ORIGINAL ARTICLES

Preferences for Cardiopulmonary Resuscitation:
Physician–Patient Agreement and Hospital Resource Use

Joan M. Teno, MD, MS, Rosemarie B. Hakim, PhD, William A. Knaus, MD, Neil S. Wenger, MD, Russell S. Phillips, MD, Albert W. Wu, MD, MPH, Peter Layde, MD, Alfred F. Connors, Jr., MD, Neal V. Dawson, MD, Joanne Lynn, MD, MA, for the SUPPORT Investigators

OBJECTIVE: To describe the association between hospital resource utilization and physicians' knowledge of patient preferences for cardiopulmonary resuscitation (CPR) among seriously ill hospitalized adult patients.

DESIGN: Prospective cohort study.

SETTING: Five U.S. academic medical centers, 1989–1991.

PATIENTS: A sample of 2,636 patients with self- or surrogate interviews and matching physician interviews describing patient preferences for CPR, from a cohort of 4,301 patients with life-threatening illnesses enrolled in the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT).

MEASURES: Patient, surrogate, and physician reports of preferences for resuscitation, and resource use derived from the Therapeutic Intensity Scoring System and hospital length of stay, converted into 1990 dollars.

RESULTS: Nearly one-third of the patients preferred to forgo resuscitation. Of the 2,636 paired physician–patient answers, nearly one-third did not agree about preferences for resuscitation. The physicians' views of the patients' preferences and those preferences themselves were both associated with resource use. Standardized adjusted hospital resource consumption, expressed as average cost in dollars during the enrollment hospitalization, was lowest when the physician agreed with the patient preference for a do-not-resuscitate order ($20,527), and highest when the patient did not have a preference and the physician believed the patient wanted resuscitation in the case of a cardiopulmonary arrest ($34,829). Hospital resource use was intermediate when patient–physician pairs evidenced either lack of agreement or communication, or awareness of options about resuscitation.

CONCLUSIONS: Both physician and patient preferences for CPR influence total hospital resource consumption. Physician misunderstanding of patient preferences to forgo CPR was associated with increased use of hospital resources, and could have led to a course of care at odds with patients' expressed preferences in the event of cardiac arrest. Increasing physicians' knowledge of patient preferences, and increasing communication to help patients understand that options for medical care that include forgoing resuscitation efforts, might reduce hospital expenditures for the seriously ill.

KEY WORDS: decision making; physician–patient relations; resuscitation orders; patient preferences; resource utilization.
J GEN INTERN MED 1995;10:179–186.

D ecisions about using cardiopulmonary resuscitation (CPR) should reflect the preferences of informed patients, and ideally as the result of "shared decision making"[1-3] between patient and physician. In this collaborative format, the physician is responsible for informing the patient about his or her medical condition, treatment options, including the choice of no treatment, and likely outcomes, as well as a recommendation for a specific plan of care for the patient. The patient, in turn, informs the physician about his or her

CPR preferences. The medical decisions that result from this dialogue should yield care consistent with the preferences of the patient. While this model of decision making has been widely endorsed, physicians often postpone discussions about CPR until it is too late for the patient to participate in the decision making process.[4-6] For this and other reasons, physicians often do not understand patient preferences for treatment.[7-9]

Previous studies have used responses by fairly healthy respondents to hypothetical scenarios to assess physician understanding of patient preferences.[8, 9] However, little work has been done to examine the impact of patient preferences and those of the physician on actual care given to the very sick. We examined physicians' knowledge of patient preferences for CPR in a population of severely ill hospitalized adults enrolled in the descriptive phase (Phase I) of the Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatments (SUPPORT),[10] and examined the relationship of patients' CPR preferences and physicians' perception of these preferences to hospital resource consumption.

