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Sequencing the Withdrawal of Life-Sustaining Treatments[1]

Abstract

Previous studies have demonstrated that when patients are withdrawn from life-sustaining treatments, these treatments are often withdrawn sequentially, rather than all at once. We observed the sequence of withdrawing life support among 211 consecutive patients dying in four Midwestern United States hospitals from whom at least one of eight specific life-sustaining treatments was or could have been withdrawn. We used a parametric statistical technique to explain the order in which these forms of life support were withdrawn in terms of a set of previously determined characteristics of the forms of life support including, among other characteristics, their cost, scarcity, and discomfort. We found a distinct sequence in which the eight forms of life support were withdrawn in this clinical sample. The observed order was, from earliest to latest: blood products, hemodialysis, vasopressors, mechanical ventilation, total parenteral nutrition, antibiotics, intravenous fluids, tube feedings ($p < 0.0001$). This sequence is almost identical to that observed in a previous study based on hypothetical scenarios. Those forms of life support perceived as more artificial, scarce, or expensive were withdrawn earlier than those with less of these characteristics. We conclude that the preference for withdrawing some forms of life-sustaining treatments over others is associated with intrinsic characteristics of the forms of life-sustaining treatments themselves. Once the decision has been made to forgo life-sustaining treatment, the process used remains complex and appears to target many different goals simultaneously.

In the United States, there is an established ethical consensus that patients may forgo unwanted life-sustaining treatments.[2-6] Although physicians generally accept these choices,[7-15] an enlarging body of empirical evidence suggests that both physicians' attitudes and practices vary greatly in this area, and this variation may be explained by differences in physicians' rank or experience,[6,9,16] specialty,[12,15,17] preferences for risk,[11] religion,[15] or specific biases in the way they make their decisions.[10]

[1] Much of this paper is drawn from: Asch DA, Faber-Langendoen K, Shea JA, Christakis NA. The sequence of withdrawing life-sustaining treatments from patients. Am J Med 1999;107:153-156. The help and contributions of Drs. Shea and Christakis are gratefully acknowledged.

Most patients who require one form of life-sustaining treatment also require others. A patient receiving mechanical ventilation, for example, may also be receiving antibiotics, intravenous fluids, vasopressors, or hemodialysis. The withdrawal of any one of these interventions might result in the patient's death. For this reason, a decision to withhold or withdraw life support often involves decisions about multiple interventions. Figure 1 shows schematically that patients or their proxies typically participate actively in the decision to withdraw life-sustaining treatment, but that once this decision has been made, there remains a subsequent decision about which forms of life support to withdraw or how to withdraw them. The second decision, about the specific process by which life support is withdrawn, is usually entrusted to physicians.

