Published in final edited form as:

J Trauma Acute Care Surg. 2018 November ; 85(5): 992–998. doi:10.1097/TA.0000000000002000.

The impact of inpatient palliative care on end of life care among older trauma patients who die after hospital discharge

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List of Meetings:

48th Annual Meeting of the Western Trauma Association, February 25 – March 2, 2018 in Whistler, British Columbia, Canada.

41st Annual Residents Trauma Papers Competition during the American College of Surgeons Committee on Trauma Annual Meeting, March 8, 2018 in San Antonio, Texas, United States

Authorship Statement:

EJL contributed to the literature search, study design, data analysis, data interpretation, writing, and revisions.

KCL contributed to the literature search, data interpretation, writing, and revisions.

ZC contributed to the literature search, study design, data interpretation, writing, and critical revisions.

JWS, NJK, AHH, AS, and RG contributed to the study design, data interpretation, writing, and critical revisions.

Conflicts of Interests:

EJL: No conflicts of interest

KCL: No conflicts of interest

JWS: No conflicts of interest

NJK: No conflicts of interest

AHH: No conflicts of interest

AS: No conflicts of interest

RG: No conflicts of interest

ZC: No conflicts of interest

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Abstract

Background—Palliative care is associated with lower intensity treatment and better outcomes at the end of life. Trauma surgeons play a critical role in end-of-life (EOL) care, however the impact of PC on healthcare utilization at the end of life has yet to be characterized in older trauma patients.

Methods—This retrospective cohort study using 2006-2011 national Medicare claims included trauma patients ≥65 years who died within 180 days after discharge. The exposure of interest was inpatient palliative care during the trauma admission. A non-PC control group was developed by exact-matching for age, comorbidity, admission year, injury severity, length of stay, and post-discharge survival. We employed logistic regression to evaluate six EOL care outcomes: discharge to hospice, rehospitalization, skilled nursing facility (SNF) or long-term acute care hospital (LTACH) admission, death in an institutional setting, and intensive care unit (ICU) admission or receipt of life-sustaining treatments (LST) during a subsequent hospitalization.

Results—Of 294,665 patients who died within 180 days after discharge, 2.1% received inpatient PC. Among 5,693 matched pairs, inpatient PC was associated with increased odds of discharge to hospice (odds ratio [95% confidence interval] = 3.80 [3.54-4.09]) and reduced odds of rehospitalization (0.17[0.15-0.20]), SNF/LTACH admission (0.43[0.39-0.47]), death in an institutional setting (0.34[0.30-0.39]), subsequent ICU admission (0.51[0.36-0.72]), or receiving LST (0.56[0.39-0.80]).

Conclusions—Inpatient palliative care is associated with lower intensity and less burdensome EOL care in the geriatric trauma population. Nonetheless, it remains underutilized among those who die within 6 months after discharge.

Level of Evidence—Level III

Keywords

palliative care; quality of care; trauma; end of life care; healthcare utilization

Background

Nearly one in four patients hospitalized for trauma are 65 years or older.(1) This number is expected to grow with demographic shifts as older adults are projected to comprise of over 20% of the US population by 2050.(2) Older adults suffer substantial morbidity and mortality after major trauma, and many who die experience high healthcare utilization at the end of life.(3-5) Frail elders fare particularly poorly after trauma: 30-50% are discharged to institutional facilities and 25% die within one year.(6-8) Those with severe traumatic brain injury (TBI) have 60% 30-day mortality and nearly 75% die within 6 months of injury.(5, 9) The high cost and growing intensity of care at the end of life has led to a pressing demand

for strategies to improve the quality and value of care. As providers of care for seriously ill older patients, trauma clinicians play a critical role in end-of-life (EOL) care for older adults.(10)

Palliative care is a multidisciplinary approach to care which focuses on alleviating suffering and improving quality of life for seriously ill patients – those with life-limiting disease or major functional and cognitive impairment.(11) Palliative care interventions in patients in the surgical intensive care unit (ICU) have been shown to decrease ICU length of stay and lead to earlier discussion of goals of care and decisions to withdraw or limit life-sustaining treatment (LST) without impacting overall mortality.(12-14) At the same time, studies in non-trauma populations have shown that palliative care confers cost reductions and lower intensity EOL care, and can even prolong survival when administered alongside curative treatment.(15-19) Additionally, hospice utilization at the end of life is associated with lower intensity EOL care and lower healthcare costs.(20) Many older trauma patients have underlying frailty and medical illness, which confer a shortened life expectancy, burdensome symptoms, and poor quality of life, all of which may be worsened by injury.(7, 21) Thus the responsibility of care planning, goal setting, and preparing for EOL care frequently falls to the inpatient trauma team.