METHODS

Study Population

From June 1989 through June 1991, SUPPORT enrolled all patients meeting study entry criteria at five medical centers in the United States: Beth Israel Hospital in Boston, Massachusetts; MetroHealth Medical Center in Cleveland, Ohio; Duke University Medical Center in Durham, North Carolina; St. Joseph's Hospital in Marshfield, Wisconsin; and the University of California Medical Center at Los Angeles. Entry criteria required that patients be at least 18 years old and in an advanced stage of one of the following diseases: coma, acute respiratory failure, multiple organ system failure with sepsis or malignancy, chronic obstructive lung disease, congestive heart failure, cirrhosis, metastatic colon cancer, or non–small-cell lung cancer (stage III or IV).[11] For the categories of acute respiratory failure and multiple organ system failure, the patient had to be in an intensive care unit (ICU) to qualify for study enrollment. Patients were excluded if they died or were discharged within 48 hours of admission; were admitted with a scheduled discharge within 72 hours; did not speak English; or had AIDS, multiple trauma, or pregnancy.

Data Sources

The patients, their surrogates (defined as the person who would make decisions if the patient was unable to do so), and their physicians were interviewed between the second and sixth days after study admission. The patient and surrogate interviews included questions about preferences for CPR. Matching physician interviews included questions about his or her knowledge of the patient's CPR preference. The patient interview also con-

tained questions about sociodemographic status, recent independence in activities of daily living (ADL), and self-assessed quality of life (QOL). Dependence in ADL was scored on a seven-point scale where each point indicated dependence in basic functioning; QOL was measured using a five-point index that ranged from excellent to poor.

Hospital records were abstracted by nurses trained in data extraction for physiologic indicators of disease severity, including vital signs, laboratory measurements, comorbidities, and clinical assessments, which comprise the Acute Physiology Score (APS) of the APACHE III scoring system for the prediction of hospital survival.[12] A lower APS is associated with a better prognosis. Charts were also abstracted for items included in a modified version of Therapeutic Intervention Scoring System (TISS), a weighted scoring of prespecified patient care services.[13, 14] A higher TISS score indicates higher consumption of hospital resources. Items for TISS were abstracted on study days 1, 3, 7, 14, and 25. An electronic copy of the hospital bill was the source of hospital charges.

Study Sample

The study sample consisted of patients or their surrogates who answered the question about resuscitation in the initial interview, and who had a matching physician interview. The surrogate response was substituted when there was no patient response, paralleling clinical situations in which the patient's views are represented by the surrogate when the patient is unable to communicate his or her wishes.

Definition of Patient Preference for CPR and Physician Perception of This Preference

To determine the patient's preference for resuscitation, the following question was asked:

> As you know, there are a number of things doctors can do to try to revive someone whose heart has stopped beating, which usually include a machine to help breathe. Thinking of your current condition, what would you want your doctors to do if your heart ever stops beating? Would you want your doctors to try to revive you, or would you want your doctors not to try to revive you?

In a suitably modified question, each surrogate and physician was asked what he or she thought the patient would want in the case of a cardiopulmonary arrest. We constructed a nine-category variable representing all possible combinations of the joint patient–physician response to the CPR question, including all combinations of agreement for or against CPR and "don't know" responses. This variable was defined from the perspective of the patient because of the moral claim that decisions to use or forgo CPR should reflect patient preferences.

Definition of Resource Use

The outcome of interest was hospital resource use. Because the relation of hospital charges to actual intensity of care varied across institutions, regions, and time periods, actual hospital charges were not a reliable indicator of resource consumption. Therefore, aggregate resource use over the patient's hospital stay was estimated by combining the average TISS score with the length of hospital stay following study enrollment to give an estimate of hospital costs that represented resource consumption modified by length of stay. The log of the product of the average TISS score and the length of hospital stay was transformed into 1990 dollars using a site-specific coefficient derived from a linear regression model that related this to the actual hospital billing charges in dollars. The correlation between the actual hospital bill and the product of average TISS score and length of stay was high ($r^2 = 0.80$).

Statistical Analysis

To understand the differences between the SUPPORT subjects in the study sample and the patients not included in the analysis because they did not have an interview, characteristics of these two groups were compared, and differences were evaluated using Student's t-test or the chi-square test.

