

TITLE PAGE

Delivery of End of Life Care in an Emergency Department-Based Intensive Care Unit

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ABSTRACT

Objective: Intensive care unit (ICU) admissions near the end of life have been associated with worse quality of life and burdensome costs. Patients may not benefit from ICU

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admission if appropriate end of life care can be delivered elsewhere. The objective of this study was to descriptively analyze patients receiving end of life care in an Emergency Department (ED) based ICU (ED-ICU).

Methods: This is a retrospective analysis of patient outcomes and resource utilization in adult patients receiving end of life care in an ED-ICU. In 2015, an “End of Life” order set was created to standardize delivery of palliative therapies and comfort measures. We identified adult patients (>18 years) receiving end of life care in the ED-ICU from December 2015 to March 2020 whose clinicians utilized the end of life order set.

Results: A total of 218 patients were included for analysis; 50.5% were female and median age was 73.6 years. The median ED-ICU length of stay was 13.3 hours (IQR 7.4-20.6). Two patients (0.9%) were admitted to an inpatient ICU, 117 (53.7%) died in the ED-ICU, 77 (35.3%) were admitted to a non-intensive care inpatient service, and 22 (10.1%) were discharged from the ED-ICU.

Conclusions: An ED-ICU can be utilized for ED patients near the end of life. Only 0.9% were subsequently admitted to an ICU, and 10.1% were discharged from the ED-ICU. This practice may benefit patients and families by avoidance of costly ICU admissions and benefit health systems by reducing ICU capacity strain.

INTRODUCTION

Background:

Hospice and Palliative Medicine (HPM) has existed as a subspecialty within the field of Emergency Medicine (EM) since 2008. Initiation of palliative care in the Emergency Department (ED) has been associated with a 3.6 day shorter hospital length of stay.¹ Earlier discussion of goals of care is associated with better quality of life during patients' final days, lower family distress, and lower costs of care.^{2,3} The need for palliative medicine is likely to increase as the share of the US population over 65 increases,⁴ and nearly three in four Americans over 65 prefer treatment focused on palliation rather than life extension.⁵

Importance:

Palliative interventions can be challenging in the ED due to time and resource limitations.^{4,6,7} In addition, ED care usually focuses on rapid stabilization, treatment, and disposition of patients to maintain departmental flow.⁸ This can create challenges for clinicians initiating conversations regarding palliative care or providing palliative interventions when warranted.⁹ As a result, palliative interventions are often not initiated until patients are admitted to an inpatient service, typically an Intensive Care Unit. (ICU)^{1,10} However, ICU admission may not be in alignment with the patients' goals of care, and ICU admissions near end of life are associated with worse quality of life for patients.¹¹ Additionally, costs associated with ICU admission can be burdensome for patients and healthcare systems.¹²

A potential avenue toward more effective and widespread delivery of palliative care in the ED is the ED-based ICU, though this has not previously been studied. An ED-ICU

provides an environment in which critical care interventions can be performed while goals of care are further investigated. The Joyce and Don Massey Family Foundation Emergency Critical Care Center (EC3) is an ED-ICU at the University of Michigan, created with the objective of delivering high-quality critical care in the ED. It consists of 9 ICU style rooms, 5 resuscitation bays, and a multidisciplinary care team.¹³ ED patients requiring ongoing critical care can be transferred to EC3 regardless of inpatient ICU bed availability, and common indications for transfer have been previously described.¹³ The ED-ICU model has previously been associated with improved patient mortality and reduced ICU utilization¹³⁻¹⁷, and may offer an opportunity to reduce ICU admissions among patients receiving end of life care or for whom ICU admission is not in alignment with goals of care.

An “End of Life” order set was created in the electronic health record (EHR) in 2015 to provide standardized options and interventions for ED clinicians providing palliative care. These include symptomatic treatments for pain, dyspnea, congestion, secretion management, nausea, hiccups, pruritus, and cough, along with non-symptom focused aspects to relieve suffering. The order set also provided optional consults to Palliative Medicine, Social Work, and/or Spiritual Care, assessments of patient and family distress or discomfort, and discontinuation of vital signs, lab draws, noise disturbances, and interventions not conducive to patient comfort. Details of the order set are provided in **Appendix A**.

Goals of this investigation:

The objective of this study was to descriptively analyze patients receiving end of life care in an ED-ICU, including patient and resource utilization outcomes. We hypothesized that delivery of end of life care in an ED-ICU was associated with a low rate of admission to an inpatient ICU.