The impact of palliative care delivery during a trauma admission on healthcare utilization and end of life care for older patients discharged from the hospital has not been examined. We hypothesized that inpatient palliative care during trauma admission would be associated with less aggressive EOL care for older trauma patients who died within 6 months of discharge. In this study, we used a national population-based cohort of older trauma patients do the following: 1) Study trends in inpatient palliative care utilization over time; 2) Examine the timing of palliative care and patterns of survival; and 3) Compare EOL outcomes in patients who receive inpatient palliative care and those who did not.

Methods

Data Source

This retrospective cohort study used national Medicare 100% Claims from 2006-2011. Using Medicare claims data permitted us to study longitudinal trends in healthcare utilization and long-term mortality outcomes in a national population. The use of longitudinal data is particularly valuable for studying outcomes in geriatric trauma, as many of these patients are at risk of increased mortality related to their injuries in the weeks and months after the acute trauma hospitalization.(22) Claims data for care received during inpatient hospitalizations were obtained from the Medicare Provider Analysis and Review (MEDPAR) file. Demographic information for the cohort were extracted from the Master Beneficiary Summary File using unique beneficiary identification numbers. Information on hospice utilization was extracted from the Hospice File. The Partners Human Research Committee approved this study and waived this study from informed consent.

Study Population

The cohort included beneficiaries 65 years who (1) were admitted to an acute care hospital for trauma; (2) had at least moderate injuries, defined as Injury Severity Score (ISS) ≥ 9 ; (3) were discharged alive from the trauma admission; (4) died within 180 days after discharge; and (5) were continuously enrolled in Medicare Part A and Part B without HMO coverage from the date of trauma admission until death. Trauma admissions were identified based on *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) diagnosis codes 800-959. For patients with more than one trauma admission within the 180 days preceding death, the first hospitalization was chosen as the index trauma admission. Injury severity was determined using International Classification of Diseases Program for Injury Categorization (ICDPIC) version 3.0 to extract data from ICD-9-CM codes and compute the ISS.(23) We chose to limit the cohort to those with at least moderate injury (ISS ≥ 9) in order to increase the likelihood that trauma was a proximate contributor to mortality. A 180-day cutoff for survival was selected because anticipated survival of less than 6 months is a primary criteria for hospice eligibility, which gives this time period intrinsic prognostic significance.(24) We excluded beneficiaries with any interruptions in Medicare Part A and Part B enrollment from injury until death, those with HMO coverage, and those who were transferred from or to another acute care facility, as this may result in incomplete claims data. We also excluded patients with any hospice claim preceding the index trauma admission, as this may impact EOL healthcare utilization.

Matching

The exposure of interest in this study was the receipt of palliative care during a trauma admission, identified based on claims codes for palliative care during the trauma admission (ICD-9-CM V66.7).(25, 26) While some patients may have received palliative care evaluations during subsequent inpatient and outpatient healthcare interactions, our objective was to examine the utility of palliative care during the trauma admission. Therefore, we focused only on patients who received inpatient palliative care during the trauma admission.