The primary aim of developing a model with resource use as the outcome was to understand how hospital costs varied between the nine conjoint categories of physicians' perceptions and patients' stated resuscitation preferences. Independent variables in the model were used to adjust for confounding by factors related to both resource use and patient's CPR preferences and physician's perception of CPR preferences. To accomplish this, the average estimated hospital resource use in dollars, as derived from the log of the product of average TISS score and length of hospital stay described above, within the nine categories of patient–physician pairs, was derived from a multivariable linear regression model using patients' resuscitation preferences and physicians' perceptions of their patients' preferences as independent predictors of resource use. The model was run with adjustment for potential confounding by patient age, race, years of education, insurance status, income, primary disease category, presence of cancer as comorbidity, ADL, QOL, modified Glasgow Coma Scale score, and APS of APACHE III. The resulting resource use estimate was then standardized, using direct adjustment, to project dollar estimates by the nine cojoint patient and physician categories. These standardized estimates are representative of the typical SUPPORT patient and adjusted for factors that could affect the relationships between the nine categories.

We assessed the potential bias of using a patient sample in which surrogate responses had been substituted when the patient had been able to respond by

Table 1

Characteristics of the 2,636 Subjects or Their Surrogates* with a Complete Baseline Interview in Phase 1 of SUPPORT

	Sample Interviewed (*n* = 2,636)	Others (*n* = 1,665)
Age—mean (SD)	62.3 (15.8) yr	62.7 (15.2) yr
APACHE III APS†— mean	35.9 (21.1)	40.1 (26.8)§
Glasgow Coma Scale score—mean	9.2 (21.6)	15.1 (28.4)§
Number of comorbidities—mean	1.8 (1.3)	1.7 (1.2)§
ADL‡ score—mean	1.5 (1.6)	1.8 (1.0)§
Quality of Life Index—mean	3.7 (0.9)	3.9 (0.6)§
Gender		
Male	56.0%	58.7%
Female	44.0%	41.3%
Race		
White	79.6%	79.3%
Black	15.7%	14.7%
Asian	0.7%	1.5%
Other	4.0%	4.5%
Annual income		
<$11,000	53.3%	67.3%§
$11,000–25,000	22.0%	14.5%
$25,000–50,000	16.4%	11.5%§
>$50,000	8.2%	6.7%
Mortality rate		
In-hospital rate	22.9	32.9§
Six-month rate	45.2	52.9§
Disease group		
Acute respiratory failure/MOSF¶ with sepsis	36.9%	32.4%
COPD‖	11.7%	9.1%
Congestive heart failure	16.3%	17.8%
Cirrhosis	7.3%	6.2%
Coma	4.8%	7.2%§
Colon cancer	6.2%	6.3%
Lung cancer	9.5%	12.6%§
MOSF with cancer	7.3%	8.5%

**Surrogate information was used when no patient interview was available.*
†*Acute Physiology Score of APACHE III.*
‡*Activities of daily living.*
§*p-value < 0.05.*
¶*Multiple organ system failure.*
‖*Chronic obstructive pulmonary disease.*

Table 2
Conjoint Association of Patients' Resuscitation Preferences and Physicians' Perception of Patient Preferences Stratified by Hospital Cost, SUPPORT, 1989–1991

Agreement	n (%)	Standardized Hospital Cost* (95% CI)
Patient prefers CPR†		
Physician perception agrees	861 (56.9%)	$31,594 ($26,729–37,468)
Physician perception disagrees	258 (17.0%)	$26,608 ($22,069–32,171)
Physician doesn't know patient preference	394 (26.1%)	$30,350 ($25,435–36,325)
Total	1,513 (100.0%)	
Patient prefers DNR‡		
Physician perception agrees	380 (47.0%)	$20,527 ($17,148–24,649)
Physician perception disagrees	249 (30.9%)	$26,771 ($22,229–32,335)
Physician doesn't know patient preference	179 (22.1%)	$26,524 ($21,783–32,386)
Total	808 (100.0%)	
Patient doesn't know		
Physician also doesn't know	113 (35.9%)	$29,882 ($24,085–37,165)
Physician perceives patient prefers CPR	132 (41.9%)	$34,829 ($28,288–42,994)
Physician perceives patient prefers DNR	70 (22.2%)	$28,260 ($22,105–36,206)
Total	315 (100.0%)	

