Received: 30 June 2020 | Revised: 14 August 2020 | Accepted: 2 September 2020

DOI: 10.1002/emp2.12258

JACEP OPEN
JOURNAL OF THE AMERICAN COLLEGE OF EMERGENCY PHYSICIANS OPEN
A GLOBAL JOURNAL OF EMERGENCY MEDICINE
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ORIGINAL RESEARCH

Palliative Care

Delivery of end-of-life care in an emergency department–based intensive care unit

Thomas B. Leith AB[1] | Nathan L. Haas MD[2,3,4] | Carrie E. Harvey MD[2,3] | Cynthia Chen MD[2] | Crystal Ives Tallman MD[2,3] | Benjamin S. Bassin MD[2,3,4]

[1] University of Michigan Medical School, Ann Arbor, Michigan, USA

[2] Department of Emergency Medicine, University of Michigan, Ann Arbor, Michigan, USA

[3] Department of Emergency Medicine, Division of Critical Care, University of Michigan, Ann Arbor, Michigan, USA

[4] Michigan Center for Integrative Research in Critical Care, University of Michigan, Ann Arbor, Michigan, USA

Correspondence
Nathan L. Haas, MD, Department of Emergency Medicine, University of Michigan Medical School, 1500 E Medical Center Drive, Ann Arbor, MI 48109-5303.
Email: haasn@med.umich.edu

Thomas B. Leith and Nathan L. Haas should be considered joint first authors.

This work has not previously been presented or published elsewhere.

Funding and Support: By *JACEP Open* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article as per ICMJE conflict of interest guidelines (see www.icmje.org). The authors have stated that no such relationships exist.

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 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 use 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 used the end-of-life order set.

Results: A total of 218 patients were included for analysis; 50.5% were female, and the median age was 73.6 years. The median ED-ICU length of stay was 13.3 hours (interquartile range, 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 used 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 avoiding costly ICU admissions and benefit health systems by reducing ICU capacity strain.

KEYWORDS
ED-ICU, end of life, palliative care

1 | INTRODUCTION

1.1 | Background

Hospice and palliative medicine has existed as a subspecialty within the field of emergency medicine 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 aged older than 65 years increases,[4] and nearly 3 in 4 Americans aged older

Supervising Editor: Austin Johnson, MD, PhD.

than 65 years prefer treatment focused on palliation rather than life extension.[5]

1.2 | Importance

Palliative interventions can be challenging in the ED because of 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 ICU.[1,10] However, ICU admission may not be in alignment with patients' goals of care, and ICU admissions near end of life are associated with worse quality of life for patients.[11] In addition, the costs associated with ICU admission can be burdensome for patients and health care systems.[12]

A potential avenue toward more effective and widespread delivery of palliative care in the ED is the ED-based ICU, although 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] Patients in the ED 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 use[13–17] 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 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, laboratory draws, noise disturbances, and interventions not conducive to patient comfort. Details of the order set are provided in Appendix 1.

1.3 | 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 use 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.

The Bottom Line

End-of-life care can be complicated in an emergency department setting. In this study, Leith et al demonstrate that the use of an emergency department ICU for end-of-life care can result in a low ICU admission rate and even allow some patients to be discharged home.

2 | MATERIALS AND METHODS

2.1 | Study design, setting, and selection of participants

This is a retrospective observational analysis of patient outcomes and resource use 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 ≈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 statement.[18]

An electronic health record 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 used.

2.2 | Measurements and outcomes

Age, sex, time to EC3 transfer, time to end-of-life order set use, ED and EC3 length of stay (ED length of stay is inclusive of EC3 length of stay), ED disposition, hospital disposition, and whether extubation was performed in EC3 were collected from the electronic health record 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 length of stay, EC3 mortality, and hospital mortality.

2.3 | Analysis

We performed a descriptive analysis of all patients identified using the previous criteria. Subgroup analyses were performed of patients who expired in EC3 and those who survived to EC3 disposition. Outcomes were compared between subgroups using the Welch *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 2020–June 2020.

