Impact of Critical Care Medicine Training Programs' Palliative Care Education and Bedside Tools on ICU Use at the End of Life

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Abstract

Background Intensive care unit (ICU) use at the end of life is rising. Little research has focused on associations among critical care fellows' training, institutional support, and bedside tools with ICU use at the end of life.

Objective We evaluated whether hospital and critical care medicine program interventions were associated with ICU use in the last 6 months of life for patients with chronic illness.

Methods Our observational, retrospective study explored associations between results from a survey of critical care program directors and hospital-level Medicare data on ICU use in the last 6 months of life. Program directors evaluated quality of palliative care education in their critical care fellowships and reported on the number of bedside tools and the presence or absence of an inpatient palliative care consultation service.

Results For the 89 hospitals and 71 affiliated training programs analyzed, there were statistically significant relationships between 2 of the explanatory variables—the quality of palliative care education and the number of bedside tools—in ICU use. Each level of increased educational quality (1–5 Likert scale) was associated with a 0.57-day decrease in ICU days, whereas, for each additional, evidence-based bedside tool, there was a 0.31-day decrease. The presence of an inpatient palliative care program was not a significant predictor of ICU use.

Conclusions We found that the quality of palliative care training in critical care medicine programs and the use of bedside tools were independently associated with reduced ICU use at the end of life.

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Introduction

A rising proportion of end-of-life care takes place in the intensive care unit (ICU). Nearly 30% of Medicare patients used the ICU in their last month of life, increased from 24% a decade ago.[1] Patients and families may opt for a treatment trial in an ICU when faced with progressive illness necessitating critical care because prognosis and mortality can be difficult to predict.[2,3] The ICU is an important setting for end-of-life decision making, and critical care physicians play a crucial role in those decisions.

However, intensive care use at the end of life varies widely by hospital, suggesting that factors other than disease severity and patient preferences affect ICU use.[4] Hospital and medical education leaders have worked to address concerns about the increasing amount and significant variation in end-of-life ICU use. Individual institutions have developed and evaluated a variety of interventions that include a more proactive approach to the provision of palliative care, educational initiatives targeting ICU staff, and bedside tools for communication and

symptom management.[5–8] Researchers have also implemented and evaluated multisite, controlled trials.[9,10] The Accreditation Council for Graduate Medical Education (ACGME) requires palliative and end-of-life care training for critical care medicine fellows.[11]

Research assessing factors associated with the quantity of end-of-life ICU care at the state and national levels has focused on structural variables.[12] In contrast, provider behavior theory suggests that provider characteristics, such as the tools to enhance the patient encounter and institutional support, can independently influence practice.[13] To our knowledge, no studies have addressed training program initiatives and their influence on subsequent ICU use at the end of life.

The objective of our study was to evaluate how factors consistent with the provider behavior theory[13] at the critical care medicine training program level, including quality of palliative care education, evidence-based bedside tools, and availability of a palliative care consultation service, affect ICU use in the last 6 months of life for Medicare patients with chronic illnesses.[14] Previous research has used the last 6 months of life to assess hospital variation in end-of-life care use.[14,15]

What was known

There is increasing intensive care unit (ICU) use by patients at the end of life.

What is new

Data on whether critical care medicine program interventions, focused on the quality of palliative care training and beside tools, are independently associated with ICU use in the last 6 months of life for patients with chronic illness.

Limitations

Subjective definition used for the quality of palliative care education.

Bottom line

Reduced ICU use at the end of life was associated with the quality of palliative care training and the use of bedside tools.

