Integrating Palliative and Critical Care
Evaluation of a Quality-Improvement Intervention

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Rationale: **Palliative care in the intensive care unit (ICU) is an important focus for quality improvement.**

Objectives: **To evaluate the effectiveness of a multi-faceted quality improvement intervention to improve palliative care in the ICU.**

Methods: **We performed a single-hospital, before–after study of a quality-improvement intervention to improve palliative care in the ICU. The intervention consisted of clinician education, local champions, academic detailing, feedback to clinicians, and system support. Consecutive patients who died in the ICU were identified pre- (n = 253) and postintervention (n = 337). Families completed Family Satisfaction in the Intensive Care Unit (FS-ICU) and Quality of Dying and Death (QODD) surveys. Nurses completed the QODD. The QODD and FS-ICU were scored from 0 to 100. We used Mann-Whitney tests to assess family results and hierarchical linear modeling for nurse results.**

Measurements and Main Results: **There were 590 patients who died in the ICU or within 24 hours of transfer; 496 had an identified family member. The response rate for family members was 55% (275 of 496) and for nurses, 89% (523/590). The primary outcome, the family QODD, showed a trend toward improvement (pre, 62.3; post, 67.1), but was not statistically significant ($P = 0.09$). Family satisfaction increased but not significantly. The nurse QODD showed significant improvement (pre, 63.1; post, 67.1; $P < 0.01$) and there was a significant reduction in ICU days before death (pre, 7.2; post, 5.8; $P < 0.01$).**

Conclusions: **We found no significant improvement in family-assessed quality of dying or in family satisfaction with care, we found but significant improvement in nurse-assessed quality of dying and reduction in ICU length of stay with an intervention to integrate palliative care in the ICU. Improving family ratings may require interventions that have more direct contact with family members.**

Keywords: intensive care; critical care; withdrawing life support; end-of-life care; palliative care

Approximately 20% of deaths in the United States occur in an intensive care unit (ICU) or shortly after a stay in the ICU (1, 2). The majority of deaths in the ICU are preceded by a decision to withhold or withdraw life-sustaining therapies (3–7). There is considerable evidence of problems in the quality of care these patients and their families receive (1, 8–10). For example, many patients die with moderate or severe pain (1) and physicians are often unaware of patients' preferences regarding end-of-life care (11). In addition, family members of critically ill patients have a high prevalence of symptoms of anxiety, depression, and post-traumatic stress disorder (PTSD) associated with having a loved one in the ICU (12, 13). These family members report a number of physician and nurse behaviors that make families feel excluded or that increase their burden after a loved one dies in the ICU (9). These data provide strong evidence that there are numerous problems in the delivery of high-quality, end-of-life care in the ICU setting.

There have been a number of studies since 2000 that have suggested that interventions to improve communication with families in the ICU can improve end-of-life care. Several communication-based interventions were associated with a reduction in ICU days before death and the interventions included routine ethics consultation, routine palliative care consultation, and a policy for the conduct of an ICU family conference within 3 days of ICU admission (14–20). However, an important limitation of these studies was that the only outcome assessed was the patient's length of stay in the ICU before death. There were no patient-centered or family-centered outcomes. In 2007, an important study from France showed that an intervention consisting of a proactive ICU family conference in combination with a bereavement pamphlet resulted in dramatic reductions in symptoms of anxiety, depression, and PTSD among family members 3 months after a death in the ICU (21). Although this study represents an important advance, two factors may limit our ability to apply the findings to critical care settings in North America. First, families in France have been less likely to participate in end-of-life decision making as compared with those in the United States (22–24). Second, in this French study, patients became eligible only when physicians were confident that the patient would die, which is often relatively late in the ICU stay and may miss earlier opportunities for improving palliative and end-of-life care.

AT A GLANCE COMMENTARY

Scientific Knowledge on the Subject

One in five Americans die in the intensive care unit and yet palliative care in this setting is often of poor quality. Therefore, this is an important focus for quality improvement.

What This Study Adds to the Field

We found no significant improvement in family-assessed quality of dying or in family satisfaction with care, but there was significant improvement in nurse-assessed quality of dying and reduction in ICU length of stay with an intervention to integrate palliative care in the ICU. Improving family ratings may require interventions that have more direct contact with family members.