Analysis adjusted for age. income. insurance status. education. disease group. presence of cancer as comorbidity. activities of daily living scale. quality of life scale. Acute Physiology Score of APACHE III. modified Glasgow Coma Scale score. year of recruitment. and site and standardized to the typical SUPPORT patient.
†Cardiopulmonary resuscitation.
‡Do not resuscitate.

repeating our analyses on a patient-only sample. The two analyses produced similar results. We therefore chose to use the larger, patient-with-surrogate-substitution sample for this report. The independent contributions of the effects of the physicians' perceptions of patient preferences for CPR and of the patients' own preferences on hospital resource consumption were tested in an analysis of covariance and in linear regression models. We calculated the unadjusted proportion of do-not-resuscitate (DNR) orders that were accompanied by some other documentation of a decision to withhold or withdraw life-sustaining treatment by category of conjoint patient CPR preferences and physician perception of these preferences to determine whether a DNR order and withholding other treatments vary within these nine categories. We also calculated within each category the unadjusted and six-month mortality rates adjusted for variables listed above, and the unadjusted frequencies of the key components of resource use: mean number of days spent in an ICU, and rates of vasopressor use, intubation, and resuscitation attempts, to illustrate the effects of these key components on resource use.

RESULTS

Of the 4,301 patients enrolled in Phase I of SUPPORT, 1,650 (38.5%) were interviewed, but answers to the questions about preferences for resuscitation were not available for 63 (3.8%), resulting in 1,587 patient interviews. Eighty-four percent of patients who were not comatose, intubated, discharged, or deceased before the

interview were successfully interviewed. Surrogate responses were available for an additional 1,550 patients. However, matching physician interviews were not available for 501 patients, yielding a study sample of 2,636. Response rates for surrogate and physician interviews were 85% and 88%, respectively.

Table 1 compares the sample of interviewed patients and surrogates with the patients excluded from the analysis because of missing patient, surrogate, or physician interviews about CPR preferences. The subjects in the study sample were less acutely ill, as indicated by a lower APACHE III APS, were less likely to have altered mentation, and had slightly fewer comorbidities, fewer ADL dependencies, and a higher self-assessed QOL. The patients interviewed had a lower hospital mortality rate (22.9%) and six-month mortality rate (45.2%) than had those not interviewed (hospital mortality, 32.9%, six-month mortality, 52.9%). The differences in mortality were statistically significant (p < 0.05).

Among the 1,513 patients reporting a preference for CPR, the physician's reported perception of the patient preference agreed with that of the patient 57% of the time. Of these, the physician reported that the patient's preference was to forgo CPR 17% of the time, and the physician reported that he or she did not know the patient's preference 26% of the time (Table 2). Thirty-one percent of the patients preferred to forgo CPR; and for these, 53% of the physicians either reported that their patients preferred CPR or did not know what their patients' preferences were. Twelve percent of the patients reported being unsure about their preferences for CPR;

and for 36% of these patients, the physicians also reported being unsure of their patients' preferences.

In Table 2, adjusted, standardized average hospital costs are shown by the conjoint association of patients' CPR preferences and physicians' perceptions of patient preferences for CPR. For those patients with an expressed preference for CPR, total estimated hospital resource consumption was highest when the physician agreed with this preference ($31,594), and when the physician expressed uncertainty about patient preferences ($30,350). Disagreement between patients' expressed preference for CPR and physicians' perceptions tended to lower the estimated hospital costs to $26,608 per admission.

Estimated hospital resource consumption was lowest ($20,527) when patients expressed a preference not to be resuscitated and the physician agreed. Both disagreement and uncertainty about this preference were associated with increased estimated costs, $26,771 and $26,525, respectively. When both patient and physician expressed uncertainty, hospital costs were high ($29,882). In addition, when the patient expressed uncertainty, estimated costs tended to depend on the physician's beliefs about the patient's preferences: $28,260 when the physician believed the patient did not want CPR, and $34,829 when the physician believed the patient did want CPR. Analysis of a sample based on patient-only interviews also resulted in the same pattern of resource use.