Methods

Study Design

We conducted a cross-sectional study to identify associations between the results of a survey by the American College of Chest Physicians Palliative and End-of-Life Care NetWork (PEOLC NetWork) and hospital-level Medicare data. This survey assessed quality of education and competencies for palliative and end-of-life care, educational and practice tools, and characteristics of respondents and training programs. Questions were iteratively developed and piloted by members of the PEOLC NetWork committee to assess construct and content validity. The questions were pilot-tested with clinicians in training programs; subsequent interviews helped improve questions for increased comprehension and reliability. The survey was e-mailed to all program directors in the Association of Pulmonary and Critical Care Medicine Program Directors. The PEOLC NetWork members made up to 3 follow-up attempts (e-mail and telephone) to improve response rates. Additional details related to methods and results were previously presented (unpublished data).

Variable Selection

We chose explanatory variables from the PEOLC NetWork survey based on a modified version of the Quality Enhancement Research Initiative's health care provider behavior model.[13] That theoretical model identifies distinct elements that influence provider behavior, including provider characteristics (such as education), tools to influence the patient encounter, and organizational support. Our version focused on intervention components that could be implemented by local leadership. Each of these elements has been shown to influence patient outcomes and has provided the basis for multifaceted interventions in critical care.[7,9,16–18]

We identified specific survey questions a priori that were related to our 3 elements: (1) quality of provider education, (2) evidence-based bedside tools for the patient encounter, and (3) institutional support (inpatient palliative care consultation service [IPCCS]). We used program director survey responses about the overall quality of palliative care education in their training program to characterize the education element. Previous work has shown good correlation between program directors' perspectives and externally validated metrics.[19] To quantify evidence-based support to affect the patient encounter, we identified bedside tools published in the medical literature.[18,20,21] The identified tools included a family booklet,[22] a point-of-care communication card,[17] withdrawal of life-sustaining treatment protocol,[20] a bereavement brochure,[17] and a comfort measure order set.[21] The survey questions identified the presence or absence of these evidence-based tools, and the number present within the program was counted with a possible range of 0 to 5. We selected the availability of an IPCCS as a yes or no proxy for institutional support.

Using *Dartmouth Atlas*[23] methodology, we identified our dependent variable as hospital-level ICU days in the last 6 months of life for patients who had previous hospitalization with at least 1 chronic condition (BOX) in the previous 2 years. Our sample included patients who died between January 1, 2003, and December 31, 2007. We

BOX **Chronic Condition Diagnoses**

- Malignant cancer, leukemia
- Chronic pulmonary disease
- Coronary artery disease
- Congestive heart failure
- Peripheral vascular disease
- Severe chronic liver disease
- Diabetes with end organ damage
- Chronic kidney disease
- Dementia

chose a 6-month window to best incorporate repeat hospitalizations. Patients who are admitted to the ICU typically have a decompensation that can trigger new conversations about goals of care and care limitations.[24,25] Such conversations may affect future ICU use for patients who survive. This 6-month window has been previously used to assess hospital-level variation at the end of life.[14] Considering Medicare patients hospitalized in the last 2 years of life with at least 1 of 9 chronic conditions is a commonly used method to identify those who may be more amenable to care limitations.[14,23] Patients were assigned to the hospital where they had the most admissions.

Program and Hospital Selection

Medical critical care and pulmonary/critical care programs were identified through the ACGME website.[26] We searched each program's website to identify nonfederal hospitals where trainees performed critical care rotations. For programs with multiple nonfederal hospital affiliations, we specifically identified the hospitals where trainees provide critical care medicine. Federal hospitals (ie, VA and Department of Defense) were excluded because they lack available Medicare data. We accessed the *Dartmouth Atlas* website[27] and obtained the corresponding hospital-level data for ICU days in the last 6 months of life.

We classified training programs as responders or nonresponders. Responders completed at least 2 of the 3 questions on our independent variables from the NetWork survey.

The VA Greater Los Angeles Healthcare System Institutional Review Board approved the study protocol and waived the need for consent.