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In an effort to improve palliative and end-of-life care in the ICU at our institution, we developed a multifaceted, interdisciplinary, quality-improvement intervention that is based on self-efficacy theory (25–27) as applied to changing clinician behavior (28, 29). In this report, we describe a before–after study designed to evaluate the effectiveness of this intervention using families' ratings of the quality of dying and death as a primary outcome. Secondary outcomes included family satisfaction with care, nurse assessment of the quality of dying and death, and length of stay in the ICU before death. These results were reported previously as an abstract (30).

METHODS

Overview

This study represents a before–after evaluation of an interdisciplinary, multifaceted intervention designed to improve ICU clinicians' ability to provide palliative and end-of-life care to critically ill patients and their family members. We hypothesized that a successful intervention would result in the following: (*1*) improved family ratings of the patient's quality of dying and death and family satisfaction with care, (*2*) improved nurse ratings of the patient's quality of dying and death, and (*3*) reduced length of stay in the ICU for patients who died in the ICU or within 24 hours of ICU discharge. This study took place at a university-based, inner-city 350-bed level I trauma center with 65 ICU beds. The University of Washington Human Subjects Division approved all study procedures.

Intervention

The intervention targeted the clinicians and the hospital, not individual patients or family members. This quality-improvement intervention was based on self-efficacy theory in which we anticipated that changes in knowledge, attitude, and behaviors of ICU clinicians would result in improvements in palliative and end-of-life care in the ICU, and the intervention occurred over a 10-month period (April 2004 to November 2004). The intervention has been described in detail previously and is outlined in Table 1 (*see also* the online supplement for details) (31).

Outcome Evaluation

To identify eligible patients, we examined hospital admission, discharge, and/or transfer records daily during two time periods: before the intervention (July 2003 to March 2004) and after the intervention (December 2004 to October 2005). Eligible patients were those who had died in an ICU after a minimum stay of 6 hours before death or who had died within 24 hours after being transferred to another hospital location from the ICU. We excluded patients who were in the ICU for less than 6 hours because clinicians may not have had enough time to affect their care. Patients who died more than 24 hours after transfer out of the ICU were excluded because we suspected that prior care in the ICU might not have exerted a sufficiently significant impact on ratings of quality of end-of-life care.

Family members who were the legal next of kin were identified from medical records. Questionnaires were mailed to the family member 4 to 6 weeks after a patient's death. The nurse questionnaires were distributed within 48 hours of an eligible patient's death to the nurse caring for the patient during the shift that the patient died or was transferred from the ICU. It was also distributed to the nurse who was caring for the patient during the prior shift. Methods used to enhance survey response rates are included in the online supplement.

Measures

The Quality of Dying and Death (QODD) questionnaire was developed to allow families or clinicians to evaluate a patient's experiences at the end of life. A 31-item family-assessed QODD was validated in a study of 204 deaths and was shown to have good internal consistency (Cronbach's α, 0.86) and construct validity, correlating significantly with measures of symptom burden, patient–clinician communication about treatment preferences, and several measures of quality of care (32). A shorter QODD "hospital version" has been used to evaluate the quality of ICU deaths in several studies (33–36). The 21-item version has been shown to have moderate to good interrater reliability among family members, with an intraclass correlation coefficient of 0.44 (35). The ICU nurse–assessed QODD has been shown to have construct validity with significantly higher scores among patients who did not receive cardiopulmonary resuscitation in the last 8 hours of life and for patients who had someone present at the time of their death (34). The QODD total score is calculated by averaging available items and the score is linearly transformed to range from 0 to 100, and oriented so that higher values indicate higher quality of dying. The QODD and scoring instructions are available online (37).

The Family Satisfaction in the Intensive Care Unit survey (FS-ICU) is a reliable and valid 34-item tool designed to measure family satisfaction with ICU care developed and validated by Heyland and colleagues (38, 39). Recently, the FS-ICU was reduced to 24 items, and a validated scoring method was developed (40). This scoring approach provides a total satisfaction score (24 items), as well as subscale ratings for satisfaction with care (14 items) and satisfaction with decision making (10 items). The total and subscale scores are calculated by averaging available items and the scores are linearly transformed to range from 0 to 100, and oriented so that higher values indicate increased satisfaction. The survey (with instructions) is available online (41).