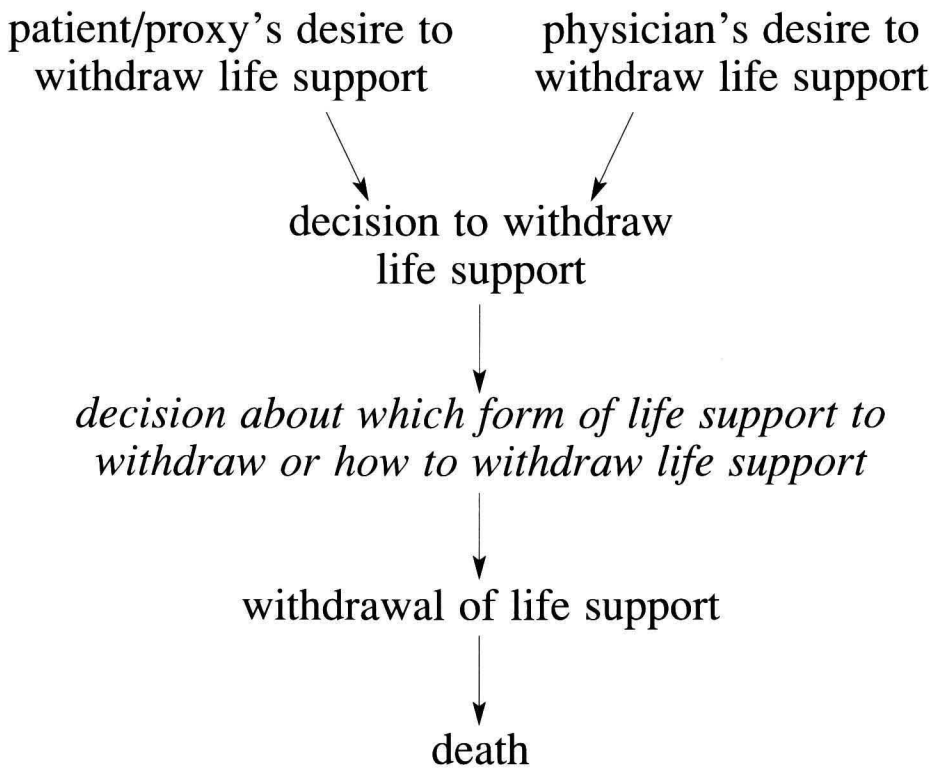

Figure 1. Schematic steps in the withdrawal of life support.

There has been considerably more research and comment about the first of these decisions than the second. Nevertheless, the second decision is important for at least two reasons: first, there are choices to be made. How life support is withdrawn can determine the rapidity of death, the comfort of the patient, the perceptions

of the family, the use and availability of scarce resources and many other considerations that may represent clinical or social goals. Understanding how these decisions are made may help identify problems in those processes and perhaps ways to improve them so that these goals can be met more effectively. Second, decisions about how life support is withdrawn may be a particularly sensitive indicator of the factors that are important to physicians in this setting. Physicians' participation in dichotomous decisions about whether to withdraw life support in general are relatively blunt, at least when compared to subtler decisions about how to do so or which specific forms of life support should be withdrawn and in what order. Understanding physicians' decision processes at this subtle level may provide additional insight into the factors that motivate them. Several decades of research in decision psychology demonstrates that factors that are strongly persuasive and motivate human decisions are not necessarily normatively justifiable. Physicians, like other humans, are often motivated by factors that are psychologically compelling on first glance, but lack normative power when examined more deeply. Examining how physicians decide how to withdraw life support may provide a window on these factors and, ultimately, lead to improvements in their decisions.

One might imagine that once the decision has been made to withdraw a patient from life-sustaining treatment, then all of that treatment would be withdrawn simultaneously and promptly. After all, a decision to withdraw life-sustaining treatment typically signals a substantial shift of goals from prolonging life to a concern for comfort or dignity, or the acceptance of death. Nevertheless, several observations—either of actual clinical practices or of physicians' responses to hypothetical clinical vignettes—suggest that all forms of life support are typically not withdrawn simultaneously and promptly. Instead, there is often a stepwise retreat as various forms of life support are withdrawn (and in some studies withheld), and often this retreat occurs in a systematic order. On the whole, these findings suggest that when life support is withdrawn, physicians are doing more than just shifting the goal away from the prolongation of life, and at least appear to be targeting other goals as well. The main purpose of studying these decisions is to uncover these hidden motivations.

Indeed, there is evidence that 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. For example, in a study of 115 patients who had life support forgone in two San Francisco intensive care units between 1988 and 1989, Smedira and colleagues found that mechanical ventilation and intravenous vasopressors were the interventions most often withdrawn first.[18] In a study of 70 patients dying consecutively in a Midwestern United States hospital in 1989, Faber-Langendoen and Bartels found that 74% died after some intervention was withheld or withdrawn, that on average 5.4 interventions were forgone per patient, and that although resuscitation and intubation were often the first interventions to be withheld, mechanical ventilation tended to be withdrawn later than other interventions.[19] Faber-Langendoen followed up this study with an expanded examination of three additional Midwestern hospitals, with nearly identical results: in a sample of 274

consecutive dying patients, 229 deaths were preceded by decisions to withdraw or withhold some form of life-sustaining treatment, and these patients had an average of 3.8 potentially life-sustaining interventions forgone before death, often not simultaneously.[20] This study also revealed that some forms of life support were forgone more often than others. For example, dialysis was forgone in 25 of 33 possible instances (76%), mechanical ventilation was withdrawn in 31 of 74 possible instances (42%), but intravenous fluids were forgone in only 36 of 157 possible instances (23%).