To compare EOL outcomes after discharge, the sample was split into two groups: those who received palliative care during the trauma admission and a control group of those who did not. We performed exact matching using 6 variables: age group, Charlson Comorbidity Index (CCI), year of admission, ISS, hospital length of stay (LOS), and post-discharge survival. Medicare claims data available to the investigators do not contain the granularity to adjust for frailty, therefore we used a modification of the CCI, adapted for use with administrative data,(27) as a proxy for pre-existing serious illness. To create pairs of beneficiaries who were as similar as possible, we matched patients based on the number of days from discharge to death so that health care utilization could be studied during a similar period of time. Prior studies have shown no difference in survival after delivery of palliative care interventions, thus we assumed that inpatient palliative care did not impact survival duration.(5, 17)

Variables

Patient demographic characteristics included age group (65-69 years, 70-74 years, 75-79 years, 80-84 years, or ≥ 85 years), sex, race (White, Black, Hispanic, Asian, or Other/

unknown), Charlson Comorbidity Index (0, 1, or 2 with 2 indicating more comorbidities), and post-discharge survival (days from discharge until death). Trauma admission characteristics included year of admission, injury severity (ISS 9-15, 16-25, or >25),(28) and hospital length of stay (1-5 days, 6-10 days, 11-20 days, 21-30 days, or >30 days). In addition, we used the ICD Program for Injury Categorization (ICDPIC),(23) a statistical program that has been previously validated to classify TBI injury severity, to identify patients with serious or severe TBI, which we defined as head AIS of 3 or more.(23)

Outcomes

We measured the duration of survival in days after discharge until death in order to examine the timing of death within 180 days after discharge. Based on prior studies of intensity and quality of care at the end of life,(5, 29-31) we measured the following six EOL care outcomes in the 180 days after discharge from the trauma hospitalization: 1) hospice enrollment before discharge; 2) rehospitalization; 3) skilled nursing facility (SNF) or long-term acute care hospital (LTACH) admission; 4) death in an institutional setting; 5) intensive care unit (ICU) admission; and 6) receipt of LST during a subsequent hospitalization.

Hospice enrollment before discharge was defined as the existence of one or more hospice claims during the trauma admission or discharge location indicating home hospice or inpatient hospice. Rehospitalization was defined as at least one admission to an acute care hospital after discharge from the index trauma admission. SNF or LTACH admission included any admission after the index trauma admission, including when this was the discharge destination. Death in an institutional setting included location of death in an acute care hospital during rehospitalization or deaths in SNF or LTACH.(32) Among beneficiaries who were rehospitalized, we identified the percentage of patients who were admitted to an ICU and the percentage who received any LST. Based on prior work from our group, LST included initiation of dialysis (ICD-9-CM 38.95, 39.95), tracheostomy tube placement (ICD-9-CM 31.1, 31.29), gastrostomy tube placement (percutaneous, endoscopic, or open; ICD-9-CM 44.32, 43.1, 43.11, 43.19), total parenteral nutrition (TPN; ICD-9-CM 99.15), re-intubation (ICD-9-CM 96.04), mechanical ventilation (ICD-9-CM 96.70–96.72), vasopressors (ICD-9-CM 00.17), cardiopulmonary resuscitation (CPR; ICD-9-CM 99.60, 99.62–3), and blood transfusion (ICD-9-CM 99.0*).(33, 34)

Statistical Analyses

Demographic and admission characteristics for those who received inpatient palliative care and those who did not were summarized as percentages or medians and inter-quartile ranges as appropriate and compared using Chi-square tests for categorical variables and Mann-Whitney U test for continuous variables. The percentage of patients who received inpatient palliative care during the trauma admission was determined for each year of data to study trends in utilization. To examine patterns of survival, we performed a Kaplan Meier survival analysis and compared those who received inpatient palliative care with all others. For the matched cohort, we employed univariable logistic regression analysis to determine whether palliative care was an independent predictor of each EOL care outcome. We also performed an *ad hoc* analysis adjusting for severe TBI, which has a known poor prognosis in the

elderly,(5, 35, 36) and discharge to hospice, which has been shown to reduce healthcare utilization,(20) given the potential for confounding with respect to EOL care.

Analyses were performed using SAS/STAT version 9.3 (SAS Institute Inc., Cary, NC) and Stata, version 14.0 (StataCorp, College Station, TX) where $\alpha = 0.05$.