Chart Abstraction

Eligible patients' medical records were reviewed by trained chart abstractors using a standardized chart abstraction protocol, regardless of whether or not the family returned a questionnaire. Chart abstractor training included at least 80 hours of formal training. Training included instruction on the protocol, guided practice charts, and independent

TABLE 1. DESCRIPTION OF THE INTEGRATING PALLIATIVE AND CRITICAL CARE INTERVENTION

Intervention Component	Description	Content/Examples
1. Critical care clinician education in palliative care	Lectures, pamphlets Poster boards and pamphlets Teaching video	Principles of decision making Communication with patients, families, and the ICU team Symptom management Principles and practice of withdrawal of life support Principles of cross-cultural communication
2. Training of ICU local champions	Half- or full-day training sessions	Same as above plus discussions of role modeling in palliative care and facilitating behavior change
3. Academic detailing of nurse and physician directors	One-on-one session with investigators to identify local barriers to palliative care	Review unit-specific issues and problems and identify solutions
4. Feedback on quality-improvement data	Unit-specific family satisfaction data, family ratings of quality of dying, and nurse-assessed quality of dying	Items from FS-ICU questionnaire and selected items from QODD
5. System supports	Hospital or ICU level resources	Family information pamphlets "Get to know me" posters for ICU rooms Withdrawal of life support order formsICU clinician support sessions

Definition of abbreviations: FS-ICU = Family Satisfaction in the Intensive Care Unit survey; ICU = intensive care unit; QODD = Quality of Dying and Death survey. *See* the online supplement for additional details.

chart review followed by reconciliation with the research-abstractor trainer. Abstractors were required to reach 90% agreement with the trainer before being able to code independently. After initial training, 5% of the charts were coreviewed to ensure greater than 95% agreement on the 440 abstracted data elements.

Analyses

Analyses were designed to compare pre- and postintervention scores for patient and family characteristics and on the outcome measures. Bivariate statistics were used to compare patient, family, and nurse groups on demographic variables using *t* tests or analysis of variance for normally distributed variables, Mann-Whitney or Kruskal-Wallis analyses for skewed variables, and χ^2 for dichotomous variables. Pre- and postintervention family QODD and FS-ICU scores and length of stay were compared using Mann-Whitney nonparametric tests. The primary outcome variable was the family QODD and the study was powered to have a 90% chance of detecting a 10-point difference on a 0–100 scale (a Cohen effect size of 0.4 representing a moderate difference) and a 62% chance of finding a 7-point difference (a Cohen effect size of 0.28 representing a small difference) (42, 43). Length of stay was expressed as both medians and means to fully describe the data, but bivariate statistical comparisons were only conducted using nonparametric analyses. In addition, we conducted multivariate analyses to control for potential differences between the pre- and postintervention groups. For family-assessed outcomes, we included the following variables: patient age, sex, race/ethnicity, and diagnosis; family member age and sex. For length of stay, we included only patient variables: age, sex, race/ethnicity, and diagnosis. We used ordered probit regression for the family QODD and FS-ICU scores because these outcomes were not normally distributed, and Cox regression for length of stay. Multivariate analyses confirmed the bivariate analyses and are described in the online supplement.

Because nurses often completed more than one questionnaire, nurse-assessed QODD scores on different patients could not be considered independent. We therefore used ordered probit regression models with clustering to control for lack of independence within nurses, adjusting for the same patient characteristics as described above (i.e., age, sex, race/ethnicity, diagnosis, ICU length of stay) and additional nurse characteristics (i.e., age, sex, race/ethnicity, years in critical care nursing). These analyses all confirmed the unadjusted analyses (*see* the online supplement). The level for determining statistical significance for all tests was set at $P < 0.05$.

RESULTS

Sample and Response Rates

There were 590 eligible patients who died in the ICU or within 24 hours of transfer from the ICU, with 253 patients in the preintervention period and 337 in the postintervention time period. Of these 590 patients, we were able to locate and abstract the medical record for all but five individuals (abstraction rate, 99.2%). Patients in the pre- and postintervention samples did not differ significantly on any of the demographic characteristics collected from chart abstraction (Table 2). More than half of the patients were male (67%), about three-quarters were white, and their average age was 62 years.

