaining treatment under varying clinical circumstances, and also collected information about physicians' age, specialty, gender, rank (attending, fellow, or resident), religion, and the number of patients in intensive care units they cared for per month.

As part of the survey, we asked subjects to rank order eight different forms of treatment from the one they would most prefer to withdraw to the one they would least prefer to withdraw if the circumstances presented themselves. Ties were permitted.

Statistical Analysis

We analyzed the rank-ordered data using a new parametric statistical model developed for this purpose.[18] The model is a generalization of the conditional logit regression model introduced by McFadden.[19] This generalization, called the "exploded logit model," has been previously proposed in the economics[20,21] and marketing literature.[22,23] For the results reported here, we further generalized the model to accommodate ties in the rankings and also developed a practical estimation method providing odds ratios. This method allows one to estimate differences among items; to test for differences across subpopulations of physicians; and to incorporate continuous predictor variables describing subjects, items, or both.

This method takes advantage of the fact that when subjects rank a series of items, they provide more information about their preferences than when they simply select the most preferred item from a list of items. The model may be derived by postulating: (1) that individual i has a utility U_{ij} for each item j; (2) that the individual will rank item j higher than item k whenever $U_{ij} > U_{ik}$; and (3) that each U_{ij} is the sum of a fixed and a random component (ie, $U_{ij} = \mu_{ij} + e_{ij}$). The quantity μ_{ij} may then be decomposed into a linear function of a set of explanatory variables that describe individuals or items, or both. The probability of the rank ordering of a set of items for each individual may then be expressed, and a model to estimate the expression based on the rankings of many individuals may be developed and tested. The purpose of specifying models with this method is to uncover influences, or determinants, of the rankings. For example, one can assess the impact of attributes of the subjects doing the ranking or attributes of the items being ranked.

Parameter estimates provided by these models represent the differences in the log odds of preferring to withdraw one form of life support compared to an omitted category (we used antibiotics). An estimate of the odds ratio for the preference to withdraw blood products, for example, implies that physicians are 2.69 times more willing to withdraw blood products than antibiotics (Table 1).

Using this technique, we first examined the surveyed internists' rankings of the eight forms of life support. We then sought to explain these rankings with bivariate and multivariate models including the demographic characteristics of these internists and also

bivariate and multivariate models including the attributes of the forms of life support. These multivariate models assess the importance of each attribute in determining physician preferences controlling for the others. In developing these models, however, we were limited to no more than seven potential independent variables, to avoid the problem of overidentification.[18] The number of potential models given 13 possible attributes of which at most 7 can be used at a time is 5,811. As a result, we tested only a handful of models that reflected a balance among attributes and that minimized multicollinearity.

Statistical analyses were performed using Systat Version 5.2 for the Macintosh computer and SAS Version 6.07 on an IBM 9121 mainframe.

Results

The overall respose rate to the physician survey was 56%. The respondents had a mean age of 41 years; 20% were women; 70% were attending physicians, and the remainder were fellows and residents. They spent an average of 67% of their time in clinical practice. All subspecialities of internal medicine were represented. The respondents did not differ from the nonrespondents in gender, rank, or proportion of generalists. Four hundred fifty-six physicians ranked the eight forms of life support according to their preferences. Table 1 reports a multivariate model regarding physician preference for withdrawing the eight forms of life support. These results are virtually identical to those reported elsewhere using nonparametric statistics.[10] However, the exploded logit model permits an assessment of the *magnitude* of physician preferences among the items. For example, physicians were more than twice as likely to prefer to withdraw blood products or hemodialysis compared with antibiotics, and about half as likely to withdraw tube feedings, mechanical ventilation, and intravenous fluids. There was substantial agreement among physicians—none of the confidence intervals cross one, and the rank listings are significantly different from what might be expected by chance alone ($P < 0.0001$).

Bivariate analyses suggest that physicians' rankings are significantly associated with their gender ($P = 0.039$), age ($P < 0.0001$), and whether the subject is a general internist versus a specialist ($P < 0.0001$). These rankings were not associated with the physicians' religion, rank, or degree of exposure to patients in an intensive care unit. In multivariate analyses, however, only age remained significant ($P < 0.0001$). Compared to younger physicians, older physicians were less likely to prefer to withdraw intravenous vasopressors, mechanical ventilation, or hemodialysis, using antibiotics as the reference category.