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

	All EOL patients, n = 218	Expired in ED-ICU, n = 117	Alive at ED-ICU disposition, n = 101	*P*
Median age, yrs (IQR)	73.6 (60.0–85.4)	70.8 (59.6–82.8)	76.8 (60.3–87.6)	0.15
Female (%)	110 (50.5)	54 (46.2)	56 (55.4)	0.15
Disposition from EC3, n (%)				
Expired	117 (53.7)	117 (100)	–	–
Admit non-ICU	77 (35.3)	–	77 (76.2)	–
Admit ICU	2 (0.9)	–	2 (2.0)	–
Discharged	22 (10.1)	–	22 (21.8)	–
Discharged home	15 (6.9)	–	15 (14.9)	–
Discharged to hospice	3 (1.4)	–	3 (3.0)	–
Discharged to other health care facility	4 (1.8)	–	4 (4.0)	–
Hours from ED arrival to EC3 status, median (IQR)	2.8 (1.8–4.1)	2.4 (1.6–3.8)	3.3 (2.4–4.7)	<0.05
Hours from ED arrival to EOL order set, median (IQR)	8.0 (4.1–15.0)	7.1 (3.7–12.6)	9.6 (4.6–17.1)	<0.05
Median ED LOS, h (IQR)	20.1 (12.6–30.0)	16.4 (10.4–23.7)	21.9 (16.3–33.0)	<0.05
Median EC3 LOS, h (IQR)	13.3 (7.4–20.6)	11.0 (6.1–18.2)	15.6 (10.6–24.3)	<0.05
Extubated in EC3, n (%)	51 (23.4)	39 (33.3)	12 (11.9)	<0.05
Disposition from hospital, n (%)				
Expired	176 (80.7)	117 (100)	59 (58)	–
Discharged to hospice (home or facility)	16 (7.3)	–	16 (15.8)	–
Discharged to other healthcare facility	7 (3.2)	–	7 (6.9)	–
Discharged home	19 (8.7)	–	19 (18.8)	–

EC3, emergency critical care center; ED, emergency department; EOL, end of life; IQR, interquartile range; LOS, length of stay.

3 | RESULTS

During 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 using 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 length of stay was 13.3 hours (IQR 7.4–20.6). Among patients who were admitted to an inpatient service, the median hospital length of stay was 49.7 hours (IQR 20.5–87.3). Only 2 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 the 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, and ED and EC3 length of stay were all shorter among patients who expired in EC3 compared with those who did not. Of the patients who expired in EC3, 33.3% were extubated compassionately in EC3 compared with 11.9% of all other patients.

4 | 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 before 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, and so on, and for purposes of our study we were limited to the 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 use (including at the end of life) is likely larger than that reported in this study.

5 | DISCUSSION

This study demonstrates that an ED-ICU can be used for ED patients at the end of life. Only 0.9% of the observed population was 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 the potential to benefit patients, families, and health care 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 health care systems.[11]

The resources of an ED-ICU can facilitate end-of-life care that would not normally be possible in most ED settings. Although 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, >10% of patients in our sample were discharged directly from EC3 either home or to a health care/hospice facility (Table 1). Most patients prefer to live their 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 the 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 the 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 the 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 using the same physical space, nurses, and clinicians. 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 before 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 that most patients who died in EC3 would have reached an ICU before expiring if EC3 had not existed.

In conclusion, this study demonstrates use 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 the avoidance of costly ICU or hospital admissions and has the 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.

ACKNOWLEDGMENTS

The authors would like to acknowledge the Joyce and Don Massey Family Foundation for their generous support of the Emergency Critical Care Center. Numerous emergency department staff played instrumental roles in the wedding referenced. Amanda Melvin and Stephanie Laurinec provided invaluable administrative and technical support in the generation of this article. William Leith provided valuable consultation on statistical methods. Dr. Phil Rodgers, Co-Director of the Clinical Palliative Care Program, was instrumental in the development and implementation of the end-of-life order set at our institution.

CONFLICTS OF INTEREST

The authors individually and collectively have no disclosures, financial or otherwise.

AUTHOR CONTRIBUTIONS

Thomas B. Leith, Nathan L. Haas, Carrie E. Harvey, Crystal Ives Tallman, Cynthia Chen, and Benjamin S. Bassin each made substantial contributions to conception and design, analysis, and interpretation of data; have been involved in drafting the manuscript and revising it critically for important intellectual content; and have given final approval of this version.

ORCID

Nathan L. Haas MD https://orcid.org/0000-0003-2207-6316

REFERENCES

1. Wu F, Newman JM, Lasher A, Brody AA. Effects of initiating palliative care consultation in the emergency department on inpatient length of stay. *J Palliat Med*. 2013;16(11):1362-1367.
2. Wright AA, Zhang B, Ray A, et al. Associations between end-of-life discussions, patient mental health, medical care near death, and caregiver bereavement adjustment. *JAMA*. 2008;300(14):1665-1673.