Results

Study Population

There were 294,665 patients who died within 180 days after hospitalization for moderate or severe trauma; 6,097 (2.07%) received inpatient palliative care during the trauma admission. Characteristics of the cohort are presented in Table 1. The use of palliative care increased over time (Figure 1). In comparison with those who did not receive palliative care, those who did receive palliative care were older, White, had fewer comorbidities, less severely injured, a greater proportion had TBI, and shorter LOS. Survival after discharge was shorter for those who received inpatient palliative care compared with all others (Figure 2).

End-of-life Care Outcomes

Of 6,097 who received inpatient palliative care during the index trauma admission, we matched 5,693 (93%) with controls who did not. Relative to matched controls, inpatient palliative care was associated with significantly increased odds of discharge to hospice (odds ratio [95% confidence interval] = 3.80 [3.54-4.09]) and reduced odds of rehospitalization (0.17 [0.15-0.20]), SNF or LTACH admission (0.43 [0.39-0.47]), and death in an institutional setting (0.34 [0.30-0.39]) (Table 2). For those with at least one rehospitalization after the index trauma admission ($n = 1,155$), inpatient palliative care was associated with significantly reduced odds of ICU admission (0.51 [0.36-0.72]) or receiving LST (0.56 [0.39-0.80]) at a subsequent hospitalization.

Ad Hoc Analyses

Compared with matched controls, a greater proportion of the inpatient palliative care group had TBI (48.08% vs. 30.43%, $p < 0.001$) and were discharged to hospice (69.00% vs. 36.90%, $p < 0.001$). In multivariable logistic regression, adjusting for discharge to hospice and TBI, palliative care was associated with reduced odds of rehospitalization (adjusted OR 0.33 [95% confidence interval 0.28-0.38], $p < 0.001$), death in an institutional setting (0.67 [0.59-0.76], $p < 0.001$), ICU admission (0.55 [0.39-0.79], $p = 0.001$), and receipt of LST (0.60 [0.42-0.86], $p = 0.005$). Inpatient palliative care was not significantly associated with SNF or LTACH admission (0.95 [0.85-1.06], $p = 0.339$).

Discussion

For older patients, traumatic injury often represents a terminal event. In this study of older Medicare beneficiaries who died less than 6 months after trauma, fewer than 5% received inpatient palliative care. While utilization increased over time, inpatient palliative care remained infrequent and was largely limited to those who survived less than two weeks post-discharge. Palliative care was associated with higher rates of discharge to hospice and

reduced healthcare utilization at the end of life. These findings suggest that palliative care is beneficial, but underutilized, in older trauma patients.

To our knowledge, this is the first study using national, longitudinal data to show an association between palliative care and reduced intensity of care at the end of life among trauma patients. Prior studies have demonstrated that inpatient palliative care consultation is associated with reduced intensity EOL care in non-trauma patients. Singh et al. examined palliative care consultation among hospitalized patients with stroke using the Nationwide Inpatient Sample (NIS) and found that palliative care was associated with shorter LOS among those who died.(37) However, the NIS only collects data on inpatient care, thus is inadequate to study longitudinal effects or long-term outcomes. Among older patients with metastatic cancer, palliative care is associated with lower intensity care near the end of life, including lower rates of invasive procedures, hospitalizations, and ICU admissions, and higher rates of hospice admission.(30) Additionally, palliative care for hospitalized patients has been shown to reduce ICU admissions and ICU LOS.(38) Our findings expand upon the current literature by demonstrating benefits in older trauma patients after hospital discharge. The value of palliative care in this population include exploring goals and values for treatments and formalizing advance directives with patients and families. Our findings of decreased healthcare utilization near EOL may reflect the care planning benefits of palliative care delivery to patients and families. Recent policy changes, including the new Medicare physician reimbursement for “voluntary advanced care planning,” suggest a national investment in palliative care delivery to the seriously ill.(39) Furthermore, recently released guidelines from the American College of Surgeons Trauma Quality Improvement Program include recommendations for goals of care discussions and advance care planning for trauma patients at high risk of death.(40) Future work to identify unmet palliative care needs will be critical to help trauma surgeons to adapt to meet these directives.