Both patient preferences and physician perceptions of patient preferences were strongly and independently associated with hospital resource consumption in an analysis of covariance after adjustment for disease severity and site differences (F = 15.7 and 9.4, respectively, p < 0.0001). Linear regression indicated that the impacts of patient preferences and physician perception on hospital resource consumption were approximately equal after adjustment for other covariates. Physician perception of a patient preference for CPR was associated with a 22% increase in hospital resource consumption, and a patient preference for CPR was associated with a 21% increase.

Table 3 illustrates patterns of medical care and outcomes as they vary between categories of the conjoint association of patient CPR preferences and physician perceptions of patient preferences for CPR. These patterns tended to parallel the trends in hospital costs (Table 2). When the physicians were in agreement with their patients' stated preferences to be resuscitated, or they did not know their patients' preferences, there were fewer DNR orders written in conjunction with a decision to forgo or withhold another form of life-sustaining treatment, long ICU stays, more use of vasopressors, more resuscitation attempts, and more intubations. When the patient preferred not to be resuscitated and the physician accurately perceived this preference, the average length of stay in an ICU was less than four days, fewer

than 20% of patients either were intubated or received vasopressors, and only 1% of these patients had a subsequent resuscitation attempt. Physician misperception of this preference was associated with an increased number of resuscitation attempts, longer ICU stays, and more use of vasopressors and intubation. Six-month mortality rates were associated with agreement on CPR preferences even after adjustment for disease severity, age, and other factors. Seventy-one percent of patients for whom there was patient and physician agreement on a preference to forgo CPR died in six months, while only 42% died when the physician disagreed with this preference. When the patient was uncertain about resuscitation, length of ICU stay, use of vasopressors, intubation, and number of resuscitation attempts tended to reflect the physician's perceptions or uncertainties.

DISCUSSION

This analysis of data from the observational phase of SUPPORT revealed that physicians frequently do not report the same preferences for their patients' care as those reported directly by patients, results that are compatible with previous studies.[8,9] While previous studies examined physician reports of patient preferences in the outpatient setting, we interviewed seriously ill hospitalized patients, many of whom faced end-of-life decisions. We found that disagreement between patient CPR preferences and physician perception of patient preferences was common, and was associated with consumption of more hospital resources. These associations corresponded to higher use of ICU beds, vasopressors, mechanical ventilation, and resuscitation attempts and persisted after adjustment for illness severity, age, and diagnostic group.

Our findings are consistent with savings in resource consumption achieved in the care of "hopelessly ill" patients by a multidisciplinary comprehensive supportive team that aimed to implement care plans as preferred by the patients or their proxy decision maker.[15] Studies examining the association of advance directives with resource use at the end of life are conflicting. Chambers and colleagues found a 68% reduction in resource use among subjects who had documentation of an advance directives discussion during the first three days of hospitalization.[16]

In contrast, a recent randomized trial to facilitate the use of formal advance directives did not reduce resource use in the last month of life.[17] We have previously reported that self-reported advance directives were not associated with different patterns of resource use in terminal patients.[18] Furthermore, patients often have not discussed their advance directives with their physicians. To effect real change, and to gain increased agreement on preferences for CPR, repeated and frequent discussions may need to accompany formal advance directives,

and open dialogue between seriously ill patients and their physicians should become institutionalized.

