



## Differences in End-of-Life Care in the ICU Across Patients Cared for by Medicine, Surgery, Neurology, and Neurosurgery Physicians

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**Background:** Some of the challenges in the delivery of high-quality end-of-life care in the ICU include the variability in the characteristics of patients with certain illnesses and the practice of critical care by different specialties.

**Methods:** We examined whether ICU attending specialty was associated with quality of end-of-life care by using data from a clustered randomized trial of 14 hospitals. Patients died in the ICU or within 30 h of transfer and were categorized by specialty of the attending physician at time of death (medicine, surgery, neurology, or neurosurgery). Outcomes included family ratings of satisfaction, family and nurse ratings of quality of dying, and documentation of palliative care in medical records. Associations were tested using multipredictor regression models adjusted for hospital site and for patient, family, or nurse characteristics.

**Results:** Of 3,124 patients, the majority were cared for by an attending physician specializing in medicine (78%), with fewer from surgery (12%), neurology (3%), and neurosurgery (6%). Family satisfaction did not vary by attending specialty. Patients with neurology or neurosurgery attending physicians had higher family and nurse ratings of quality of dying than patients of attending physicians specializing in medicine ( $P < .05$ ). Patients with surgery attending physicians had lower nurse ratings of quality of dying than patients with medicine attending physicians ( $P < .05$ ). Chart documentation of indicators of palliative care differed by attending specialty.

**Conclusions:** Patients cared for by neurology and neurosurgery attending physicians have higher family and nurse ratings of quality of dying than patients cared for by medicine attending physicians and have a different pattern of indicators of palliative care. Patients with surgery attending physicians had fewer documented indicators of palliative care. These findings may provide insights into potential ways to improve the quality of dying for all patients.

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**Abbreviations:** DNR = do not resuscitate; EOL = end of life; QODD = Quality of Dying and Death

Death is common in the ICU in the United States,<sup>1,2</sup> and the importance of integrating quality palliative care into the ICU is being increasingly recognized. One of the challenges in the delivery of high-quality palliative care in the ICU is the dramatic variability in end-of-life (EOL) care across different ICUs.<sup>3</sup> Each ICU has its own culture that is shaped by many factors, including its structure, history, policies, processes of care, and attitudes.<sup>4</sup> Other important factors in the culture of the ICU are the types of patients and spe-

cialty of providers in an ICU. The characteristics of patients with certain types of illness or injury and the practice of different types of critical-care physicians can present challenges to the integration of palliative care into the ICU.<sup>5</sup>

A few reports have focused specifically on EOL care of the neurology or neurosurgery patient.<sup>6,7</sup> Devastating neurologic insults often occur suddenly in the absence of chronic debilitating conditions, and life-sustaining interventions are often initiated emergently

before a diagnosis or prognosis can be defined.<sup>8</sup> Conversely, patients with many medical and some surgical diagnoses are more likely to have chronic comorbid illnesses related to their ICU admission. One prior study found that nurses rated quality of dying higher for neurology and neurosurgery patients than patients of other specialties.<sup>9</sup> However, to our knowledge, a comparison of the quality of EOL care across different physician specialties in the ICU has not otherwise been described.

To explore differences in EOL care across medicine, surgery, neurology, and neurosurgery physicians, we examined a cohort of patients who died in or shortly after a stay in the ICU. We asked whether the following outcomes differed by the physician specialty of the attending physician of record at the time of death: (1) family or nurse satisfaction with care, (2) family or nurse ratings of quality of dying, and (3) documentation of delivery of palliative care.

## MATERIALS AND METHODS

### Design

Data were collected as part of a cluster-randomized trial designed to evaluate the efficacy of a multifaceted, interdisciplinary intervention to improve palliative care in the ICU (the Integrating Palliative and Critical Care study). Details of the study design and results of the randomized trial have been previously reported.<sup>10-12</sup> All study procedures were approved by the institutional review board at all sites.