Palliative care has been called the fourth pillar of acute care surgery.(41) We found that palliative care is underutilized among older trauma patients. Prior studies have found similarly low rates of inpatient palliative care among surgical patients.(42, 43) However, many older adults have palliative care needs including high symptom burden, functional and cognitive disabilities, and multiple burdensome comorbid conditions. However, there is a systemic scarcity of specialist palliative care providers, with only 1 specialist palliative care provider per 1,200 seriously ill patient, and even fewer surgeons fellowship-trained in palliative care.(44) To meet the needs of the epidemic of trauma in older adults, a sustainable model for palliative care delivery is needed. Relying on specialist palliative care consults is insufficient to meet the palliative care needs of our geriatric trauma population.

Consequently, trauma surgeons must meet these demands by developing primary palliative care skills, including communicating prognosis, sharing serious news, formulating patient-oriented recommendations, and integrating these skills into routine trauma care.(13, 14, 45, 46) Such care is instrumental to optimize the management of these patients at all stages of life, including near the end of life.

In this analysis, inpatient palliative care was associated with decreased survival. However, this is likely reflective of late engagement with palliative care or palliative care delivery only near the end of life. Challenges include difficulty with predicting which patients will die

after discharge and identifying the trauma patients with the highest need for palliative care. Hip fracture, severe traumatic brain injury and an acute surgical admission for patients with dementia have all been suggested as triggers for inpatient palliative care consult.(47, 48) Recent work to identify patients who are likely to die and with high palliative care needs include the Palliative Performance Scale and the Geriatric Trauma Outcomes Score.(49, 50) Further work needs to be done to validate these potential triggers for palliative care delivery to older trauma patients and determine whether primary and specialty palliative care results in goal-concordant EOL care.

Limitations

This study is limited by its retrospective design. Using these data, we were unable to account for patient preferences for EOL care or adjust for patient frailty, which has been associated with discharge to SNF/LTACH, increased mortality, and higher rates of readmission.(7, 21) Furthermore, the use of claims codes for palliative care evaluation has been validated for identifying consultation in patients with heart failure but has not been validated in trauma and is likely to miss patients who received palliative care or advance care planning from their primary teams and who were not immediately dying, in hospice care, or had an active palliative care order set.(25) Prior work has also shown that the ICD-9-CM V66.7 code has poor sensitivity for specialist palliative care consultation and misses palliative care consults among inpatients.(26) Additionally, trauma providers may code advance care planning under alternative ICD-9-CM codes such as V68.89 for “encounters for other specified administrative purpose” or with critical care services. Therefore, while the V66.7 code may be used to identify inpatient palliative care, it may fail to capture palliative care services that trauma teams provide. New administrative billing codes such as Current Procedural Terminology 99497 for ‘voluntary advance care planning’ may have promise in better capturing palliative care services delivered to trauma patients within administrative databases.

While patients were matched based on ISS, this scoring system measures global severity of disease. We did not match patients based on specific injury mechanism or body region, as this level of granularity would have greatly limited the size of our matched cohort. These data are also from six years ago and it is possible that utilization of palliative care has changed in recent years. Finally, this study focused only on decedents and did not evaluate long term outcomes for trauma survivors who received palliative care. It is important to emphasize that palliative care is appropriate for all stages of serious illness, not just at the end of life, and this study should not promote the misperception that palliative care is limited to EOL care. Future work will need to prospectively study the benefits of palliative care for serious ill trauma survivors.

Conclusions

Inpatient palliative care for older patients with moderate to severe trauma was associated with reduced healthcare utilization at the end of life. Nonetheless, only 2% of those who died within 6 months after discharge received inpatient palliative care during the trauma admission. This suggests that palliative care consultation is both beneficial and underutilized

in trauma. Palliative care during the trauma admission represents an opportunity to improve EOL care for those who die.

Acknowledgments

AHH is or has been PI on grants or contracts from the National Institutes of Health (NIA, NIMHD, NIGMS), the Patient Centered Outcomes Research Institute, the American College of Surgeons, the Orthopedic Trauma Association and the Department of Defense, Henry M. Jackson Foundation for Military Medicine. He is also the Co-Founder and equity holder of Patient Doctor Technologies Inc. which owns and operates the website <http://www.doctella.com>. ZC is supported by the Paul B. Beeson Emerging Leaders Career Development Award in Aging (1K76AG054859-01), the American Federation for Aging Research, and the Cambia Foundation. Dr. Cooper also received funding during this time, but not for support of this project, from PCORI (1502-27462), the American Geriatrics Society Geriatrics for Specialists Initiative, National Cancer Institute (1R35CA197730-01), and the National Institute on Aging (95R01AG044518-02).