TABLE 1. Physician Ranking of Forms of Life Support in Order of Preference[a]

Rank	Form of Life Support	Odds Ratio	95% Confidence Interval
1[b]	Blood products	2.69	2.26–3.19
2[b]	Hemodialysis	2.66	2.23–3.17
3	Intravenous vasopressors	1.91	1,61–2.26
4	Total parenteral nutrition	1.59	1.34–1.89
5	Antibiotics	1	—
6[c]	Tube feedings and fluids	0.58	0.49–0.69
7[c]	Mechanical ventilation	0.50	0.42–0.61
8	Intravenous fluids	0.32	0.27–0.39

[a]Antibiotics is the omitted category; its risk ratio is set at 1 and all other ratios are relative to this category. For the entire rank list, chi-square = 1,011 (degree of freedom = 7), suggesting that rankings are nonrandom ($P < 0.0001$).

[b,c]Differences between these pairs are not statistically significant at the 0.05 level.

TABLE 2. Mean Ratings of Each of Eight Forms of Life Support Along 13 Dimensions[a]

	Antibiotics	Blood Products	Intravenous Fluids	Intravenous Vasopressors	Mechanical Ventilation	Renal Dialysis	Total Parenteral Nutrition	Tube Feedings and Fluids	W[b]
Invasive	2.3 ± 1.9	3.2 ± 2.0	1.8 ± 1.2	4.7 ± 2.8	9.6 ± 0.8	8.7 ± 1.7	4.9 ± 2.0	4.5 ± 2.9	0.72
Scarce	2.0 ± 1.4	8.0 ± 2.2	1.0 ± 0.2	3.0 ± 2.2	6.1 ± 3.3	6.6 ± 3.2	3.5 ± 2.2	1.9 ± 0.9	0.61
Unnatural	4.7 ± 3.4	5.5 ± 3.1	4.0 ± 3.5	6.7 ± 3.2	8.9 ± 2.3	8.6 ± 2.5	6.1 ± 3.2	4.3 ± 3.4	0.46
Artificial	5.0 ± 3.2	5.4 ± 3.2	4.3 ± 3.6	7.7 ± 2.0	9.6 ± 0.8	9.1 ± 1.3	6.3 ± 2.9	4.7 ± 3.5	0.45
Expensive	5.8 ± 2.2	6.6 ± 2.2	2.0 ± 2.0	5.9 ± 2.2	9.1 ± 1.1	9.4 ± 1.0	6.8 ± 1.8	4.3 ± 2.3	0.68
Uncomfortable when withdrawn	2.0 ± 1.4	2.4 ± 1.7	2.9 ± 2.0	2.0 ± 1.2	8.5 ± 2.3	3.7 ± 2.6	1.6 ± 0.9	2.9 ± 1.9	0.40
Causes death rapidly when withdrawn	2.8 ± 1.1	4.2 ± 2.2	2.9 ± 1.9	8.7 ± 1.1	9.6 ± 0.7	5.1 ± 1.7	2.3 ± 1.5	1.8 ± 1.2	0.71
High technology	3.1 ± 2.1	3.1 ± 1.6	1.2 ± 0.5	5.0 ± 2.4	9.3 ± 1.4	9.0 ± 1.5	5.3 ± 2.1	2.7 ± 1.2	0.77
Requires an ICU	1.2 ± 0.5	1.8 ± 1.6	1.5 ± 1.6	8.7 ± 1.5	9.4 ± 0.9	3.5 ± 1.6	1.5 ± 0.6	1.1 ± 0.3	0.71
Requires an active intervention to withdraw	4.6 ± 3.2	4.5 ± 3.2	4.7 ± 3.4	7.2 ± 2.8	9.8 ± 0.9	6.6 ± 3.2	5.2 ± 2.8	5.0 ± 3.0	0.44
Requires continuous administration	2.7 ± 2.5	2.6 ± 2.4	7.0 ± 2.3	8.8 ± 2.3	9.6 ± 0.8	3.6 ± 2.1	6.0 ± 2.7	5.0 ± 2.9	0.38
Causes patient discomfort	1.5 ± 0.7	2.3 ± 1.1	1.4 ± 0.6	2.5 ± 1.5	9.5 ± 1.0	7.6 ± 2.3	2.5 ± 1.6	3.5 ± 2.1	0.65
Emotionally taxing for patients	1.7 ± 1.1	4.0 ± 2.9	1.5 ± 1.1	4.5 ± 3.0	9.3 ± 2.0	7.8 ± 2.4	3.6 ± 2.4	4.7 ± 2.7	0.30

ICU, intensive care unit.
[a]Ratings are from a 1–10 scale shown ± 1 standard deviation. A 1 indicates a low rating in an attribute.
[b]Kendall's coefficient of concordance.