There were 496 patients for whom we identified a family member from the medical record. Of these family members, 275 (55.4%) completed and returned the survey. Most responding family members were white and female, and almost half of respondents were the patient's spouse (Table 3). Responding families did not differ significantly between the pre- and postintervention periods on any of the demographic data collected from family questionnaires (Table 3). Patients without family questionnaires differed significantly from patients with family questionnaires by race; they were less often white (70.5 vs. 82.2%) and more often Hispanic (5.1 vs. 1.8%) (Table 4). They also differed by length of stay, with patients with family questionnaires experiencing longer median ICU stays (3.9 vs. 2.9 d, $P = 0.001$). There were also small differences by patient's primary diagnosis (Table 4).

We identified ICU nurses caring for an eligible patient on the shift of death (or transfer out of the ICU) or the shift before death and distributed 1,155 nurse questionnaires (preintervention, n = 499; postintervention, n = 656); 787 of these questionnaires were

TABLE 2. DEMOGRAPHIC CHARACTERISTICS OF PATIENTS DURING THE PRE- AND POSTINTERVENTION TIME PERIOD

Patient Demographics	Preintervention, All Patients (*n = 253*)*	Postintervention, All Patients (*n = 337*)†	*P* Value‡
Mean age, yr (SD)	62.0 (17.51)	61.7 (17.65)	0.98
Male, % (n)	66.9 (168)	66.5 (222)	0.91
Race/ethnicity, % (n)§			
White, non-Hispanic	73.7 (185)	78.7 (263)	0.18
Black	6.4 (16)	5.1 (17)	0.15
Hispanic	4.4 (11)	3.0 (10)	0.37
Asian	6.8 (17)	7.2 (24)	0.20
Native American	1.2 (3)	2.1 (7)	0.16
Pacific-Islander	0.8 (2)	0.6 (2)	0.19
Other	0.8 (2)	0.3 (1)	0.15
Primary admission diagnosis, % (n)			0.06
Cardiovascular	8.8 (22)	4.8 (16)	
Infectious	13.2 (33)	11.7 (39)	
Respiratory	6.0 (15)	8.1 (27)	
Gastrointestinal and hepatic	7.6 (19)	4.2 (14)	
Neurological	30.3 (76)	36.8 (123)	
Trauma	20.7 (52)	18.9 (63)	
Cancer	3.6 (9)	1.8 (6)	
Miscellaneous	9.2 (23)	13.5 (45)	
Missing	0.8 (2)	0.3 (1)	

* Data available for 251 patients.
† Data available for 334 patients.
‡ *P* values based on Mann-Whitney and Chi square tests.
§ Race/ethnicity was coded as "all that apply" and therefore are not mutually exclusive categories.

TABLE 3. COMPARISON OF DEMOGRAPHIC CHARACTERISTICS OF FAMILIES COMPLETING STUDY QUESTIONNAIRES IN THE PRE- AND POSTINTERVENTION TIME PERIOD

Family Demographics	Preintervention (*n = 125*)	Postintervention (*n = 150*)	*P* Value*
Family member age, yr (SD)	56.0 (12.95)	56.9 (14.45)	0.54
No. years known patient (SD)	38.4 (16.69)	38.5 (15.10)	0.94
Male, % (n)	38.4 (48)	30.0 (45)	0.13
Race/ethnicity, % (n)†			
White, non-Hispanic	82.4 (103)	86.0 (129)	0.39
Black	4.8 (6)	2.7 (4)	0.46
Hispanic	3.2 (4)	4.7(7)	0.82
Asian	8.0 (10)	4.0 (6)	0.27
Native American	6.4 (8)	4.0 (6)	0.48
Pacific Islander	0.8 (1)	2.0 (3)	0.50
Other	0.8 (2)	0 (0)	0.10
Relationship to the patient, % (n)			0.41
Spouse of patient	44.0 (55)	45.3 (68)	
Child of patient	31.2 (39)	22.7 (34)	
Other relationship	24.0 (30)	32.0 (48)	
Lived with patient, % (n)	52.0 (65)	62.2 (92)	0.15
Level of education, % (n)			0.92
Eighth grade or less	1.6 (2)	2.0 (3)	
Some high school	4.0 (5)	5.3 (8)	
High school diploma or GED	20.0 (25)	18.0 (27)	
Some college or trade school	41.6 (52)	45.3 (68)	
Four-year college degree	20.0 (25)	14.7 (22)	
Graduate or professional school	12.0 (15)	14.0 (21)	

* *P* values based on Mann-Whitney and χ^2 tests.
† Race/ethnicity was coded as "all that apply" and therefore are not mutually exclusive categories.

