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Journal article: *Unmet palliative care needs in elderly trauma patients: can the Palliative Performance Scale help close the gap?*

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Unmet palliative care needs in elderly trauma patients: can the Palliative Performance Scale help close the gap?

Christopher M. McGreevy, M.D.[a], Sarah Bryczkowski, M.D.[a], Sri Ram Pentakota, M.D., M.P.H., Ph.D.[a], Ana Berlin, M.D., M.P.H., F.A.C.S.[a], Sangeeta Lamba, M.D., M.S., H.P.Ed.[b], Anne C. Mosenthal, M.D., F.A.C.S.[a,*]

Departments of [a]Surgery and [b]Emergency Medicine, Rutgers-New Jersey Medical School, Newark, NJ, USA

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Trauma;
Functional outcome;
Palliative care;
Glasgow Outcome Scale;
Elderly

Abstract

BACKGROUND: The elderly injured have significant palliative care (PC) needs due to increased mortality and poor functional outcomes. We hypothesized the Palliative Performance Scale (PPS) could be predictive of poor outcomes in elderly trauma patients.

METHODS: Retrospective study of trauma patients 55 years or older admitted to the surgical intensive care unit. Using logistic regression, PPS was assessed as a predictor of mortality, Glasgow Outcome Scale, and discharge destination.

RESULTS: Out of 153 patients, 28 died; 28% of the survivors had a Glasgow Outcome Scale 3 or less and 13% were discharged to dependent care. PPS score of 80 or less was an independent predictor of mortality (odds ratio [OR]: 2.97 [1.08 to 8.66]), poor functional outcome (OR: 12.59 [4.81 to 37.07]), and discharge to dependent care (OR: 8.13 [2.64 to 30.09]), yet only 52% of the patients with PPS of 80 or less received PC.

CONCLUSIONS: Admission PPS can predict mortality and poor functional outcomes in elderly trauma patients, and has potential as a trigger for delivery of PC in this vulnerable population.

The elderly who sustain trauma are a particularly vulnerable population at risk for serious life-limiting illness and mortality. Elderly patients are the fastest growing group among the injured; they also experience worse outcomes compared with younger cohorts, with longer hospital stays and increased in-hospital mortality.[1,2] Among survivors, the elderly have significant impairment in long-term function and quality of life after injury due to frailty, comorbidities, and decreased physiologic reserve and are more likely to be discharged to dependent care.[3–5]

For many elderly, these outcomes are not compatible with their preferences. Evidence demonstrates that the elderly value quality of life as much as, if not more than, length of life, and make health care decisions accordingly.[6] However, studies have also shown that there is variability in delivery of care, and that many patients do not receive care concordant with their goals and values.[7]

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* Corresponding author. Tel.: 973-972-6398; fax: 973-927-6803.

E-mail address: mosentac@njms.rutgers.edu

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Palliative care is increasingly recognized as a component of high-quality care for those with life-limiting illness or near the end of life. Palliative care improves survival and quality of life as compared with usual care among patients with cancer or other surgical diseases[8–10] and helps ensure care is concordant with patient preferences. An integrated palliative care program has been shown to decrease length of stay without affecting mortality rates in a trauma intensive care unit (ICU).[11] Early palliative care interventions have been also been associated with improved quality of life.[10]

Although palliative care interventions are an increasingly important core service for geriatric trauma centers, accurate prognostication is critical for determining when and to whom palliative care should be delivered. Multiple triggers for palliative care intervention have been proposed, including frailty assessments, ICU length of stay, prolonged respiratory failure, and anoxic brain injury,[5,12–14] but their validity and feasibility among elderly trauma patients remain uncertain. Frailty has been shown to be predictive of postoperative complications, increased length of stay, and discharge disposition in older trauma and surgical patients.[4,13] Unfortunately, many frailty indices are complex, multivariate, and cumbersome or impossible to apply at the bedside of an injured patient, pointing to the need for an efficient, objective assessment that can feasibly identify elderly trauma patients at risk for adverse outcomes.

The aims of this study were to (1) characterize the palliative care services received by elderly trauma patients, (2) describe the outcomes of these patients at discharge, and (3) evaluate the relationship of preinjury functional status to patient outcomes. We hypothesized that there is a high proportion of elderly trauma patients with unmet palliative care needs. In defining this gap, we shed light on factors that can predict not only mortality but also poor-functional outcomes and demonstrate the potential of an admission functional assessment as a trigger for palliative care.