Table 2 reports the mean ratings of the 8 forms of life support along each of the 13 attributes. For example, blood products ranked highest, and intravenous fluids lowest, along the attribute "scarce." In general, the 23 critical care physicians provided similar ratings as demonstrated by Kendall's coefficient of concordance (W).

Table 3 reports bivariate odds ratios for each of the 13 attributes as predictors of the ranking of the 8 forms of life support made by the 456 internists in the survey sample. These odds ratios reflect the association of each attribute with physicians' preferences in choosing among forms of life support to withdraw. Odds ratios greater than one imply that higher values of an attribute increase the likelihood that a physician will prefer to withdraw a form of life support, and vice versa. In general, physicians prefer to withdraw forms of life support that are scarce, expensive, invasive, artificial, unnatural, emotionally taxing, represent high technology, and cause death rapidly when withdrawn. They prefer not to withdraw forms of therapy that require continuous rather than intermittent administration, and forms of therapy that cause pain when withdrawn. They appear to be uninfluenced by whether a form of life support is painful, requires an intensive care unit for administration, or requires an active intervention to withdraw.

The odds ratios provide an estimate of the relative magnitudes of these effects and reflect a movement of a *single unit* on an attribute. The effect of movements of more than one unit can be determined by raising the odds ratio to the power of the difference along an attribute scale. In Table 2, for example, total parenteral nutrition is rated as 4.8 units higher on the expense scale than intravenous fluids. This difference implies that the effect of cost is to make physicians 80% more likely to withdraw total parenteral nutrition than intravenous fluids. Similarly, the seven-unit movement on the scarcity scale between intravenous fluids and blood prod-

TABLE 3. Bivariate Odds Ratios for Each of 13 Dimensions[a]

Dimension	Odds Ratio	95% Confidence Interval	Significance
Artificial	1.09	1.07–1.11	
Causes death rapidly when withdrawn	1.02	1.01–1.03	
Causes patient discomfort	1.00	0.98–1.01	NS
Emotionally taxing for patients	1.03	1.01–1.04	
Expensive	1.13	1.11–1.15	
High technology	1.06	1.04–1.07	
Invasive	1.03	1.02–1.05	
Requires an active intervention to withdraw	1.00	0.99–1.01	NS
Requires an ICU	1.00	0.99–1.02	NS
Requires continuous administration	0.90	0.88–0.91	
Scarce	1.15	1.13–1.17	
Uncomfortable when withdrawn	0.89	0.87–0.91	
Unnatural	1.04	1.02–1.06	

NS, not significant (confidence intervals that include 1.00 are not significant at the 0.05 level); ICU, intensive care unit.

[a]Bivariate odds ratios estimated with the exploded logit model for each of 13 attributes are reported along with their 95% confidence intervals. These odds ratios reflect the extent to which individual attributes of forms of life support are associated with ranking of the eight forms of life support by 456 internists.

ucts implies that the effect of scarcity is to make physicians more than two and a half times more likely to withdraw blood products than intravenous fluids.

Multivariate models designed to control for the potentially confounding effects of the multiple attributes sustain these conclusions. Although no more than seven attributes could be tested simultaneously, each of the attributes that was statistically significant in bivariate analyses retained that significance in almost all multivariate models examined, and provided stable parameter estimates consistent with the bivariate analyses. For example, physicians prefer to withdraw forms of life support perceived as scarce (odds ratio: 1.11; 95% confidence interval: 1.07–1.14) even when controlling for invasiveness, whether an intervention is continuous, expense, the rapidity of death after withdrawal, pain, and pain on withdrawal of treatment. The other findings reported in Table 3 are similarly robust.