TABLE 4. DEMOGRAPHIC CHARACTERISTICS OF PATIENTS WITH AND WITHOUT FAMILY QUESTIONNAIRES

Patient Demographics	Patients without Family Questionnaires (*n = 315*)	Patients with Family Questionnaires (*n = 275*)	*P* Value*
Mean age, yr (SD)	61.24 (17.49)	62.45 (17.68)	0.25
Male, % (n)	67.9 (214)	64.0 (176)	0.20
Race/ethnicity, % (n)†			
White, non-Hispanic	70.5 (222)	82.2 (226)	**0.02**
Black	7.0 (22)	4.0 (11)	0.19
Hispanic	5.1 (16)	1.8 (5)	**0.03**
Asian	7.6 (24)	6.2 (17)	0.46
Native American	1.3 (4)	2.2 (6)	0.47
Pacific-Islander	1.0 (3)	0.4 (1)	0.44
Other	1.0 (3)	0 (0)	0.20
Primary admission diagnosis, % (n)			**0.02**
Cardiovascular	6.4 (20)	6.6 (18)	
Infectious	14.6 (46)	9.5 (26)	
Respiratory	8.3 (26)	5.8 (16)	
Gastrointestinal and hepatic	3.8 (12)	7.6 (21)	
Neurological	30.5 (96)	37.5 (103)	
Trauma	17.1 (54)	22.2 (61)	
Cancer	3.5 (11)	1.5 (4)	
Miscellaneous	13.7 (43)	9.1 (25)	
Missing	2.2 (7)	0.4 (1)	
Median ICU length of stay, d (IQR)	2.90 (1.02–7.34)	3.86 (1.64–9.77)	**0.001**
Mean ICU length of stay, d (SD)	5.74 (7.81)	7.18 (8.67)	

Definition of abbreviations: ICU = intensive care unit; IQR = interquartile range.
Boldface type denotes statistically significant differences at $P < 0.05$.
* *P* values based on Mann-Whitney and χ^2 tests.
† Race/ethnicity was coded as "all that apply" and therefore are not mutually exclusive categories.

returned (preintervention, n = 328; postintervention, n = 459) for an overall nurse response rate of 68.1%. We selected one nurse survey per patient based on the survey that was most complete or, if two surveys were equally complete, by randomly selecting one survey. We thereby selected 523 nurse surveys (preintervention, n = 216; postintervention, n = 307) representing unique patients. Our overall nurse survey completion rate based on eligible patients was 88.7% (523/590).

We also assessed whether the demographics (i.e., age, sex, race/ethnicity) of patients with questionnaires from nurses varied significantly between the pre- and postintervention period. We found no significant differences (*see* the online supplement).

Family-assessed Outcomes

The predetermined primary outcome for this study is the family QODD. In bivariate analyses, the family QODD total score showed a trend toward improvement, with a preintervention score of 62.3 (SD, 25.1) and a postintervention score of 67.1 (SD, 25.9), but this difference did not achieve statistical significance ($P = 0.09$). Similarly, family satisfaction with care, as assessed by the FS-ICU total score, also showed a trend toward improvement, with a preintervention score of 80.8 (SD, 16.2) compared with a postintervention score of 83.0 (SD, 16.5), but this did not achieve statistical significance ($P = 0.14$). In addition to the total score, the FS-ICU has two subscales (satisfaction with care and satisfaction with decision making) that showed no significant changes between the pre- and postintervention time periods (Table 5).