In the present study, hospital resource use was high in cases in which the physician and patient were in agreement about the choice to have CPR and lowest when there was agreement on preference to forgo CPR. Physician and patient agreement about preferences to forgo CPR was associated with decisions about the provision of life-sustaining treatment. A DNR order is a key decision that often either coincides with or precedes other decisions about life-sustaining treatment. Of concern, six-month hospital mortality rates were associated with patients' preferences for resuscitation and physicians' perception of those preferences. When a physician did not accurately perceive a preference to forgo CPR, the six-month mortality rate was 43%, in contrast to a six-month mortality rate of 71% when there was agreement. It is possible that personal preferences and values independent of prognosis enabled both patient and physician to reach agreement that aggressive care was not appropriate. The results in Table 3 indicate that patients did receive more aggressive care when the physician thought resuscitation was indicated. These results highlight the importance of concordance not only on resource use but also on short-term mortality.

Our findings suggest that increased communication between physicians and patients could potentially lead to increased resource use only if both the patient and the physician disagreed, had any uncertainty, or agreed to forgo resuscitation, and then moved to a preference for CPR. This type of movement seems unlikely at present. Currently, at the time of admission with a terminal illness, virtually all persons are in agreement with their physicians about the use of CPR, and nearly all patients who die of a serious, established disease get a DNR order some time before death. Somewhere between these two points there is a period when patients, their families, and their physicians struggle with issues about aggressive care at the end of life. It is during this time that patients, their surrogates, and their physicians may report uncertainty or disagreement. When seriously ill patients and their physicians jointly make informed choices to withhold aggressive care, however, substantial and noncontroversial reductions in resource consumption result.

In each of our categories of patient CPR preferences and physician perceptions, resource use was highest when the physicians believed that the patient wanted CPR, and lowest when they believed the patient did not want CPR, regardless of the patient's stated preferences. This suggests that influencing physician attitudes and behavior, especially in situations when patients are receiving more intensive treatment than they might choose, could lower total resource use for seriously ill hospitalized adults. A growing literature about predicting who may benefit from CPR is now available to assist physicians in their decision making.[19-24]

The problem of rapidly escalating health care costs has focused attention on cost containment. Of concern is whether resources are disproportionately devoted to the care of the seriously ill in the last few months of life.[25] Studies among hospitalized patients indicate that CPR has limited efficacy.[26] Because of this, some have concluded that access to high-cost end-of-life care should be restricted. One approach to reducing costs of care at the end of life might be to further encourage medical decision making to reflect the informed preferences of patients. If a substantial number of seriously ill patients are receiving more resource-intensive medical care than they want, this strategy might lead to a reduction in medical resource use.[27, 28]

A possible interpretation for the relationships seen in Table 2 is that differences in hospital charges were a result of resuscitation attempts, per se, along with their sequelae, contributed to the increase in costs. Indeed, only 8.5% (overall) of the 2,636 had a resuscitation attempt at any time after study enrollment, and the observed pattern of resource consumption persisted after elimination of these cases. Therefore, resuscitation attempts do not account for the differences in amounts of resource use observed in this study. We believe the degree to which physician and patient responses are in agreement acts here as a marker for the degree to which the physician and the patient are communicating and share an understanding of the goals of care.

Our study has several potential limitations. The data collection period was immediately before the implementation of the Patient Self-Determination Act (PSDA). It is possible that decision making practices have dramatically changed since then. However, we have examined data from the second phase of SUPPORT, which occurred after implementation of the PSDA, and found that decision making did not change over the entire five-year period of data collection in SUPPORT.[29] The physician and patient preference variables were based on survey questions about CPR, and were subject to the limitations of such techniques. Because the questionnaire was administered early in the hospitalization and provides a snapshot of a complex process of decision making, the associations do not necessarily reflect causality.

Physicians may have changed their decision making practices given the knowledge that they would be interviewed about their patients' preferences. Our results may also have underestimated the true rate of misunderstanding between physicians and their patients. Moreover, patients may not have fully understood the questions or may have changed their minds later. However, quality testing of SUPPORT interview data has given evidence of high reliability. (Phillips RS, et al. Unpublished data, 1994.) Since data were available only for cases in which there was a patient or surrogate interview with a matching physician interview, our results may not be generalizable to the extremely ill, the very poor, or less competent subjects without surrogates. Because

Table 3
Patterns of Care for 2,636 Seriously Ill Adults Stratified by the Joint Association of Patients' Resuscitation Preferences and Physicians' Perceptions of Patient Preferences, SUPPORT, 1989–1991