### Study Participants

All patients who died in the ICU after a minimum stay of 6 h or within 30 h of transfer from the ICU were eligible for the study. Patients with brain death were excluded. Hospitals in the Seattle-Tacoma, Washington, area were eligible if they had enough ICU deaths to meet sample size requirements for the Integrating Palliative and Critical Care study.<sup>11</sup> Of 16 eligible hospitals, 15 agreed to participate. The current study includes the 12 sites from the randomized trial as well as two of the pilot sites (one site was a pilot for the intervention but did not include chart abstraction). These 14 hospitals include two university-affiliated teaching hospitals;

three community-based teaching hospitals; and nine community-based, nonteaching hospitals. Most of the hospitals (12 of 14) had one ICU (either medicine or mixed medicine-surgical). Of the two remaining hospitals, one had two ICUs (surgery and neurology) and the other had six ICUs (trauma, surgical, cardiac, medicine, burn, and neurosurgical). The majority of the hospitals (13 of 14) had a semi-open ICU structure with either optional or required intensivist consultation; the six ICUs at the remaining hospital included both closed and open ICU structures. Patients who died were identified using discharge and transfer logs. Study activities were from August 2003 to February 2008. Study procedures were approved by the institutional review board at each study site (e-Appendix 1).

### Data Collection

**Family Surveys:** Surveys were mailed to families of patients who died during the study period. Surveys were mailed 1 to 2 months after the patient died and were written in English. One family member per patient was asked to respond. The survey packet included a cover letter, consent form, \$10 incentive, postage-paid return envelope, and questionnaire booklet. The questionnaire booklet included demographic questions, the Quality of Dying and Death (QODD) questionnaire, and the Family Satisfaction in the ICU survey. Survey follow-up used a standardized approach<sup>13</sup> that included reminders sent 2 weeks after the initial mailing and second survey packets sent after 4 weeks if there was no response to the initial mailing.

**Nurse Surveys:** Nurse questionnaires were distributed within 72 h of death to the nurse caring for the patient at the time of death/transfer and the nurse from the prior shift. Survey packets included a cover letter, consent form, coffee-card incentive, the QODD questionnaire, and questions asking for ratings of the care the patient received in the last days of life. The same procedures were used to follow-up with nonrespondents as with family members.<sup>13</sup>

**Chart Abstraction:** Data abstractors were trained by two research-abstraction trainers. Training included a minimum of 80 h of practice abstraction followed by reconciliation with trainers. Training continued until 95% agreement was reached with trainers. For ongoing quality control, abstractors coreviewed a 5% random sample, ensuring at least 95% agreement on the 440 abstracted data elements.

**Death Certificate Data:** Washington State death certificates were linked by patient identifier to provide data that were unavailable or incomplete in the medical record. Data obtained from death certificates include patient race, education, marital status, and cause of death.

### Variables of Interest

#### Outcome Measures

**Quality of Dying and Death Questionnaire—Family members and nurses completed the validated QODD questionnaire measuring family- or clinician-assessed quality of dying.<sup>9,14-16</sup> For this study, we examined a single-item, quality-of-dying rating (range, 0-10) that is associated with ICU palliative care.<sup>17</sup> Higher scores indicate higher-quality dying.**

**Family Satisfaction in the ICU Survey—This survey is a validated 34-item questionnaire measuring family satisfaction with ICU care.<sup>18,19</sup> Scores on 24 items provide a total satisfaction score, as well as two domain scores: satisfaction with care and satisfaction with decision-making.<sup>20</sup> Scores are recoded and recalibrated to a 0 to 100 range, with higher values indicating higher satisfaction.<sup>20</sup>**

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**Nurse-Assessed Satisfaction With Care**—Two questions were used to assess nurse ratings of satisfaction with care of patients and their family. Nurses were asked to rate on a 0 to 10 scale (from worst care possible to best care possible) “the care your patient received in the last several days of his/her life while in the ICU from all doctors and other health-care providers combined.” Nurses were also asked to rate the following on a 0 to 10 scale (from not satisfied at all to very satisfied): “How satisfied were you with how well the health-care team met the family’s needs while their loved one was in the ICU?”<sup>21</sup>

**Chart-Based Indicators of Palliative Care**—Indicators of palliative care were identified from medical records and included aspects of care that have been previously defined in consensus documents as indicators of palliative care.<sup>22,23</sup> These include palliative care consultation, social work services, spiritual care, do not resuscitate (DNR) order at time of death, withholding or withdrawal of life-sustaining therapies, pain assessments in the last 24 h of life, avoidance of CPR prior to death, a family conference within 72 h of admission, a discussion of prognosis within 72 h of admission, ICU length of stay, and time from ICU admission to withdrawal of mechanical ventilation. These indicators of palliative care have been shown to be associated with higher family ratings of quality of dying,<sup>17</sup> higher ratings of family satisfaction with care,<sup>24</sup> and decreased family psychologic symptoms after death of their loved one,<sup>25</sup> providing validation of their usefulness as indicators of quality palliative care.