3. Zhang B, Wright AA, Huskamp HA, et al. Health care costs in the last week of life: associations with end-of-life conversations. *Arch Intern Med*. 2009;169(5):480-488.
4. Angus DC, Barnato AE, Linde-Zwirble WT, et al. Use of intensive care at the end of life in the United States: an epidemiologic study. *Crit Care Med*. 2004;32(3):638-643.
5. Barnato AE, Herndon MB, Anthony DL, et al. Are regional variations in end-of-life care intensity explained by patient preferences?: A Study of the US Medicare Population. *Med Care*. 2007;45(5):386-393.
6. Di Leo S, Alquati S, Autelitano C, et al. Palliative care in the emergency department as seen by providers and users: a qualitative study. *Scand J Trauma Resusc Emerg Med*. 2019;27(1):88.
7. Lamba S, DeSandre PL, Quest TE. Opportunities and challenges facing the integrated physician workforce of emergency medicine and hospice and palliative medicine. *J Emerg Med*. 2016;51(6):658-667.
8. Wright RJ, Lowton K, Robert G, Grudzen CR, Grocott P. Emergency department staff priorities for improving palliative care provision for older people: a qualitative study. *Palliat Med*. 2018;32(2):417-425.
9. Chan GK. End-of-life models and emergency department care. *Acad Emerg Med*. 2004;11(1):79-86.
10. Hua MS, Li G, Blinderman CD, Wunsch H. Estimates of the need for palliative care consultation across united states intensive care units using a trigger-based model. *Am J Respir Crit Care Med*. 2014;189(4):428-436.
11. Khandelwal N, Long AC, Lee RY, McDermott CL, Engelberg RA, Curtis JR. Pragmatic methods to avoid intensive care unit admission when it does not align with patient and family goals. *Lancet Respir Med*. 2019;7(7):613-625.
12. Khandelwal N, Curtis JR. Economic implications of end-of-life care in the ICU. *Curr Opin Crit Care*. 2014;20(6):656-661.
13. Gunnerson KJ, Bassin BS, Havey RA, et al. Association of an emergency department-based intensive care unit with survival and inpatient intensive care unit admissions. *JAMA Netw Open*. 2019;2(7):e197584.
14. Haas NL, Whitmore SP, Cranford JA, et al. An emergency department-based intensive care unit is associated with decreased hospital and intensive care unit utilization for diabetic ketoacidosis. *J Emerg Med*. 2020;58(4):620-626.
15. Haas NL, Nafday A, Cranford JA, Yentz SE, Bixby DL, Bassin BS. Implementation of a multidisciplinary care pathway via an emergency department-ICU to improve care of emergency department patients presenting with Leukostasis. *Crit Care Explor*. 2020;2(2):e0084.
16. Joseph JR, Haas NL, Joseph JR, Heth J, Szerlip NJ, Bassin BS. Utilization of a resuscitative care unit for initial triage, management, and disposition of minor intracranial hemorrhage. *Crit Care Explor*. 2020;2(4):e0097.
17. Haas NL, Larabell P, Schaeffer W, et al. Descriptive analysis of extubations performed in an emergency department-based intensive care unit. *West J Emerg Med*. 2020;21(3):532-537.
18. von Elm E, Altman DG, Egger M, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Int J Surg*. 2014;12(12):1495-1499.
19. Wilcox ME, Harrison DA, Patel A, Rowan KM. Higher ICU capacity strain is associated with increased acute mortality in closed icus. *Crit Care Med*. 2020;48(5):709-716.
20. Angood PB. Right care, right now–you can make a difference. *Crit Care Med*. 2005;33(12):2729-2732.
21. Binney ZO, Quest TE, Feingold PL, Buchman T, Majesko AA. Feasibility and economic impact of dedicated hospice inpatient units for terminally ill ICU patients. *Crit Care Med*. 2014;42(5):1074-1080.

AUTHOR BIOGRAPHIES

Thomas B. Leith is a medical student at the University of Michigan in Ann Arbor, MI, USA.

Nathan Haas, MD, is an assistant professor in the Department of Emergency Medicine at University of Michigan Medical School, Ann Arbor, MI.

SUPPORTING INFORMATION

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How to cite this article: Leith TB, Haas NL, Harvey CE, Chen C, Tallman CI, Bassin BS. Delivery of end-of-life care in an emergency department–based intensive care unit. *JACEP Open*. 2020;1:1500–1504. https://doi.org/10.1002/emp2.12258