Methods

Data source and study population

This is a retrospective observational study of consecutive older adults (age $\geq$55) admitted to the surgical ICU after traumatic injury at an urban level 1 trauma center during the calendar year 2012. The age of 55 was used due to the evidence that patients 55 and above are at higher risk of poor outcomes after trauma than their younger counterparts, as previously described in the trauma literature.[15] Patients who were younger than 55 years old, pregnant, or incarcerated were excluded. Patients were identified from the institutional trauma registry. Data were abstracted from the medical record and included demographics, injury characteristics, length of stay, comorbidities, and palliative care processes and interventions. The Palliative Performance Scale (PPS) was used to assess preinjury functional status on admission. PPS scores were retrospectively calculated from the chart, using admission nursing assessments, and physician history and physicals. Any charts that did not have nursing admission assessments or were missing data that were necessary to the main outcome of the study were excluded. This study was approved by the Institutional Review Board at our institution.

Palliative Performance Scale

The PPS is a functional assessment tool designed for prognostication in seriously ill patients receiving palliative care.[16] The PPS has been shown to be correlated with survival in patients with advanced cancer[17,18] and other seriously ill populations.[19–21] The score is derived from assessment of 5 domains: ambulation, activity level/evidence of disease, self-care, intake, and level of consciousness.[16] Scores range from 0 to 100 in increments of 10. Each domain has a defined range of options to select. For example, activity level/evidence of disease options range from no evidence of disease and normal activity to unable to do a hobby or housework due to a significant disease load (ie, New York Heart Association Stage III heart failure) to unable to do any activity due to extensive disease (ie, quadriplegia). A full version of the PPS along with its guidelines for use can be found on the Victoria Hospice Society website.[22] Our preliminary analysis identified a PPS level of 80 or less as predictive of mortality and poor-functional outcome, and this was used as our cutoff in the final analysis.

Outcome measures

The main outcome of this study was the proportion of patients who received palliative care services, including palliative care consultation, family meetings, documented goals-of-care conversations, do not resuscitate orders, and withdrawal of life support. Secondary outcomes were in-hospital mortality, discharge disposition (home or acute rehabilitation vs dependent care, that is, hospice, long-term acute care facility, or skilled nursing facility), and Glasgow Outcome Scale (GOS) score at discharge (with GOS of 2 or 3 indicating persistent vegetative state or severe functional disability among survivors). To determine the prevalence of unmet palliative care need in our cohort, we referred to criteria for palliative care assessment defined by the Center to Advance Palliative Care, including a high probability of mortality within 6 months, elderly patients with cognitive impairment and an acute surgical problem, and poor-functional outcome.[23]

Statistical analysis

Counts and percentages were used to describe categorical variables. Continuous variables were described using

Table 1 Patient characteristics (N = 153)

Characteristic	n	%
Age*	70.8	11.6
Age categories		
<65	44	28.8
65–74	39	25.5
75–84	32	20.9
85 or more	38	24.8
Sex		
Female	60	39.2
Male	93	60.8
Race		
White	84	54.9
Black	32	20.9
Other	37	24.2
Injury characteristics		
Any TBI	73	47.7
Severe TBI (GCS ≤ 8)	17	11.1
ISS*	19.4	11.1
Length of stay (in days)		
Hospital†	9	11
ICU†	4	6
Number of end-stage comorbidities		
0	106	69.3
1	40	26.1
2 or more	7	4.6
End-stage comorbidities		
Advanced cancer	27	17.7
Chronic renal failure on hemodialysis	2	1.3
End-stage liver disease	3	2.0
Advanced chronic heart failure	9	5.9
COPD on home oxygen	12	7.8
Advanced dementia	2	1.3
Palliative Performance Scale		
50	6	3.9
60	9	5.9
70	20	13.1
80	23	15.0
90	41	26.8
100	54	35.3

COPD = chronic obstructive pulmonary disease; GCS = Glasgow Coma Scale; ICU = intensive care unit; ISS = injury severity score; TBI = traumatic brain injury.

*Mean (standard deviation).

†Median (interquartile range).

means and standard deviations, medians, and ranges. All study outcomes were dichotomous in nature; as such, we used logistic regression models to assess association between study outcomes and admission factors. To identify predictors for receipt of palliative care intervention, we fit step-wise regression models using a *P* value of less than or equal to .2 for variable entry and *P* value of greater than .05 for variable elimination. Multivariable logistic regression models with all covariates in the model along with PPS were fit to assess the adjusted relationship between PPS and patients' outcomes using the Firth method to reduce small sample bias. Results from logistic regression models were presented as odds ratios with 95% confidence intervals. All analyses were performed using SAS, v9.4 statistical software.