Analysis

Descriptive analyses of the 3 independent variables were performed based on both individual program results and associated hospital results because some training programs provided critical care for more than 1 hospital. We analyzed descriptive statistics of hospital-level ICU days in the last 6 months of life and assessed whether a linear model was acceptable or transformation was needed. A histogram revealed the presence of an outlier (SD = 4.8 from the mean and not the program's main teaching hospital), which was removed. Student *t* tests compared responding and nonresponding institutions' ICU days in the last 6 months of life.

TABLE 1 **Characteristics of Hospitals and Training Programs as Rated by Critical Care Program Directors**

Program Characteristics Integrating Palliative Care in the Intensive Care Unit	Hospitals, No. (%) (N = 89)	Programs, No. (%) (N = 71)
Quality of palliative care education	n = 82	n = 65
Excellent	5 (6)	4 (6)
Good	35 (43)	24 (37)
Adequate	22 (27)	19 (29)
Fair	18 (22)	16 (25)
Marginal	2 (2)	2 (3)
No. of bedside tools	n = 88	n = 70
5	0 (0)	0 (0)
4	11 (12)	9 (13)
3	14 (16)	12 (17)
2	23 (26)	17 (24)
1	20 (23)	16 (23)
0	20 (23)	16 (23)
Availability of an inpatient palliative care service	n = 89	n = 71
Yes	81 (91)	65 (92)
No	8 (9)	6 (8)

Univariate analyses were performed using ordinary least squares to evaluate for associations. From those, we developed a multivariate regression model, using our 3 identified variables, and tested for multicollinearity. Sensitivity analyses were performed with bootstrapping and multiple imputations to assess the effect of missing variables, including responders who only answered 2 of the 3 questions. Statistical analyses were performed using Stata Statistical Software version 11 (StataCorp LP, College Station, TX).

Results

Our response rate was 49% (82 of 167 ACGME programs, encompassing 184 affiliated hospitals). Of those, we excluded 4 programs because they lacked data from the *Dartmouth Atlas* and excluded another 7 because they did not respond to at least 2 of the 3 survey questions. A total

TABLE 2 **Univariate Analysis of Hospital-Level Program Characteristics and Intensive Care Unit (ICU) Use During the Last 6 Months of Life**

Characteristic	n	Decreased ICU Days per Unit	Interval	*P* Value
Overall quality of education[a]	82	0.60	0.19–1.01	.005
No. of evidence-based bedside tools[b]	88	0.29	0.00–0.59	.05
Inpatient palliative care program	89	0.21	−1.2–1.6	.77

[a] Overall quality of education was rated on a Likert scale of 1–5.
[b] The number of evidence-based bedside support tools out of the 5 identified.

of 71 programs and 89 affiliated hospitals were used in the analysis.

Patients associated with responder hospitals had a mean of 4.84 (95% confidence interval [CI] = 4.38–5.30) ICU days in their last 6 months of life, whereas similar patients in nonresponder hospitals had a mean of 5.32 (95% CI = 4.80–5.85) ICU days. Student *t* tests showed no difference in ICU days between responder and nonresponder hospitals.

Characteristics of the 3 selected components of palliative care in the responder training programs and affiliated hospitals are shown in TABLE 1. The distribution of the overall quality of education had a mean (SD) score of 3.2 (1). Most of the programs and hospitals had 2 or fewer bedside tools available, with a range of 0 to 4 (TABLE 1). More than 90% (81 of 89) of the hospitals had an IPCCS.

Our univariate evaluation of program and hospital characteristics identified statistically significant associations with ICU use at the end of life (TABLE 2). Multicollinearity analysis revealed no significant correlation between the 3 independent variables: quality of education, number of evidence-based bedside tools, and availability of an IPCCS ($r < 0.1$). Our multivariate regression model showed that for each additional improvement in the rating level of education quality there was a 0.57 ICU-day decrease mean per patient ($P = .007$), whereas, for each additional report of any of 5 evidence-based bedside tools, there was a 0.31 ICU-day decrease mean per patient ($P = .02$). The availability of an IPCCS was not associated with a significant difference in ICU days (TABLE 3). These results were supported by sensitivity analyses, assessing variance, and missing data with multiple imputation (TABLE 4).