Discussion

These results support several conclusions. First, physicians have distinct and consistent preferences for withdrawing certain forms of life support over others. These preferences are surprising given their context. Decisions to withdraw life support are perhaps most often made when the patient and the physician have determined that further medical treatment is inconsistent with the patient's goals. Under these circumstances, one might imagine there would be little reason to sustain differences in the way life support is withdrawn. We found, however, that some physicians do have preferences; that these preferences reflect intrinsic differences in the forms of life support themselves; and that in general these preferences are consistent across physicians and do not vary according to gender, experience, specialty status, or religion.

Second, these preferences are associated with physicians' age. Several other studies have reported related findings. Using different data from the same population examined in this study, we found that younger physicians are more likely than older physicians to withdraw life support in both hypothetical and real situations.[15] Here, we show an effect of age even at the level of choosing among *alternative forms* of life support to withdraw. Similarly, in a national survey of critical care physicians, older physicians were less likely to report withdrawing mechanical ventilation.[14]

Third, in the context of the withdrawal of life support, physicians are able to agree on a series of underlying characteristics that distinguish different forms of life support. We learned this qualitatively in the Delphi component of the study, and more quantitatively in the stability of the ratings across our expert panel of 23 critical care physicians. In addition, these ratings help explain physicians' preferences. In bivariate and multivariate models, the underlying characteristics of different forms of life support are associated with physicians' rank-ordered preferences. The validity of these associations is supported by their intuitive plausibility, the fact that the effects are in the expected direction, and the fact that they are robust across models.

Other studies have examined how patient preferences and attributes, physician preferences and attributes, and clinical circumstances influence decisions about the withdrawal of life-supporting treatment. To our knowledge, this is the first study that has sought to explain physician preferences by quantitatively examining the underlying characteristics of the forms of life support themselves. This study suggests that even when physicians may have agreed that life support should be withdrawn, the choices they make about the manner of withdrawing life support reflect other moral, social, and clinical goals. These goals include a desire to withdraw forms of treatment they perceive as expensive, scarce, or artificial.

In this report we also introduce a new statistical technique. Various techniques have been used to understand the factors that motivate individuals' behaviors, preferences, and judgments. These techniques include qualitative choice models in which subjects are asked directly about the factors they find important, and lens models or policy-capturing models in which subjects' judgments are predicted by a linear model of observable factors.[24,25]

Rank-ordered preference data are extremely rich sources of underlying values because they permit multiple and simultaneous comparisons between items scattered along the entire rank list rather than simply the comparison of discrete pairs of items. For the same reason, the statistical interpretation of rank-ordered data is complex. We have found that the exploded logit model is a powerful way to capture the rich information available from ranked preference data. Moreover, this method provides output in easily interpretable odds ratios.

This study has several limitations. First, the preferences and attributes we examined were elicited in the abstract and may not reflect the factors that influence physicians' decisions in real clinical situations. Nevertheless, we are reassured by the agreement we found among the 456 internists providing the rank list of the 8 forms of life support, and the 23 critical care physicians providing the ratings along the 13 attributes. Second, the physicians we surveyed were all affiliated with a single university department of medicine, and may not reflect the decision processes of a wider population. However, although about half of our subjects were affiliated with one of two hospitals, the remainder were scattered among 22 other hospitals regionally. Third, only 56% of the surveyed physicians responded, and slightly fewer provided a rank list of the eight forms of life support. Although there is a possibility of nonresponse bias, we think this is unlikely because we have little reason to believe that physicians who did not respond would express very different rank lists for the eight forms of life support. In addition, respondents did not differ from nonrespondents in any of the attributes we were able to measure in both groups. Finally, we used an expert panel of critical care physicians, rather than the surveyed internists, to rate each form of life support along the 13 dimensions. Although it is possible that the critical care physicians might perform this task differently from the general subject pool, the ratings performed by the expert panel should be a more accurate reflection of the intrinsic characteristics of the forms of life support. In any case, the ratings were associated with the subjects' rankings of the form of life support. This finding suggests that these ratings mean something to our subjects.

Past research has revealed that physicians' preferences are an important component of decisions to withdraw life support. Other studies have sought to explain these preferences by examining attributes of physicians. In this study we report that these preferences also reflect perceived intrinsic characteristics of the technology that are consistent across physicians. Many physicians would agree that their primary goal in caring for patients who wish life support withdrawn is to relieve patient suffering. Our findings suggest that physicians also seek to achieve other ends in the process.

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