Results

Patient characteristics

One hundred fifty-three patients met the inclusion criteria. Patient characteristics can be found in Table 1. This was a diverse population; 55% of the patients were White, 21% were Black, and 24% were Hispanic or Asian. One-fourth of the cohort was greater than 85 years old. Almost half of the patients suffered a traumatic brain injury. PPS ranged from 50 to 100 with over 60% greater than 80. Thirty percent of the patients had end-stage comorbidities, with 5% having 2 or more. Only 17% of the patients had an advance directive on admission. Table 2 shows the patient outcomes. The in-hospital mortality rate was 18% (28/153). Of survivors, 28% (35/125) had a GOS of 2 or 3, and 13% (17/125) were discharged to a dependent care facility.

Palliative care processes

Of the 153 patients in the study, 53 (35%) received a palliative care intervention. These were not evenly distributed; 90% of the 28 in-hospital mortalities received palliative care services (Fig. 1). In contrast, 12% of survivors with a GOS greater than 3 (a good functional outcome) received palliative care services. Among survivors with GOS 2 or 3 (severe disability or vegetative state), 49% (17/35) received palliative care services. In other words, more than half of the patients with a poor-functional outcome at discharge did not receive palliative care.

Palliative care processes were associated with changes in management in goals of care. Of patients who died and received palliative care, 78% (22/28) had a do not

Table 2 Patient outcomes at discharge

Discharge outcome	n	%
Died	28	18.3
Alive	125	81.7
Glasgow Outcome Scale*		
5	50	40.0
4	41	32.8
3	29	23.2
2	5	4.0
Discharge destination		
Home	53	42.4
Rehabilitation	55	44.0
Dependent care†	17	13.6

*Glasgow Outcome Scale of 1 is death.

†Discharged to skilled nursing facility, long-term acute care, or hospice.

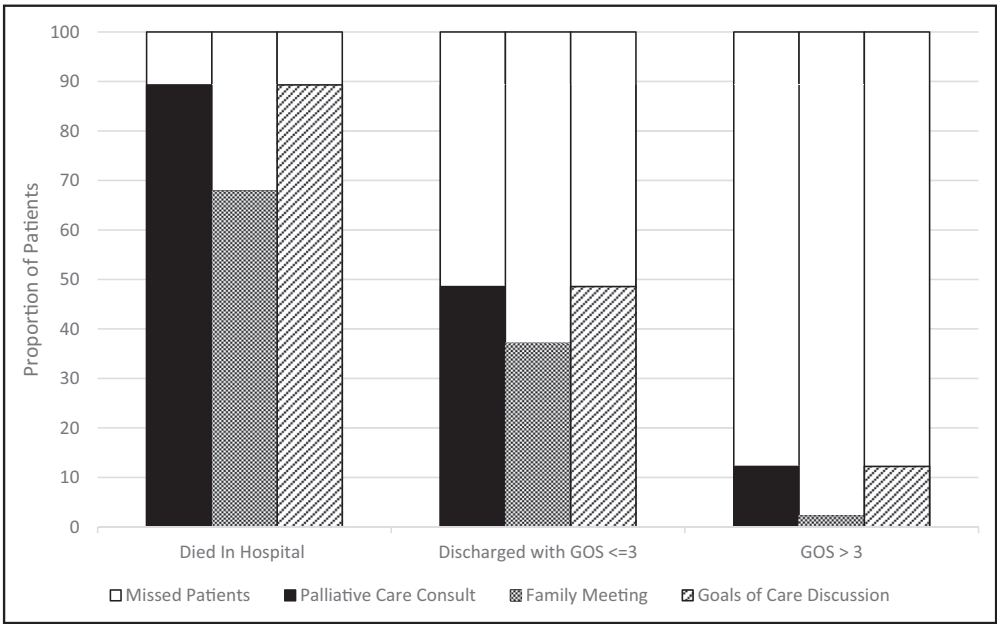

Figure 1 Proportion of patients receiving palliative care interventions, by outcome.

resuscitate order, and 39% (11/28) had withdrawal of life support. Of the 38 patients who were mechanically ventilated and received palliative care, 8 had the ventilator withdrawn. In 3 patients, mechanical ventilation was withheld.