Agreement Category	DNR + Other*	Mean ICU Days (median, range)	Vaso-pressor† (%)	Intuba-tion‡ (%)	Resusci-tation Tried (%)	6-month Mortality (%)	6-month Mortality AOR§ (95% CI)
Patient prefers CPR¶							
Physician perception agrees	7.4	9.6 (4, 0–175)	37.5	32.6	6.2	28.3	0.21 (0.15–0.28)
Physician perception disagrees	19.3	5.9 (2, 0–109)	25.6	24.4	3.5	56.9	0.55 (0.38–0.80)
Physician doesn't know patient preference	12.4	8.8 (4, 0–251)	33.8	35.8	7.4	22.3	0.31 (0.22–0.44)
Patient prefers DNR‖							
Physician perception agrees	32.4	3.6 (0, 0–149)	19.5	18.7	1.1	71.1	—
Physician perception disagrees	12.8	7.4 (4, 0–91)	34.9	30.1	5.2	42.1	0.35 (0.24–0.51)
Physician doesn't know patient preference	28.2	7.5 (4, 0–138)	25.1	37.4	2.8	57.0	0.54 (0.36–0.82)
Patient doesn't know							
Physician also doesn't know	21.2	7.9 (4, 0–52)	33.6	43.4	4.4	58.5	0.38 (0.24–0.62)
Physician states patient prefers CPR	12.1	10.4 (6, 0–96)	40.1	44.7	5.3	38.6	0.30 (0.19–0.47)
Physician states patient prefers DNR	25.7	4.6 (2, 0–55)	25.7	21.4	1.4	51.3	0.58 (0.33–1.02)

*Do-not-resuscitate order accompanied by documentation of decision to withhold or withdraw another life-sustaining treatment such as mechanical ventilation.

†Use of a vasopressor at any time during hospitalization.

‡Patient intubated on third study day.

§Adjusted for age, income, education, insurance status, disease group, presence of cancer as comorbidity, activities of daily living scale, quality of life scale, Acute Physiology Score of APACHE III, modified Glasgow Coma Scale score, and institution.

¶Cardiopulmonary resuscitation.

‖Do-not-resuscitate order.

surrogates do not always agree with patients,[9] the use of surrogate substitution may have introduced unknown biases. However, when we repeated the analysis using the subjects who had only a patient and physician interview, the trends and levels of statistical significance were similar. Further, patients were enrolled from academic medical centers, which may or may not reflect medical practice in community hospitals.

In conclusion, even among very sick hospitalized patients, patient preferences for CPR are often in disagreement with physicians' perception of what the patient wants and that disagreement is associated with increased costs. Our results suggest that increased discussion between patients, family, and physicians about preferences for CPR could help to reduce hospital resource use among seriously ill patients, and that resource consumption is influenced by both patient and physician perspectives. The lack of physician agreement with a patient preference to forgo CPR is associated with an increase in resources used for these patients. These insights should encourage more effective discourse between physicians and patients, aiming to use advanced medical technology for patients who both desire and can benefit from it.