Nurse-assessed Outcomes

The nurse-assessed QODD score showed a significant improvement after the intervention, with a preintervention score of 63.1 (SD, 18.1) and a postintervention score of 67.1 (SD, 23.7) ($P < 0.01$; *see* Table 5). These findings remained after controlling for patient age, sex, race/ethnicity, diagnosis, and nurse age, sex, race/ethnicity, and years in critical care nursing (*see* the online supplement).

TABLE 5. COMPARISON OF OUTCOMES FOR PRE- AND POSTINTERVENTION

Outcomes	Preintervention	Postintervention	*P* Value*
Family-assessed outcomes	(*n = 125*)	(*n = 150*)	
Family-assessed QODD total score (SD)	62.3 (25.1)	67.1 (25.9)	0.09
Family satisfaction with ICU care (FS-ICU)			
Total score (SD)	80.8 (16.18)	83.0 (16.54)	0.14
Satisfaction with care (SD)	81.6 (17.10)	85.2 (15.24)	0.07
Satisfaction with decision-making subscale (SD)	79.1 (19.48)	80.21 (20.46)	0.43
Nurse-assessed outcomes	(*n = 216*)	(*n = 307*)	
Nurse-assessed QODD total score (SD)	63.1 (18.1)	67.1 (23.7)	**0.01**
Length of stay variables	(*n = 253*)	(*n = 337*)	
Median length of ICU stay in days (IQR)	3.85 (1.57–9.47)	3.06 (1.02–7.25)	**0.01**
Mean length of ICU stay in days (SD)	7.19 (8.81)	5.83 (7.76)	
Median length of hospital stay in days (IQR)	5.00 (2–11.75)	4.00 (1–10.0)	**0.02**
Mean length of hospital stay in days (SD)	9.38 (12.95)	7.54 (9.37)	

Definition of abbreviations: ICU = intensive care unit; IQR = interquartile range; QODD = Quality of Dying and Death survey.
* *P* values based on Mann-Whitney and χ^2 tests.

Length of Stay

Using bivariate analyses, we identified a significantly smaller number of ICU days before death for patients in the postintervention group, with a median length of stay in the preintervention group of 3.9 days (interquartile range, 1.57–9.47) as compared with a median length of stay in the postintervention group of 3.1 days (interquartile range, 1.02–7.25) ($P < 0.01$; *see* Table 5). In the multivariate Cox regressions, this finding remained significant after controlling for patient age, sex, race/ethnicity, and patient diagnosis (*see* the online supplement).

DISCUSSION

This study represents a before–after evaluation of a multifaceted quality-improvement intervention to improve palliative care in the ICU using survey-based family- and nurse-assessed outcome measures as well as length of stay. This evaluation does not demonstrate the effectiveness of the intervention based on the primary outcome variable, the family QODD score. In addition, we did not show a significant increase in family-assessed satisfaction with ICU care. However, we did see a significant improvement in the nurse-assessed QODD total score as well as a significant reduction in the ICU length of stay before death. Furthermore, there was a trend toward improvement in the family-assessed QODD and in the total score assessing family satisfaction with care. The results of this before–after study suggest that this quality-improvement intervention does not produce significant improvements in family ratings of care, but that the intervention may improve another measure of quality of care, nurse assessment of the quality of dying. In addition, this intervention was associated with a reduction in the ICU length of stay for patients who died without any evidence of worsening of family satisfaction or family ratings of the quality of the patient's death.

Our results raise questions of the "responsiveness to change" and the "minimal clinically important difference" in the family-assessed outcome measures (44, 45). Both the QODD and the FS-ICU were developed and validated as outcome measures of interventions to improve the quality of care (32–41, 46, 47). However, responsiveness and the minimal clinically important difference for these measures have not been defined. Therefore, we were unable to determine whether there might have been important changes in family assessment of the quality of dying or family satisfaction that these instruments or our sample size were unable to detect. Our study had 90% power to identify a 10-point difference in the QODD, which represents a moderate effect size based on a Cohen effect size of 0.4. However, we only had 62% power to identify a 7-point difference, which represents a small Cohen effect size of 0.28 (42, 43). We previously reported family-assessed QODD scores that were 7 points higher for patients who died in the location they preferred (home or health care institution) as compared with patients who did not (32). This would suggest that 7 points might be a clinically significant difference, but that a larger sample size might be needed to demonstrate the statistical significance for this difference. Further study is needed to determine the responsiveness and the minimal clinically important difference of these measures.