#### *Predictors and Covariates*

**ICU Attending Physician Specialty**—Patients were categorized by the specialty of the attending physician caring for the patient at the time of death, defined by the specialty of the attending physician of record documented on the patient’s death summary. We used the following four categories: (1) medicine (family medicine, internal medicine, and internal medicine subspecialties), (2) surgery (general surgery and surgical subspecialties except neurosurgery), (3) neurology, and (4) neurosurgery.

**Patient, Family, and Nurse Characteristics**—Patient characteristics were collected from medical records and death certificates. Demographic variables for patients included age, sex, race, cause of death (cancer, trauma, or other), insurance status (insured vs underinsured),<sup>26</sup> and education. Family member characteristics collected from family surveys included age, sex, race, and relationship to the patient (spouse/partner vs other relationship). Nurse characteristics collected from nurse surveys included age, sex, race, and years of ICU nursing experience.

#### *Data Analysis*

Characteristics of patients, family members, and nurses were examined by ICU physician specialty using descriptive statistics and expressed as either mean (SD) or number (percent). Associations between physician specialty and the outcomes of interest were based on Tobit or robust linear regression models for family and nurse ratings, Cox regression models for time-based variables, and logistic regression models for dichotomous variables. The choice of Tobit or linear regression for pseudocontinuous outcomes (eg, outcomes scored 0-10) was based on the number of cases at the lowest and highest possible values on the outcome. If  $\geq 25\%$  of the cases were at either the ceiling or floor, we used Tobit regression. To test nurse outcomes, we used clustered-regression models with patients clustered under nurses. All regression estimates were based on restricted maximum likelihood. For Cox model coefficients, the higher the value, the shorter the associated time period.

A priori, we chose to adjust all models for hospital (using dummy variables). In addition, any covariate that caused  $> 20\%$  change in the coefficient for any physician specialty was considered a con-

founder for that predictor-outcome pair and was included in that individual model. Covariates that were examined for confounding in all models included patient characteristics (age, sex, race, cause of death, insurance status, and education). For family outcomes, we tested family characteristics (age, sex, race, relationship to patient). For nurse outcomes, we tested nurse characteristics (age, sex, race, and years of ICU nursing experience).

Medicine specialty was the reference group in all models. In the adjusted analyses for each outcome, an overall *P* value for specialty was calculated based on the reduction in deviance obtained in a model in which the coefficients for the three dummy indicators for specialty were freely estimated, when compared with a model in which the three specialty-related regression coefficients were constrained to 0.0. Significance was defined as  $P \leq .05$ .

## RESULTS

A total of 3,124 patients died during the study period at the 14 sites. Of these, 1,185 (38%) had at least one family-reported outcome assessed, and 1,198 (38%) had at least one nurse-reported outcome assessed. The patients’ mean age was 69 years, and the majority of patients were non-Hispanic white (79%) and male (59%). The majority were cared for by a medicine attending physician at the time of death (78%), with fewer from surgery (12%), neurology (3%), and neurosurgery (6%) (Table 1). All of the 14 hospitals had patients with medicine and surgery attending physicians, while eight of the 14 (57%) had patients with a neurology attending physician and 10 of the 14 (71%) had patients with a neurosurgery attending physician.

A total of 1,184 family members (mean age, 58 years) responded to the survey. The majority of family members were non-Hispanic white (86%) and female (68%). Approximately one-half were the patient’s spouse (Table 1).

A total of 593 nurses (mean age, 42 years) returned at least one questionnaire. The median number of surveys completed per nurse was one (range, 1-10). The majority of nurses were non-Hispanic white (83%) and female (86%). Table 2 describes the family- and nurse-assessed outcomes and documentation of indicators of palliative care for the four physician specialties.