In a series of related studies, Christakis and Asch explored the decisions made by 481 of 862 Pennsylvania internists responding to a mail survey containing a variety of hypothetical clinical vignettes. All together, these studies revealed that some physicians have strong preferences when given a choice among different forms of life support to withdraw. For example, in one study, they found that 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.[10] Similarly, they found that physicians prefer to withdraw recently instituted rather than longstanding interventions, and to withdraw forms of life support that will result in immediate death rather than delayed death.

In a companion study, they found that medical specialists prefer to withdraw familiar technologies when withdrawing life support, so that, for instance, pulmonologists preferred to withdraw mechanical ventilation; nephrologists preferred to withdraw hemodialysis; gastroenterologists preferred to withdraw tube feedings; hematologists preferred to withdraw blood products and cardiologists preferred to withdraw intravenous vasopressors, all relative to otherwise matched comparison internists.[16] In addition, they found that preferences for withdrawing certain forms of life support are associated with the characteristics of the forms of life support themselves, for example, their scarcity, invasiveness, or expense.[21] In general, physicians prefer to withdraw blood products and prefer not to withdraw intravenous fluids, and these preferences are associated with the perceived scarcity of blood products, among other factors.

Because these studies were based on responses to hypothetical clinical situations or from the expressed preferences of physicians responding in the abstract, the studies could be constructed with experimental designs not usually possible in actual clinical practice. As a result, these studies reach deeply into possible decision processes. For the same reason, however, an important limitation of these studies is that they do not reflect decisions made in real clinical situations.

To address these limitations in part, we combined data from disparate studies to address novel questions: what is the sequence of the withdrawal of life-sustaining treatments from real patients dying in United States hospitals and how does this sequence compare to that derived from earlier work with hypothetical situations? An important goal of this work was to test whether the insights learned through experimental manipulation in hypothetical situations reflect observations from real clinical practice.

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. The charts of all acute-care patients dying in these institutions during the study period were reviewed. The study period for the university hospital in Minnesota was May 1 – June 30, 1989, during which time there were 73 deaths. The study period for the other hospitals was June 30, 1992 until 75 deaths were recorded at each of those institutions. Of the 298 requested charts, 291 (98%) were available for review. Of these, seventeen patients were admitted directly to hospice or extended care beds and were excluded; 229 of the remaining 274 patients died following 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. Further details about patient recruitment have been reported elsewhere.[19] For the present analysis, in order to make the data as similar as possible to those collected in the studies using hypothetical situations, we consider only decisions to withdraw eight potentially life-sustaining treatments (listed in Table 2). Our sample is restricted to 211 patients who were on one or more of the eight specific forms of treatment and thus could have had a treatment withdrawn. For each patient, each of the eight forms of life support could have been withdrawn, continued until death, or not received. Forms of life support that were withdrawn were ranked in the order in which they were withdrawn. Forms of life support that were continued until death were given a rank that put them at the end of the rank list because these treatments could have been withdrawn, but were not. Forms of life support that were not received contribute no information to our statistical models.

Attributes of forms of life support

In previous work,[20] we had empanelled seven internists who, through a modified Delphi technique, developed a list of thirteen attributes that could characterize the eight forms of life support, such as 'cost,' 'pain upon withdrawal,' 'scarcity,' 'invasiveness,' and the like. There are no objective standards by which forms of life support can be rated as scarce, painful, or the like. Therefore, using the responses of an expert panel of 23 critical care physicians, we developed numerical ratings for each of the eight forms of life support along each of the thirteen attributes using a 1-10 scale, anchoring the form of life support scoring highest at ten and the form of life support scoring lowest at one. For example, critical care 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 ten along the attribute 'pain on withdrawal.' We refer to these items as ratings along attributes. Table 1 reports the thirteen attributes, and the mean rating of each of the eight forms of life support along these attributes, provided by the 23 critical care physicians. We used these ratings to help explain the choices physicians were observed to make in the clinical data set.