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Figure 1.
Annual Percentage of Inpatient Palliative Care Consults Among Elderly Trauma Patients.

Figure 2.

Survival after discharge after trauma comparing those who received inpatient palliative care with all others.

Table 1

Cohort Characteristics (N = 294,665)

Variable	All patients n (%)	Inpatient palliative care n = 6,097 (2.07)	Non-palliative care n = 288,568 (97.93)	p-value
Age, y, median [IQR]	86 [81-91]	87 [82-92]	86 [81-91]	< 0.001
Gender				0.668
Male	108,886 (36.95)	2,237 (36.69)	106,649 (36.96)	
Female	185,779 (63.05)	3,860 (63.31)	181,919 (63.04)	
Race				< 0.001
White	271,473 (92.13)	5,738 (94.11)	265,735 (92.09)	
Black	13,084 (4.44)	181 (2.97)	12,903 (4.47)	
Hispanic	4,070 (1.38)	52 (0.85)	4,018 (1.39)	
Asian	2,330 (0.79)	62 (1.02)	2,268 (0.79)	
Other/Unknown	3,708 (1.26)	64 (1.05)	3,644 (1.26)	
CCI				<0.001
0	93,339 (31.69)	2,223 (36.46)	91,116 (31.58)	
1	85,440 (29.00)	1,630 (26.73)	83,810 (29.04)	
2	115,886 (39.33)	2,244 (36.80)	113,642 (39.38)	
ISS				<0.001
9-15	39,318 (13.34)	2,090 (34.28)	37,228 (12.90)	
16-25	1,228 (0.42)	64 (1.05)	1,164 (0.40)	
>25	254,119 (86.24)	3,934 (64.67)	250,176 (86.70)	
Severe TBI	53,104 (18.02)	2,786 (45.69)	50,318 (17.44)	<0.001
Hospital LOS				<0.001
1-5 days	98,134 (33.30)	3,042 (49.89)	95,092 (32.95)	
6-10 days	132,900 (45.10)	1,975 (32.39)	130,925 (45.37)	
11-20 days	47,981 (16.28)	868 (14.24)	47,113 (16.33)	
21-30 days	9,462 (3.21)	156 (2.56)	9,306 (3.22)	
>30 days	6,188 (2.10)	56 (0.92)	6,132 (2.12)	
Median survival [IQR], days	48 [17-100]	6 [3-16]	49 [18-101]	<0.001

Abbreviations: CCI, Charlson Comorbidity Index; ISS, Injury Severity Score; IQR, inter-quartile range; LOS, length of stay.

Table 2

Comparison of end-of-life outcomes for matched cohort (N = 11,386)

Variable	All patients n (%)	Inpatient palliative care n = 5,693	Matched controls n = 5,693	Odds Ratio [95% CI] ^b
Discharge to hospice	6,029 (52.95)	3,928 (69.00)	2,101 (36.90)	3.80 [3.54-4.09] *
Rehospitalization	1,155 (10.14)	192 (3.37)	963 (16.92)	0.17 [0.15-0.20] *
SNF/LTACH admission	2,169 (19.05)	725 (12.73)	1,444 (25.36)	0.43 [0.39-0.47] *
Death in an institutional setting	1,538 (13.51)	433 (7.61)	1,105 (19.41)	0.34 [0.30-0.39] *
ICU admission ^a	450 (38.96)	51 (26.56)	399 (41.43)	0.51 [0.36-0.72] *
Any LST ^a	385 (33.33)	45 (23.44)	340 (35.31)	0.56 [0.39-0.80] *

^aCalculated among patients who had at least one readmission to an acute care hospital after discharge from the index trauma hospitalization, n = 1,155

^bStandard error estimates clustered for matched pairs

* $p < 0.05$