#### *Family-Assessed Outcomes*

In the adjusted analyses, only family member ratings of quality of dying were significantly different by physician specialty. Compared with patients cared for by medicine attending physicians, family ratings were higher for patients with a neurology or neurosurgery attending physician (Table 3). There were no significant differences in family ratings of satisfaction with care in the ICU.

#### *Nurse-Assessed Outcomes*

In the adjusted analysis, two of the nurse-assessed outcomes were significantly different across the four

**Table 1—Characteristics of Patients and Families by Specialty of Attending Physician at Time of Death**

Patients	All Patients		Medicine		Surgery		Neurology		Neurosurgery	
	No.	Statistic	No.	Statistic	No.	Statistic	No.	Statistic	No.	Statistic
Age, mean (SD), y	3,124	69.2 (15.2)	2,447	70.3 (14.8)	380	66.3 (17.1)	101	70.0 (14.7)	196	60.1 (18.5)
Female	3,124	41.5	2,447	41.8	380	37.1	101	43.6	196	46.1
Minority race/ethnicity	3,124	21.0	2,447	21.3	380	15.3	101	28.7	196	24.0
Primary condition	3,124		2,447		380		101		196	
Trauma		10.0		5.0		28.9		7.9		35.7
Cancer		14.3		15.8		12.1		3.0		5.1
Other		75.8		79.2		58.9		89.1		59.2
Education	3,044		2,381		370		100		193	
≤ 8th grade		7.7		7.6		9.2		8.0		5.2
Some high school		9.4		9.4		10.8		5.0		9.8
High school graduate or equivalent		40.1		40.4		37.0		41.0		42.0
Some college		23.7		23.6		25.1		23.0		21.2
4-y college degree		13.3		13.5		11.6		13.0		14.5
Postcollege study		5.8		5.5		6.2		10.0		7.3
Had insurance	3,124	84.5	2,447	86.1	380	79.2	101	80.2	196	78.1
Family members										
Age, mean (SD), y	1,180	58.2 (14.3)	867	58.9 (14.6)	166	57.0 (13.6)	48	57.1 (14.4)	99	54.6 (12.8)
Female	1,181	68.2	868	68.5	166	69.9	48	79.2	99	57.6
Minority race/ethnicity	1,169	14.1	858	14.0	165	10.3	48	18.8	98	19.4
Patient's spouse	1,184	45.2	870	46.0	166	36.7	49	46.9	99	51.5

Data are given as No. (%) unless otherwise indicated.

physician specialties (Table 4). Using medicine as the reference group, nurse ratings of quality of dying were significantly higher among patients cared for by neurology or neurosurgery attending physicians and significantly lower among patients cared for by surgery attending physicians. There were also significant differences across the physician specialties in nurse ratings of quality of care by all providers. Although none of the individual physician specialties differed significantly from medicine, when all specialties were included, including the negative rating for surgery specialty, the four specialties were significantly different from one another. There were no specialty differences in nursing satisfaction with meeting family needs.

#### Documentation of Palliative Care

In the adjusted analyses, all but one of the palliative care indicators were significantly different across the physician specialties (Table 5). Using medicine as the reference, patients cared for by neurology and neurosurgery attending physicians had fewer palliative care consultations and fewer documented pain assessments, but more avoidance of CPR, family conferences, and discussions of prognosis in the first 72 h of their ICU stay. In addition, patients with a neurology attending physician had more DNR orders in place at time of death, spent fewer days in the ICU, and had shorter time to withdrawal of mechanical ventilation. Using medicine as the reference group, patients with a surgery attending physician had fewer palliative

care consultations, fewer DNR orders in place at time of death, less withdrawal of life-sustaining therapies, less avoidance of CPR prior to death, fewer discussions of prognosis in the first 72 h, more days in the ICU, and longer time to withdrawal of mechanical ventilation.