Palliative care interventions increased with advancing age and severity of traumatic brain injury (TBI; Fig. 2); however, the association with age was not statistically significant. Specifically, 42% of the patients age 85 or older received palliative care services, as did 65% of those with severe TBI, as defined by Glasgow Coma Scale of 8 or less. Regression modeling showed that a higher injury severity score and one end-stage comorbidity were independent predictors of receiving palliative care (odds ratio [OR], 1.11; 95% confidence interval [CI], 1.06 to 1.16 and OR, 4.24; 95% CI, 1.79 to 10.05, respectively; Table 3). Surprisingly, neither age, sex nor initial Glasgow Coma Scale were predictive of receiving palliative care. Hispanic patients were significantly less likely to receive palliative care than their Black or White counterparts (OR, .30; 95% CI, .09 to .95).

Relationship of Palliative Performance Scale to patient outcomes and palliative care processes

Table 4 shows the outcomes at discharge for patients for each PPS score. As the PPS score decreases, the rate of

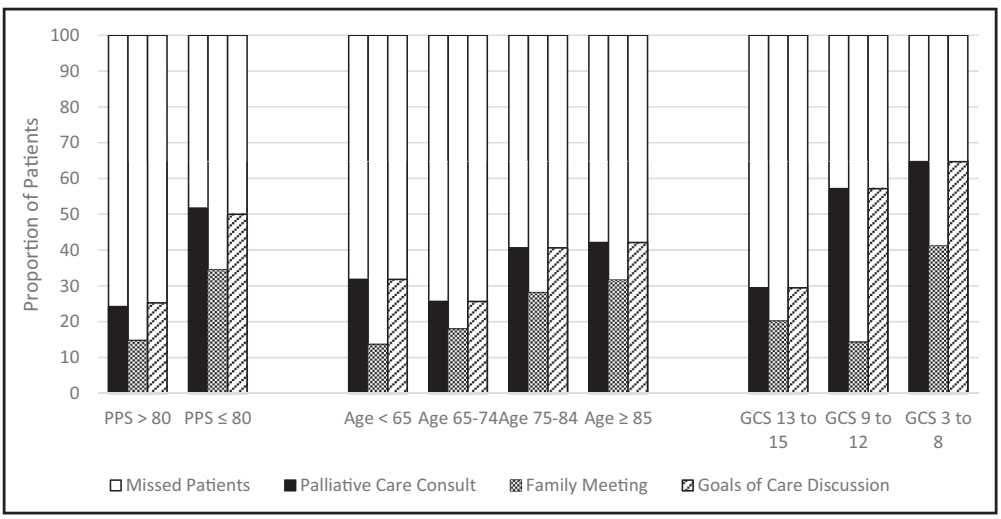

Figure 2 Proportion of patients receiving palliative care interventions, by palliative performance scale (PPS), age, and Glasgow Coma scale (GCS).

Table 3 Independent predictors* for receipt of palliative care

Predictor variables	OR (95% CI)
Injury severity score	1.11 (1.06–1.16)
End-stage comorbidities	
None	Reference
One	4.24 (1.79–10.05)
Two or more	5.67 (.98–32.92)

CI = confidence interval.
*Candidate variables: Age, sex, race, Glasgow Coma Scale, injury severity score, traumatic brain injury, delirium, transfusions, end-stage comorbidities.

in-hospital mortality and discharge with a GOS score of 2 or 3 increases. The results from logistic modeling for the association between PPS and the study outcomes can be seen in Table 5. When adjusting for all other factors, PPS of 80 or less (OR, 2.97; 95% CI, 1.08 to 8.66), age greater than 85 (OR, 6.58; 95% CI, 1.57 to 37.27), higher injury severity score (OR, 1.04; 95% CI 1.00 to 1.09) and severe TBI (OR, 15.39; 95% CI, 3.79 to 77.37) were significant predictors of in-hospital mortality. Predictors of poor-functional outcome (GOS 2 or 3) among survivors (n = 35) included PPS of 80 or less (OR, 12.59; 95% CI, 4.81 to 37.07) and being Black (OR, 4.62; 95% CI, 1.44 to 16.27). Only a PPS of 80 or less (OR, 8.13; 95% CI, 2.64 to 30.09) was an independent predictor of discharge to dependent care. Despite the strong association between poor-functional status on admission and poor outcomes, only 52% of the patients with a PPS of 80 or less received palliative care services.