Table 1. Mean ratings of each of eight forms of life support along thirteen attributes*

	Antibiotics	Blood products	Intravenous fluids	Intravenous vasopressors	Mechanical ventilation	Renal dialysis	Total parenteral nutrition	Tube feedings and fluids
Invasive	2.3	3.2	1.8	4.7	9.6	8.7	4.9	4.5
Scarce	2.0	8.0	1.0	3.0	6.1	6.6	3.5	1.9
Unnatural	4.7	5.5	4.0	6.7	8.9	8.6	6.1	4.3
Artificial	5.0	5.4	4.3	7.7	9.6	9.1	6.3	4.7
Expensive	5.8	6.6	2.0	5.9	9.1	9.4	6.8	4.3
Uncomfortable when withdrawn	2.0	2.4	2.9	2.0	8.5	3.7	1.6	2.9
Causes death rapidly when withdrawn	2.8	4.2	2.9	8.7	9.6	5.1	2.3	1.8
High technology	3.1	3.1	1.2	5.0	9.3	9.0	5.3	2.7
Requires an ICU	1.2	1.8	1.5	8.7	9.4	3.5	1.5	1.1
Requires an active intervention to withdraw	4.6	4.5	4.7	7.2	9.8	6.6	5.2	5.0
Requires continuous administration	2.7	2.6	7.0	8.8	9.6	3.6	6.0	5.0
Causes patient discomfort	1.5	2.3	1.4	2.5	9.5	7.6	2.5	3.5
Emotionally taxing for patients	1.7	4.0	1.5	4.5	9.3	7.8	3.6	4.7

* Modified from 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. Medical Care 1996; 34:103-111.

Statistical analysis

We analyzed the rank ordered data using a new parametric statistical model, called the 'exploded logit model,' developed for this purpose.[22] 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 the list. They provide information about many different possible pair-wise comparisons of items on the list. The purpose of specifying models with this method is to uncover influences, or determinants, of the rankings. 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) and so provide an estimate of the size of differences along a ranked list. Using this technique, we first examined the observed sequence of withdrawal over the eight forms of life support. We compared the sequence observed from the actual clinical cases derived from the chart review in Minnesota and Missouri to the sequence observed from the hypothetical cases presented to the internists in Pennsylvania. We then incorporated the attribute ratings into the model to help explain the observed sequence on the basis of the intrinsic characteristics of the forms of life support. Statistical analyses were performed using SAS version 6.11.

Results

Demographic and clinical characteristics of the 211 patients included in this analysis are shown in Table 2. As expected, most patients receiving one form of life support were also receiving others.

Table 2. Characteristics of the 211 patients.

Characteristic	
Mean age (s.d.)	65.7 (23)
Female sex, n (%)	101 (48)
Race, n (%)*	
African-American	45 (28)
Caucasian	115 (71)
Native American	1 (0.6)
Mean length of stay, days (s.d.)	18.0 (22.0)
Primary diagnosis, n (%)	
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, n (%)	
1	55 (26.1)
2	68 (32.2)
3	60 (28.4)
4	18 (8.5)
5	7 (3.3)
6	2 (1.0)
7	1 (0.5)

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

Table 3 reports a multivariable model reflecting the observed sequence of withdrawing the eight forms of life support. The numbers of patients receiving each treatment are shown in the second column. These clinically derived ranks are very similar to those found using hypothetical questions using either exploded logistic regression[20] or mean rank ordering.[10] The only differences are that mechanical ventilation has moved up in rank from seven to four, and intravenous fluids and tube feedings, which are now adjacent, have reversed. The odds ratios provided by the exploded logit model permit an assessment of the magnitude of physician preferences among the items. For example, the odds of withdrawing hemodialysis before antibiotics 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. The confidence intervals around the odds ratios of adjacent and near adjacent forms of life support often overlap, reflecting sparse data for some comparisons as well as similar effect sizes. Nevertheless, for the entire rank list, $X^2 = 44.53$ (df = 7), suggesting that the observed sequence is non-random ($p < 0.0001$). The column on the far right reports, for comparison, the ranking of hypothetical situations reported previously.[20]

Table 3. Observed sequence of withdrawing eight forms of life support.