#### DISCUSSION

We describe several differences among patients cared for by medicine, surgery, neurology, and neurosurgery attending physicians in the quality of EOL care in the ICU. We found that patients who had a neurology or neurosurgery attending physician at the time of death had higher family and nurse ratings of quality of dying than patients who had a medicine attending physician, while patients with a surgery attending physician had lower nurse ratings of quality of dying than patients who had a medicine attending physician. Interestingly, there were no differences in family or nurse ratings of satisfaction with care when comparing these groups. These discrepant findings between the two outcomes (ie, quality of dying and satisfaction with care) may be explained by differences in the experiences that these surveys measure. The Family Satisfaction in the ICU survey asks family members to rate experiences with providers, including the courtesy shown by staff, the type and completeness of information provided, and the help received with decision-making. The QODD questionnaire asks family members to rate experiences that are directly associated with dying.

**Table 2—Family- and Nurse-Assessed Outcomes and Documented Indicators of Palliative Care, by Specialty of Attending Physician**

Outcomes	All Patients		Medicine		Surgery		Neurology		Neurosurgery	
	No.	Statistic	No.	Statistic	No.	Statistic	No.	Statistic	No.	Statistic
Family-assessed outcomes										
Quality of dying <sup>a</sup>	1,135	7.0 (3.1)	843	6.8 (3.1)	151	6.7 (3.4)	48	8.5 (2.0)	93	7.7 (2.6)
Satisfaction with care <sup>b</sup>	1,162	77.8 (20.3)	855	77.0 (20.3)	159	77.7 (23.1)	49	84.0 (17.3)	99	81.0 (16.0)
Satisfaction with decision-making <sup>b</sup>	1,185	75.4 (22.3)	874	75.1 (22.0)	162	74.2 (25.4)	50	81.1 (20.4)	99	77.2 (20.0)
Total satisfaction <sup>b</sup>	1,167	76.7 (20.3)	859	76.1 (20.3)	160	76.4 (22.9)	49	82.6 (18.0)	99	79.4 (16.3)
Nurse-assessed outcomes										
Quality of dying ratings <sup>a</sup>	1,118	7.2 (2.8)	744	7.2 (2.8)	184	6.4 (3.1)	64	7.6 (1.9)	126	8.0 (2.3)
Quality of care by all providers <sup>a</sup>	1,198	8.4 (1.6)	797	8.5 (1.5)	202	8.2 (1.8)	65	8.5 (1.1)	134	8.5 (1.6)
Satisfaction, team met family's needs <sup>b</sup>	1,153	7.9 (2.0)	766	8.0 (2.0)	190	7.7 (2.1)	63	7.8 (1.9)	134	7.6 (2.1)
Documented indicators of palliative care, %										
Palliative care consultation	2,193	11.7	1,621	12.5	297	11.4	99	10.1	176	4.5
Social work support	3,121	42.6	2,444	39.2	380	47.4	101	58.2	196	68.9
Spiritual care	3,121	46.0	2,444	43.9	380	49.2	101	45.5	196	67.3
DNR order	3,110	81.5	2,435	81.7	378	73.0	101	96.0	196	87.8
Life sustaining therapy withheld/withdrawn	3,110	72.9	2,435	72.5	378	68.5	101	83.2	196	80.6
Pain assessment	3,122	81.1	2,446	81.2	379	82.8	101	77.2	196	78.6
CPR avoided in last hour	3,016	89.3	2,441	89.3	368	81.5	101	99.0	196	99.5
Family conference	3,099	73.0	2,443	72.4	369	68.8	101	83.2	196	83.7
Prognosis discussed	3,097	37.8	2,441	37.2	369	32.0	101	51.5	196	49.0
Days in ICU	3,122	5.6 (9.0)	2,446	5.4 (9.1)	379	7.8 (10.0)	101	3.1 (4.0)	196	5.6 (5.9)
Days to ventilator withdrawal	1,581	6.2 (10.0)	1,193	6.1 (9.9)	187	8.7 (10.5)	69	3.4 (4.5)	132	5.3 (5.7)

Data are given as mean (SD) unless otherwise indicated. DNR = do not resuscitate.

<sup>a</sup>Score could range from 0 (terrible quality) to 10 (almost perfect quality).

<sup>b</sup>Score could range from 0 (not satisfied at all) to 100 (very satisfied).

<sup>c</sup>Score could range from 0 (worst possible) to 10 (best possible).