Discussion

Our findings demonstrate that the quality of palliative care education in critical care medicine training programs, as perceived by the program directors, and the number of evidence-based bedside tools were independently associated with reduced ICU use in the last 6 months of life in the same program. In contrast, availability of an IPCCS was not significantly associated with end-of-life ICU use. To our knowledge, this is the first cross-sectional study to evaluate the effect of either educational quality or availability of practice bedside assistance tools in training programs for ICU clinicians as they occur within their natural environment. Our results are consistent with design theory highlighting the importance of combining bedside tools to enhance the practice of critical care physicians and quality of education related to palliative care.[13]

One possible explanation for the strong effect of these components is their organic relationship to the training program. Unlike trials of educational interventions, our study captures organizational elements that were internally motivated and locally driven[9] and that were likely designed to fit the needs of the local environment.[28] Our observational study of effectiveness of behavioral interventions in the actual program settings may be more generalizable than previous randomized, controlled trials.[29] Authors of a recent, randomized, controlled trial suggested the lack of locally driven and customized support as a potential reason that intervention did not show a reduction in length of ICU stay.[9]

TABLE 3 **Characteristics' Influence on Intensive Care Unit (ICU) Days in the Last 6 Months of Life in a Multivariate Linear-Regression Model**

Characteristic	Decreased ICU Days per Unit	*P* Value
Overall education quality[a]	0.57	.007
No. of evidence-based tools[b]	0.31	.02
Availability of an inpatient palliative care program	0.45	.52

[a] Overall quality of education was rated on a Likert scale of 1–5.
[b] The number of evidence-based bedside support tools out of the 5 identified.

TABLE 4 **Sensitivity Analysis of Program Characteristics Influencing Decrease in Intensive Care Unit (ICU) Days During the Last 6 Months of Life**

	Bootstrap		Multiple Imputation	
Characteristic	**Adjusted β**	***P***	**Adjusted β**	***P***
Overall quality of education[a]	0.57	.007	0.53	.02
No. of evidence-based bedside tools[b]	0.31	.04	0.28	.06
Inpatient palliative care program	0.45	.52	0.06	.93

[a] Overall quality of education was rated on a Likert scale of 1–5.
[b] The number of evidence-based bedside support tools out of the 5 identified.

The lack of an association with IPCCS was unexpected and may be due to a high rate of IPCCS among the participating programs. An IPCCS is increasingly available and has been shown to influence ICU use at the end of life,[7,8,30,31] but its high prevalence (>80%) in our sample reduced our ability to detect differences. Additionally, we do not have information about how an IPCCS is integrated into the ICU.

Our study had several limitations. We used program directors' perceptions to measure the quality of education. Our study was limited in its ability to assess the effect of potential confounders on ICU use, including race, socioeconomic status of patients, hospital competition,[12] availability of inpatient hospice beds, or information on the presence of a hospitalist program. Furthermore, the cross-sectional nature of our study did not provide detailed information on how often the bedside tools were used, whether and with which health care professional the patients completed their advanced directives, or how often the IPCCS was consulted. In training programs that staffed ICUs at multiple hospitals, we assumed that each hospital had a similar number of bedside tools and availability of an IPCCS. We also assumed that patients with chronic illnesses were typically cared for by medical intensivists at the end of life. Other training programs that focus on postsurgical care, anesthesia, and surgery may have skewed results.

Conclusion

Our study showed that in an actual fellowship setting, both the quality of palliative care education and the number of available bedside tools were independently associated with reduced ICU use at the end of life. The potential benefits of improving critical care physicians' palliative care training and availability of bedside tools should be considered by critical care program directors. Future research should evaluate other potentially beneficial outcomes of palliative care training, such as the quality of death and dying,[32] family satisfaction,[33] and psychological outcomes.

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