MATERIALS AND METHODS

Study design and setting; selection of participants:

This is a retrospective observational analysis of patient outcomes and resource utilization in adult patients receiving end of life care in an ED-ICU. It was conducted at a single academic medical center in the United States, with approximately 75,000 adult ED visits per year. The institutional review board at the University of Michigan reviewed and approved this study. This study is reported in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.¹⁸

An EHR search identified all patients older than 18 years between December 2015 and March 2020 who received a portion of their ED care in EC3 and for whom the end of life order set was utilized.

Measurements and Outcomes

Age, gender, time to EC3 transfer, time to end of life order set utilization, ED and EC3 length of stay (LOS) [ED LOS is inclusive of EC3 LOS], ED disposition, hospital disposition, and whether extubation was performed in EC3 were collected from the EHR and retrospectively analyzed. No additional follow-up was performed for patients who survived their hospital stay. The primary outcome of interest was ED disposition. Secondary outcomes included EC3 LOS, EC3 mortality, and hospital mortality.

Analysis

We performed a descriptive analysis of all patients identified using the criteria above. Subgroup analyses were performed of patients who expired in EC3 and those who survived to EC3 disposition. Outcomes were compared between subgroups using Welch's t-test. Statistical analysis was performed using Microsoft Excel (Microsoft Corporation, Redmond, WA) and the Python programming language (Python Software Foundation, <https://www.python.org/>). Statistical analysis was completed from February through June, 2020.

RESULTS

Over the study period, a total of 312,658 ED visits were identified, of which 10,278 (3.3%) received care in EC3. Of these, 218 patients (2.1%) were cared for in EC3 utilizing the end of life order set.

Of patients receiving end of life care in EC3, 50.5% were female and the median age was 73.6 years (interquartile range [IQR] 60.0-85.4) (**Table 1**). The median time from ED arrival to EC3 transfer was 2.8 hours (IQR 1.8-4.1), and median time from ED arrival to use of the end of life order set was 8.0 hours (IQR 4.1-15.0). The median EC3 LOS was 13.3 hours (IQR 7.4-20.6). Among patients who were admitted to an inpatient service, the median hospital LOS was 49.7 hours (IQR 20.5-87.3). Only two patients (0.9%) were admitted to an inpatient ICU. The most frequent disposition was death in EC3 (n = 117, 53.7%), followed by admission to a non-intensive care inpatient service (n = 77, 35.3%), and discharge directly from EC3 (n = 22, 10.1%). Of the 22 patients discharged from EC3, 15 were discharged directly home and 7 were discharged to hospice facility.

Of patients who expired in EC3, 46.2% were female and median age was 70.8 years (IQR 59.6-82.8). Time to EC3 transfer, time to use of the end of life order set, ED and EC3 LOS were all shorter among patients who expired in EC3 compared to those that did not. 33.3% of patients who expired in EC3 were extubated compassionately in EC3, compared with 11.9% of all other patients.

LIMITATIONS

The observational nature of this study precludes drawing causative conclusions from this data set. As the end of life order set did not exist prior to EC3, we cannot reliably identify an equivalent subset of end of life ED patients managed pre-EC3. As such, we cannot calculate the reduction in ICU bed-hours attributable to palliative care performed in the ED-ICU. However, similarities exist between admission criteria to inpatient ICUs and transfer criteria to EC3,¹³ and it seems likely that the cohort described in this study would have been admitted to an inpatient ICU in the absence of the ED-ICU.

As this was a retrospective study, we did not collect survey data from patients or family members on their perceptions of end of life care received, nor did we collect survey data from clinicians regarding job satisfaction with delivery of palliative care. We did not collect data regarding patient safety outcomes or adverse events, and collected only limited patient demographic information.

Importantly, this sample likely represents an underestimate of patients receiving palliative interventions in the ED-ICU. It was not feasible to track or report all discussions about goals of care, code status, patient / family wishes, etc, and for purposes of our study we were limited to identification of patients managed with a specific order set. Thus, the 218

patients described in this study likely represent a small subset of all ED-ICU patients receiving any type of palliative intervention, and the reported impact of the ED-ICU on the delivery of palliative care and ICU utilization (including at the end of life) is likely larger than reported in this study.