**Table 3—Association of Attending Physician Specialty With Family-Assessed Outcomes<sup>a</sup>**

Family-Reported Outcome	No.	P Value <sup>b</sup>	Regression Coefficient <sup>b</sup>			
			Medicine	Surgery	Neurosurgery	Neurology
Quality-of-dying rating <sup>c</sup>	1,109	.001	Ref	−0.196	0.739 <sup>d</sup>	1.515 <sup>e</sup>
Satisfaction with care <sup>f</sup>	1,108	.666	Ref	−1.194	0.229	2.618
Satisfaction with decision-making <sup>g</sup>	1,147	.426	Ref	−2.030	−0.411	3.680
Total satisfaction <sup>h</sup>	1,115	.592	Ref	−1.455	−0.076	2.735

Ref = reference.

<sup>a</sup>Associations were tested with multipredictor linear regression models with robust SEs, using a restricted maximum-likelihood estimator. All models included covariate adjustment for hospital (13 dummy indicators) in addition to outcome-specific confounder adjustments noted in subsequent table footnotes.

<sup>b</sup>The overall *P* value for physician specialty was based on the reduction in deviance obtained in a model in which the coefficients for the three dummy indicators for physician specialty were freely estimated, when compared with a model in which the three specialty-related regression coefficients were constrained to 0.0.

<sup>c</sup>Score could range from 0 (terrible quality) to 10 (perfect quality). This model included covariate adjustment for the family member's age.

<sup>d</sup>*P* < .05.

<sup>e</sup>*P* < .001.

<sup>f</sup>Score could range from 0 (not satisfied at all) to 100 (very satisfied). This model included covariate adjustment for the patient's age, sex, education, and insurance status and the family member's age and racial minority status.

<sup>g</sup>Score could range from 0 (not satisfied at all) to 100 (very satisfied). This model included covariate adjustment for patient's age, education, and insurance status and the family member's age.

<sup>h</sup>Score could range from 0 (not satisfied at all) to 100 (very satisfied). This model included covariate adjustment for the patient's age, education, and insurance status and the family member's age and racial minority status.

Therefore, our findings likely reflect differences between physician specialties in the ways in which family members and nurses rate the patients' experience of dying, while suggesting few differences in satisfaction with the critical care that is provided prior to death. This study cannot differentiate the influence of physician specialty from the influence of the different types of patients cared for by these specialties.

Neurology and neurosurgery patients likely have more acute, devastating injuries. Our data show that patients with neurology or neurosurgery attending phy-

sicians have fewer days in the ICU and less time to withdrawal of mechanical ventilation than medicine patients, supporting this hypothesis. In addition, patients with neurology and neurosurgery attending physicians have fewer documented assessments of pain, which may also support our hypothesis that these patients have severe neurologic injury and may be unresponsive or comatose with little sensation of discomfort or awareness. Also, there may be less prognostic uncertainty in cases of devastating neurologic injury that result in death in the ICU. A prior study showed that

**Table 4—Association of Attending Physician Specialty With Nurse-Assessed Outcomes<sup>a</sup>**

Nurse-Assessed Outcome	Patients	Nurses	P Value <sup>b</sup>	Regression Coefficient <sup>b</sup>			
				Medicine	Surgery	Neurosurgery	Neurology
Quality-of-dying rating <sup>c</sup>	1,118	562	< .001	Ref	−0.596 <sup>d</sup>	1.157 <sup>e</sup>	0.860 <sup>f</sup>
Quality of care by all providers <sup>g</sup>	1,193	583	.029	Ref	−0.159	0.463	0.415
Satisfaction, team met family's needs <sup>h</sup>	1,149	568	.665	Ref	−0.185	−0.066	0.195

See Table 3 legend for expansion of abbreviation.

<sup>a</sup>Associations for all outcomes were tested with complex multipredictor regression models, with patients clustered under nurses and estimates based on restricted maximum likelihood. Two outcomes (the quality of dying rating, satisfaction with how well the team met the family's needs) were tested with linear regression; the other outcome (quality of care by all providers) was censored from above and was tested with Tobit regression. All models included covariate adjustment for hospital (13 dummy indicators) in addition to outcome-specific confounder adjustments noted in subsequent table footnotes.

<sup>b</sup>The overall *P* value for physician specialty is based on the reduction in deviance obtained in a model in which the coefficients for the three dummy indicators for physician specialty were freely estimated, when compared with a model in which the three specialty-related regression coefficients were constrained to 0.0.