Form of life support	From clinical study				Rank from study of hypothetical scenarios[20]
	Number receiving treatment (%)	Rank	Odds ratio	95% Confidence interval*	
Blood products	32 (15)	1	13.9	2.8-70.4	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 (15)	5	1.4	0.6-3.5	4
Antibiotics	140 (66)	6	1		5
Intravenous fluids	156 (73)	7	0.5	0.3 – 1.0	8
Tube feedings	28 (13)	8	0.2	0.1-0.6	6

* Confidence intervals that include one imply the lack of a statistically significant difference between the revealed preference for the withdrawal of a form of life support and the revealed preference for the withdrawal of antibiotics, the omitted category.

Table 4 reports bivariable odds ratios for each of the thirteen attributes as predictors of the sequence of withdrawing the eight forms of life support. These odds ratios reflect the ability of individual attributes to predict the observed sequence of withdrawing the eight forms of life support. In general, forms of life support with more of each of these characteristics are withdrawn sooner than forms of life support with less of each of these characteristics. For example, the more 'artificial' a form of life support was perceived by our panel of critical care physicians, the more likely it was to be withdrawn from patients in our sample; each one-point increase in this

characteristic increased by 30% the odds that the form of life support would be withdrawn. The sequence of withdrawal appears to be uninfluenced by whether a form of life support is uncomfortable when withdrawn or requires continuous administration. Multivariable models designed to control for effects of the multiple attributes produced unstable parameter estimates, most likely because of sparse data.

Table 4. Bivariable odds ratios for each of thirteen attributes.

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 ICU	1.1	1.1-1.2	
Requires continuous administration	1.0	0.9-1.1	NS
Scarce	1.3	1.2-1.5	
Uncomfortable when withdrawn	1.1	1.0-1.2	NS
Unnatural	1.4	1.2-1.6	

NS = Not significant. Confidence intervals that include 1.0 are not significant at the 0.05 level.

Discussion

These results identify a distinct and consistent sequence in which various forms of life support are withdrawn. This finding is evident from the analysis of the clinical data presented here, and it gains additional support from the similarity of these findings to those reported previously using data derived from hypothetical questions of internists. The distinct and consistent sequence observed is surprising given its context. If withdrawing life-sustaining treatment signals a major shift in goals, for instance, from the goal of cure or prolonging life to a primary concern for comfort or an acceptance of death, one might expect life-sustaining treatments to be withdrawn simultaneously. In contrast, the observed stepwise retreat reveals a complexity of decision-making that may be influenced by patient, surrogate, or physician ambivalence, or the desire to affect the timing of death or in other ways exhibit control over the process. To our knowledge, this is the first study that has sought to explain the clinically observed sequencing of the withdrawal of life support by examining the underlying characteristics of the forms of life support themselves. This study suggests that even when decisions to withdraw life support have been made, the process used reflects other moral, social, and clinical goals. These goals include a desire to withdraw forms of treatment 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 we studied, and most received only two or three. The many missing data elements limit the statistical power of our analyses and widen the confidence intervals reported in Table 3; nevertheless, these missing data elements reflect the clinical reality that escapes hypothetical scenarios. Indeed, the striking similarity between our results here and those derived from our previous study of hypothetical choices (from which no data were missing) supports the validity of both sets of findings. Second, the patients in this study were drawn from four university and community hospitals in Minnesota and Missouri during the period from 1989-1992, and the practice patterns we observed may not reflect practice patterns more generally or more currently. Again, however, the similarity of the results between this clinical study and the study of Pennsylvania internists suggest that these observed activities reflect general decision making processes; in the study based on hypothetical scenarios, we found that only the age of the physician had a significant effect on preferences of alternative forms of life support to withdraw. Third, in this study we have reported only on activities related to withdrawing life support. Although decisions to withdraw or withhold life-sustaining treatment often co-exist, the ranking observed in Table 3 differs from the ranking observed when decisions to withhold life-sustaining treatment are included and combined with decisions to withdraw life-sustaining treatment.[19] Such differences suggest that decisions to withhold or to withdraw life-sustaining treatments are not made the same way, even though they may target similar goals.