REFERENCES

1. President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research. Deciding to forego life-sustaining treatment. Washington, DC: U.S. 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. The Coordinating Council on Life-Sustaining Medical Treatment Decisions by the Court. Guidelines for state court decision making in authorizing or withholding life-sustaining medical treatment: a project of the national center for state courts. Williamsburg, VA: West Publishing Company, 1991.
4. Bedell SE, Delbanco TL. Choices about cardiopulmonary resuscitation in the hospital: when do physicians talk with patients? N Engl J Med. 1984;310:1089–93.
5. Bedell SE, Pelle D, Maher PL, Cleary PD. Do-not-resuscitate orders for critically ill patients in the hospital: how are they used and what is their impact? JAMA. 1986;256:233–7.
6. Lynn J, Teno J, Wenger N, et al. "Do not resuscitate orders" in seriously ill patients: expressed preferences or last rites [abstract]. Clin Res. 1992;40(2):347a.
7. Teno JM, Mor V, Fleishman J. Preferences of HIV-infected patients for aggressive versus palliative care [letter]. N Engl J Med. 1991; 324:1140.
8. Uhlmann RF, Pearlman RA, Cain KC. Physicians' and spouses' predictions of elderly patients' resuscitation preferences. J Gerontol. 1988;43:M115–21.
9. Seckler AB, Meier DE, Mulvihill M, Cammer Paris BE. Substituted judgment: how accurate are proxy predictions? Ann Intern Med. 1991;115:92–8.
10. Lynn J, Knaus WA. Background for SUPPORT. J Clin Epidemiol. 1990;43(suppl):1s–4s.
11. Murphy DJ, Knaus WA, Lynn J. Study population in SUPPORT: patients (as defined by disease categories and mortality projections), surrogates, and physicians. J Clin Epidemiol. 1990;43(suppl):11s–22s.
12. Knaus WA, Wagner DP, Draper AE, et al. APACHE III prognostic system: risk prediction of hospital mortality for critically ill hospitalized adults. Chest. 1991;100:1619–36.
13. Keene AR, Cullen DJ. Therapeutic intervention scoring system: update 1983. Crit Care Med. 1983;11:1–5.
14. Oye RK, Landefeld CS, Jaye RL. Outcomes in SUPPORT. J Clin Epidemiol. 1990;43(suppl)L83s–87s.
15. Carlson RW, Devich L, Frank RR. Development of a comprehensive supportive care team for the hopelessly ill on a university hospital medical service. JAMA. 1988;259:378–83.
16. Chambers CV, Diamond JJ, Perkel RL, Lasch LA. Relationship of advance directives to hospital charges in a Medicare population. Arch Intern Med. 1994;154:541–7.
17. Schneiderman LJ, Kronick R, Kaplan RM, Anderson JP, Langer RD. Effects of offering advance directives on medical treatments and costs. Ann Intern Med. 1992;117:599–606.
18. Teno J, Lynn J, Phillips RS, et al., for the SUPPORT Investigators. Do formal advance directives affect resuscitation decisions and the use of resources for seriously ill patients? J Clin Ethics. 1994;5(1):23–30.
19. Murphy DJ, Murray AM, Robinson BE, Campion EW. Outcomes of cardiopulmonary resuscitation in the elderly. Ann Intern Med. 1989;111:199–205.
20. George AL, Folk BP, Crecelius PL, Campbell WB. Pre-arrest morbidity and other correlates of survival after in-hospital cardiopulmonary arrest. Ann J Med. 1989;87:28–34.
21. Cohn EB, Lefevre F, Yarnold PR, Aaron MJ, Martin GJ. Predicting survival from in-hospital CPR: meta-analysis and validation of a prediction model. J Gen Intern Med. 1993;8:347–53.
22. Taffet GE, Teasdale TA, Luchi RJ. In-hospital cardiopulmonary resuscitation. JAMA. 1988;260:2069–72.
23. Burns R, Graney MJ, Nichols LO. Prediction of in-hospital cardiopulmonary arrest. Arch Intern Med. 1989;149:1318–21.
24. Bedell SE, Delbanco TL, Cook EF, Epstein FH. Survival after cardiopulmonary resuscitation in the hospital. N Engl J Med. 1983;309:569–76.
25. Callahan D. Setting Limits: Medical Goals in an Aging Society. New York: Simon and Schuster, 1987.
26. Niemann JT. Cardiopulmonary resuscitation. N Engl J Med. 1992;327:1075–80.
27. Wennberg JE. Outcomes research, cost containment, and the fear of health care rationing. N Engl J Med. 1990;323:1202–4.
28. Singer PA, Lowy FH. Rationing, patient preferences, and cost of care at the end of life. Arch Intern Med. 1992;152:478–9.
29. Teno JM, Lynn J, Phillips RS, et al. Federal interventions regarding end of life decision making: lessons from the PSDA [abstract]. J Gen Intern Med. 1994;9(Apr suppl 2):99.