<sup>c</sup>Score could range from 0 (terrible quality) to 10 (perfect quality).

<sup>d</sup>*P* < .05.

<sup>e</sup>*P* < .001.

<sup>f</sup>*P* < .01.

<sup>g</sup>Score could range from 0 (worst possible care) to 10 (best possible care). This model included covariate adjustment for nurse's racial minority status.

<sup>h</sup>Score could range from 0 (not satisfied at all) to 10 (very satisfied). This model included covariate adjustment for patient disease (cancer, trauma, other) and nurse's racial minority status.

**Table 5—Association of Attending Physician Specialty With Medical-Record-Assessed Outcomes<sup>a</sup>**

Medical Record Outcome	No.	P Value <sup>b</sup>	Regression Coefficient <sup>b</sup>			
			Medicine	Surgery	Neurosurgery	Neurology
Palliative consult	2,193 <sup>c</sup>	< .001	Ref	−0.702 <sup>d</sup>	−1.995 <sup>e</sup>	−1.048 <sup>d</sup>
Social work services <sup>e</sup>	3,121	.675	Ref	0.055	0.188	−0.144
Spiritual care <sup>f</sup>	3,121	< .001	Ref	0.041	0.749 <sup>e</sup>	−0.199
DNR in place <sup>g</sup>	3,110	< .001	Ref	−0.635 <sup>e</sup>	0.226	1.279 <sup>h</sup>
LST withdrawn/withheld <sup>i</sup>	3,110	.008	Ref	−0.364 <sup>d</sup>	0.218	0.234
Pain assessment	3,122	.007	Ref	−0.187	−0.643 <sup>d</sup>	−0.685 <sup>h</sup>
CPR avoided, last hour	3,106	< .001	Ref	−0.813 <sup>e</sup>	2.844 <sup>d</sup>	2.234 <sup>h</sup>
Family conference, first 72 h	3,109	< .001	Ref	−0.215	0.625 <sup>d</sup>	0.633 <sup>h</sup>
Prognosis discussed, first 72 h <sup>j</sup>	3,107	< .001	Ref	−0.255 <sup>h</sup>	0.551 <sup>d</sup>	0.783 <sup>e</sup>
Days in ICU	3,122	< .001	Ref	−0.250 <sup>e</sup>	−0.010	0.510 <sup>e</sup>
Time to MV withdrawal <sup>k</sup>	1,581	< .001	Ref	−0.318 <sup>e</sup>	0.149	0.593 <sup>e</sup>

LST = life-sustaining therapy; MV = mechanical ventilation. See Table 2 and 3 legends for expansion of other abbreviations.

<sup>a</sup>Associations for all outcomes except those related to time (days in ICU and time to MV withdrawal) were tested with multipredictor logistic regression models; the time-related variables were tested with Cox models (for Cox model coefficients, the higher the value, the shorter the associated time period). All estimates are based on restricted maximum likelihood. All models included covariate adjustment for hospital (13 dummy indicators) in addition to outcome-specific confounder adjustments noted in subsequent table footnotes.

<sup>b</sup>The overall P value for physician specialty is based on the reduction in deviance obtained in a model in which the coefficients for the three dummy indicators for physician specialty were freely estimated, when compared with a model in which the three specialty-related regression coefficients were constrained to 0.0.

<sup>c</sup>From the initial 3,121 records with valid data on all predictors, 928 records were not used in the coefficient estimates for palliative care consult because this outcome was uniformly 0 at five of the hospitals, and records from those hospitals were dropped for purposes of estimation.

<sup>d</sup>P < .01.

<sup>e</sup>P < .001.

<sup>f</sup>This model included covariate adjustment for patient age.

<sup>g</sup>This model included covariate adjustment for patient age and sex.

<sup>h</sup>P < .05.

<sup>i</sup>This model included covariate adjustment for disease (cancer, trauma, other).