Conclusions

These findings provide a compelling reminder of the complexity of end-of-life decisions. The care dying patients receive in United States hospitals has recently come under harsh criticism. One way to view these results is to see them as providing additional evidence of non-clinical and potentially irrelevant factors that influence decisions at the end of life. Seen from this perspective, the results presented here add to the enlarging body of research that identifies an agenda for reform of the care of the dying. An alternative way to view the results of this study is to see them as reflections of the multiple goals clinicians and patients apparently target simultaneously at the end of life.

Important research questions

Early research in almost any field is descriptive, and the research presented here fits that category. The presented findings are empirical, which may represent an advance over, or at least a complement to, the purely theoretical scholarship that characterizes much of bioethics. Even so, the findings presented here are based on observations of everyday clinical practice in their natural settings, rather than observations

of behavior and outcomes in response to experimental manipulations, as in a clinical trial. These findings are more meaningful as a result.

Is there a next level in this research? As discussed in the introduction, the overall purpose of these descriptive investigations is to uncover clinical practices that could stand improvement against normative standards of behavior, or at least against well endorsed standards. For example, if pulmonary physicians are indeed relatively uncomfortable withdrawing dialysis even from patients for whom life support is to be withdrawn, then their professional characteristics are somehow getting in the way of achieving patient goals. If, when physicians make decisions about how to withdraw life support, they are influenced by the intrinsic characteristics of those forms of life support, they might be motivated by factors that the patients themselves would find irrelevant. Do these decision processes represent errors or biases? They might not given a broad view that recognizes the physicians themselves as moral participants in these activities. With that view, the decisions physicians need to make for their own peace of mind may be relevant. But these decision processes are certainly faulty when viewed from a narrower perspective that considers as valuable only the achievement of patient goals.

The next step in research of this kind is 'de-biasing.' If one learns that physicians systematically make one kind of decision when they ought to make another, fail to consider a factor that ought to be relevant, or tend to consider a factor that generally is not, then one has an agenda for reforming physician practices. However, getting physicians to change their practices or think or make decisions in different ways is difficult. Even if one can find fault with the decisions expressed or revealed in these studies, the physicians who made them are not bad or evil: they are just human. Getting the human out of their decision making may not be such a good idea, even if it were possible.

In a series of studies, decision psychologists have learned that some parents avoid vaccinating their children against some contagious illnesses because they fear the adverse consequences of the vaccine, even if they understand that the risks imposed by not vaccinating their child are greater than the risks imposed by failing to vaccinate their child.[23,24] This decision making process, which has been called 'omission bias,' is clearly a bias in that it leads to the expectation of worse outcomes as judged by a plausible and common standard, and it seems to result when parents feel they will be held more responsible for the consequences of their actions than the consequences of their omissions.[25,26] Baron has shown, however, that parents who exhibit this bias can be corrected by appealing to something like the 'Golden Rule,' and asked which outcomes their child would prefer (the outcome with the lowest risk) and whether their child would care whether that outcome was reached through vaccination or non-vaccination.[27]

Results like these would seem encouraging in the end-of-life setting where physicians, like parents, serve as agents to the goals of another party. Nevertheless, decisions surrounding end-of-life care are considerably more complex than vaccination decisions, and in practice the history of interventions to improve these processes is considerably less encouraging than what might be thought at first. In the United States, for example, the SUPPORT study[28] involved a monumental nurse-based effort to

educate physicians about patient goals in the critical care setting, yet resulted in no difference in decision making and no difference in clinical outcomes. Aronowitz and Asch have argued that improving end-of-life care confronts what may be impassible obstacles because the situation is one in which there are often no good outcomes, and so patients and their clinicians are fundamentally ambivalent about their goals; the goals are often inconsistent over time or at the same time; and therefore these goals are inherently difficult to pin down or satisfy.[29]

International collaboration in these areas is likely to be challenging, given that so many of the important issues that underlie these decisions reflect social values, professional norms, and legal and regulatory structures that differ substantially across cultures. If all ethics are local, cross-cultural observations may have little practical value. At the same time, these differences allow for the development of alternative models that may be adaptable in different nations.

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