In the 1990s, a landmark randomized trial attempted to improve the quality of end-of-life care in seriously ill hospitalized adults in the United States by providing prognostic information to patients, families, and physicians, and by attempting to facilitate communication between physicians, patients, and family members (1). The Study to Understand Prognoses and Preferences for Outcomes and Risks of Treatment (SUPPORT) found no difference in quality of care based on this intervention. There have been a number of randomized trials or before–after studies since 2000 that have suggested that interventions to improve communication with families about decision making in the ICU can improve the quality of end-of-life care, using as an outcome variable the number of days in the ICU before death (14–20). The rationale for this outcome measure is that these interventions decrease the "prolongation of dying" that commonly occurs in hospitals and ICUs. However, an important limitation of this outcome variable is that it does not directly assess quality of care or patient- or family-centered outcomes and, theoretically, it might be possible to reduce ICU days before death in a way that was associated with worsened patient or family experiences (48). Our current study is the first to show that an intervention that was associated with a reduced the ICU length of stay was also associated with no evidence of worsening in patient- and family-centered outcomes and a trend toward improvement in these outcomes.

In 2007, a study from France showed that an intervention consisting of a proactive ICU family conference in combination with a bereavement pamphlet resulted in dramatic reductions in family-centered outcomes—symptoms of anxiety, depression, and PTSD—among family members 3 months after a death in the ICU (21). Interestingly, this study did not show a reduction in the ICU length of stay associated with the intervention, although this may be because the study targeted patients who the attending physician expected would die in a few days and therefore may have been too late in the course of critical illness to reduce length of stay. Nonetheless, the French study documented for the first time that an intervention to improve communication with family members in the ICU could result in significant improvement in family-centered outcomes.

Our current study has a number of important limitations. First, the before–after design cannot exclude the possibility of temporal trends affecting the results of the study. The results of any before–after study of an intervention must therefore be interpreted with caution. The most effective method to exclude the possibility of temporal trends would be to conduct a randomized trial. A randomized trial of this hospital-based intervention would require randomizing hospitals, which is expensive and time-consuming. Second, the outcome measures used in this study, the QODD and the FS-ICU, have been carefully developed and validated (32–36, 38–40, 46, 47). However, these measures have not demonstrated responsiveness to change, and minimal clinically important differences have not been defined. We powered this study to find a moderate effect size, as determined statistically with a Cohen effect size of 0.4, but our study was underpowered to identify a small effect size (42, 43). In addition, measurement of anxiety, depression, or PTSD symptoms might have improved our ability to assess family-centered outcomes, but these measures were not considered at the time the study was implemented. Third, the development and implementation of this multifaceted intervention is relatively complex, and it is not possible to determine which components might be useful. It would be more consistent with the traditional scientific method to change only one variable. However, prior studies convincingly show that a multifaceted intervention is necessary to change clinician behavior (28). Fourth, our response rate for family members was 55%, which could introduce response bias. However, this response rate was the same in the pre- and postintervention periods and is similar to other survey studies enrolling family members after the death of a loved one (49–51). Finally, this study occurred at one hospital and the effect of the intervention on the quality of care may be institution specific. Two prior small studies examining family QODD scores for ICU patients ranged from 60.0 (SD, 14.0) (35) to 77.7 (SD, 9.3) (33), suggesting considerable variability across institutions, but also suggesting that baseline quality of care at our institution is within

a range seen at other hospitals. Further studies are needed to assess generalizability of the intervention and results.

In summary, this article describes a before–after evaluation of a multifaceted quality-improvement project designed to improve the quality of palliative care in the ICU. The intervention was associated with improved nurse ratings of the quality of dying and decreased ICU length of stay among those who died in the ICU, but we did not demonstrate statistically significant improvements in family ratings of the quality of dying or satisfaction with ICU care. The study provides some evidence supporting further examination of this type of intervention, but does not provide evidence that this intervention can improve family ratings of quality of care. Improving family ratings may require that intervention components directly target individual patients and family members and have more direct contact with family members.

Conflict of Interest Statement: None of the authors has a financial relationship with a commercial entity that has an interest in the subject of this manuscript.

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