<sup>j</sup>This model included covariate adjustment for patient age and disease (cancer, trauma, other).

patients with more severe neurologic injury and a diagnosis of subarachnoid hemorrhage or ischemic stroke were more likely to undergo withdrawal of mechanical ventilation, suggesting that EOL decisions in this population are often based on the severity of the acute neurologic condition.<sup>6</sup>

In addition to higher ratings of quality of dying, patients with a neurology or neurosurgery attending physician had more chart documentation of some indicators of palliative care than patients with a medicine attending physician, while patients with a surgery attending had fewer documented indicators. There were some exceptions to this pattern. For example, patients with a neurology or neurosurgery attending physician had fewer documented pain assessments, which may reflect their overall neurologic condition. All other physician specialties' patients had fewer palliative care consultations than patients of medicine attending physicians. Palliative care consultations possibly were not viewed to be necessary as often for the neurology and neurosurgery patients because of their shorter ICU lengths of stay, lower levels of consciousness, and, perhaps, less prognostic uncertainty. For surgical patients with less overall documentation of indicators of palliative care, increased use of palliative care consultation may represent a target for quality improvement.<sup>5,27</sup>

Surgical patients and surgical practice may present unique challenges for integration of palliative care into the ICU.<sup>5,28,29</sup> The majority of deaths in the surgical ICU occur after a prolonged hospital course complicated by multiorgan failure with intermittent periods of improvement and deterioration.<sup>30–32</sup> These cases may provide unique challenges to providing patients and families with prognostic information. In addition, the primary ethical principle governing care in the surgical ICU may be different than that in a nonsurgical ICU, with more focus on a covenantal ethic rather than an ethic of scarce resources.<sup>33–35</sup>

This study has several important limitations. First, there may be misclassification, with patients categorized based on the specialty of the attending physician at time of death. Furthermore, when categorizing patients by physician specialty, we are capturing differences both in the types of patient cared for by specific specialties, as well as different types of patients. This study cannot adequately separate the influence of patients from health-care providers, although the pattern found with differences in quality of dying but not satisfaction with care suggest that patient factors may play an important role. Second, there may be other important, potentially confounding characteristics of the ICUs in this study, including staffing models,

multidisciplinary rounding, and nursing protocols, in addition to physician-level characteristics, that are not measured in our data. Third, while we suspect that patients with a neurology or neurosurgery attending physician had lower levels of consciousness during their ICU stay, we could not confirm this suspicion. Glasgow Coma Scale was documented in only some of the hospitals, and even in those hospitals with regular documentation of Glasgow Coma Scale, it was only documented in a minority of patients in the last 24 h of life. Fourth, the response rates for the family and nurse surveys, while typical for this type of research, are low and may introduce nonresponse bias.<sup>36</sup> Fifth, severity of illness scores such as Simplified Acute Physiology Score or APACHE (Acute Physiology and Chronic Health Evaluation) were not abstracted for this study, as all patients died during the study. It is possible that this information would help characterize the severity of illness at presentation and provide additional insights to these results. Finally, while a strength of this study is that it was conducted at multiple hospitals, all are located in a limited geographic region, which may limit our ability to generalize to other regions.

## CONCLUSIONS

Family and nurse satisfaction with EOL care was not associated with ICU physician specialty, but patients with neurology or neurosurgery attending physicians had higher family and nurse ratings of quality of dying than patients with medicine attending physicians and a different pattern of indicators of palliative care. Patients with surgery attending physicians had lower nurse ratings of quality of dying and fewer documented indicators of palliative care. These findings may provide insights to improve the quality of dying for all patients. Interventions to provide quality EOL care in the ICU may need to take attending physician specialty and patient diagnosis into account by targeting specific quality indicators or by adapting interventions to target patient and physician differences.

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*Dr Kross:* contributed to the study concept and design, data analysis and interpretation, drafting and revision of the manuscript, and approval of the final version and served as principal author.

*Dr Engelberg:* contributed to the study concept and design; data collection, analysis, and interpretation; drafting and revision of the manuscript; and approval of the final version.

*Ms Downey:* contributed to data collection, interpretation, and analysis; revision of the manuscript; and approval of the final version.

*Dr Cuschieri:* contributed to data analysis, revision of the manuscript, and approval of the final version.

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*Dr Tirschwell:* contributed to data analysis, revision of the manuscript, and approval of the final version.

*Dr Curtis:* contributed to the study concept and design; data collection, analysis, and interpretation; drafting and revision of the manuscript, and approval of the final version.

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**Additional information:** The e-Appendix can be found in the "Supplemental Materials" area of the online article.

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