DISCUSSION

This study demonstrates that an ED-ICU can be utilized for ED patients at the end of life. Only 0.9% of the observed population were subsequently admitted to an ICU. The time spent in the ED-ICU likely represents a commensurate number of ICU bed-hours saved. This practice has potential to benefit patients, families, and healthcare systems alike, as ICU admissions near the end of life are associated with worse quality of life for patients and burdensome costs for families and healthcare systems.¹¹

The resources of an ED-ICU can facilitate end of life care that would not normally be possible in most ED settings. While symptom-based comfort measures and end of life care can be provided in the ED setting, the ED-ICU setting can likely optimize the delivery of end of life care via more available space, comfort/serenity, and dedicated personnel. With more time and space than a traditional ED, clinicians are able to assist families in novel ways, including holding a wedding in EC3 involving a family member of a patient receiving end of life care. In addition, over 10% of patients in our sample were discharged directly from EC3, either home or to a healthcare/ hospice facility (**Table 1**). Most patients prefer to live final days at home, and admission to a traditional ICU may have prevented them from doing so.⁵ Discharges to home from the ED-ICU for appropriate patients at end of life represent an additional benefit for patients and their families.

Capacity strain faces many inpatient ICUs across the United States, with increasing strain being linked to worse patient outcomes.¹⁹ Strategies to optimize resource allocation via avoidance of select ICU admissions are thus needed. Patients with imminent death or with goals of care not in line with aggressive critical care are unlikely to benefit from an ICU admission if appropriate end of life care can be delivered in another setting. Physical location should not preclude the delivery of palliative or end of life care when palliative needs are identified,²⁰ and the ED is often the environment where this is first appropriate. This study demonstrates the feasibility of end of life care in the ED-ICU environment. Dedicated hospice inpatient units have also been developed, and the process of transferring terminally ill patients from inpatient ICUs to dedicated hospice inpatient units for facilitation of end of life care has been described.²¹ The process we describe of transferring critically ill ED patients to an ED-ICU for end of life care is somewhat similar to these models. Many critically ill ED patients at the time of ED arrival do not have explicitly stated comfort based goals of care, and the ED-ICU appears to allow rapid transition from advanced critical care to a comfort based care plan utilizing the same physical space, nurses, and providers. The utility and unique benefits of inpatient hospice services and ED-ICUs in end of life care should be further investigated.

Patients who expired in EC3 would likely have done so in an ICU prior to the establishment of EC3, as EC3 transfer criteria target patients with critical illness requiring ICU level of care.¹³ Pre-EC3, the median time from ED arrival to ICU level care has been reported at 5.3 hours.¹³ Among the patients analyzed in this study, the median time from ED arrival to death (when applicable) was 14.8 hours (IQR 8.5-21.6). As time to death in our cohort exceeds reported time to ICU admission pre-EC3, it seems likely most patients who died in EC3 would have reached an ICU before expiring if EC3 had not existed.

In conclusion, this study demonstrates utilization of an ED-based ICU for the provision of palliative care to ED patients near the end of life. As such patients are typically admitted to inpatient ICUs, this practice can likely benefit patients and families by avoidance of costly ICU or hospital admissions and has potential to reduce strain on ICU capacity. The availability of ED-based intensive care, including palliative and end of life care, may allow for more efficient allocation of limited clinical resources. Future study is needed to assess the impact of an ED-based ICU among other critically ill patient populations.

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Table 1. Characteristics of patients receiving end of life care in an ED-ICU

	All EOL Patients (n = 218)
Median age, years (IQR)	73.6 (60.0-85.4)
Female (%)	110 (50.5)
Disposition from EC3, n (%)	
Expired	117 (53.7)
Admit non-ICU	77 (35.3)
Admit ICU	2 (0.9)
Discharged	22 (10.1)
Discharged Home	15 (6.9)
Discharged to Hospice	3 (1.4)
Discharged to Other Healthcare Facility	4 (1.8)
Hours from ED arrival to EC3 status, median (IQR)	2.8 (1.8-4.1)
Hours from ED arrival to EOL order set, median (IQR)	8.0 (4.1-15.0)
Median ED LOS, hours (IQR)	20.1 (12.6-30.0)
Median EC3 LOS, hours (IQR)	13.3 (7.4-20.6)
Extubated in EC3, n (%)	51 (23.4)
Disposition from hospital, n (%)	
Expired	176 (80.7)
Discharged to hospice (home or facility)	16 (7.3)
Discharged to other healthcare facility	7 (3.2)
Discharged home	19 (8.7)

Legend: EOL: end of life, EC3: Emergency Critical Care Center, ICU: intensive care

unit, ED: emergency department, LOS: length of stay; IQR: interquartile range

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