Comments

Our study demonstrates that missed palliative care opportunities are prevalent among elderly trauma ICU survivors. Specifically, 51% of the patients with poor-functional outcomes at discharge have unmet palliative care needs. Predictors of mortality and poor-functional outcome were age of 85, severe TBI, Black race, higher injury severity score, and PPS of 80 or less. Most importantly, PPS of 80 or less demonstrated a strong association with discharge to dependent care. There is increasing evidence demonstrating that elderly patients who suffer traumatic injury have decreased long-term survival and poor-functional outcomes at 1 year.[24] In our study, 28% of the patients surviving to discharge suffered from a severe disability or a persistent vegetative state. Evidence suggests that these outcomes are not acceptable for a large proportion of patients.[6,25] Thus, we have defined a patient population in whom palliative care intervention stands to be of particular benefit for the purposes of improving quality of life and the goal-concordance of care provided.

In our cohort, 90% of the in-hospital mortalities received palliative care interventions, but more than 50% of the survivors with severe disability did not receive any palliative care services. This gap occurred despite an active, integrated trauma ICU palliative care service already present at our institution. The identification of appropriate triggers for palliative care in geriatric trauma patients is important in closing this gap. The challenge lies in identifying which patients are likely to be at risk for mortality or poor-functional outcomes in a prospective manner at admission.

Our study is novel in that it is the first to assess the PPS as a prognostic tool in elderly trauma patients, albeit retrospectively, and examine it as a potential trigger for palliative care. We found that PPS is a very strong independent predictor of disability (GOS 2 or 3) as well as discharge to dependent care and mortality. Joseph et al[4,5] showed that frailty is an independent predictor of unfavorable discharge in trauma patients but used a frailty index which some considered subjective and did not examine functional outcomes. Several frailty assessment tools have been described that predict mortality in elderly trauma patients,[26,27] but few have been examined as predictors of functional outcome or quality of life, both outcomes that are potentially more important to elderly than length of survival.[28] Having a reliable tool to discuss prognosis for quality of life and function, not only mortality, with elderly trauma patients and their families would be a major advance in their care. Another major advantage of the PPS is that it is derived from data that are collected in a typical nursing admission assessment or history and physical examination, making it easily obtained from the

Table 4 Patient outcomes at discharge by PPS score

PPS score	Death (GOS 1)	Persistent vegetative state/ dependent living (GOS 2/3)	Independent living/full recovery (GOS 4/5)
100 (n = 54)	6% (3/54)	11% (6/54)	83% (45/54)
90 (n = 41)	17% (7/41)	12% (5/41)	71% (29/41)
80 (n = 23)	13% (3/23)	48% (11/23)	39% (9/23)
70 (n = 20)	45% (9/20)	35% (7/20)	20% (4/20)
60 (n = 9)	45% (4/9)	33% (3/9)	22% (2/9)
50 (n = 6)	33% (2/6)	50% (3/6)	17% (1/6)

GOS = Glasgow Outcome Scale; PPS = Palliative Performance Scale.

Table 5 Factors associated with in-hospital mortality, Glasgow Outcome Scale score 2 or 3, and discharge to dependent care

	Death (N = 28)	GOS 2 or 3 (N = 35)	Discharge to dependent care† (N = 17)
	OR (95% CI)	OR (95% CI)	OR (95% CI)
Palliative performance scale			
>80	Reference	Reference	Reference
≤80	2.97 (1.08–8.66)*	12.59 (4.81–37.07)*	8.13 (2.64–30.09)*
Age, in years			
<65	Reference	Reference	Reference
65–74	.48 (.06–3.04)	2.70 (.74–10.90)	1.13 (.23–5.72)
75–84	3.52 (.81–19.26)	1.65 (.41–7.44)	2.33 (.50–12.06)
≥85	6.58 (1.57–37.27)*	1.84 (.46–7.44)	1.28 (.22–7.18)
Race			
White	Reference	Reference	Reference
Black	1.54 (.43–5.39)	4.62 (1.44–16.27)*	2.08 (.58–7.58)
Other	.74 (.19–2.54)	1.33 (.40–4.35)	.52 (.09–2.24)
Glasgow Coma Scale			
13–15	Reference	Reference	Reference
9–12	2.87 (.34–22.23)	2.17 (.11–26.42)	1.59 (.08–2.24)
3–8	15.39 (3.79–77.37)*	5.09 (.75–38.09)	3.52 (.42–25.18)
Injury severity score	1.04 (1.00–1.09)*	1.03 (.98–1.08)	1.04 (.99–1.09)
End-stage comorbidities			
None	Reference	Reference	Reference
One	2.58 (.88–7.79)	2.05 (.65–6.60)	2.17 (.58–7.82)
Two or more	2.94 (.38–20.94)	.18 (.01–1.52)	.81 (.06–6.61)

Adjusted for age, race, Glasgow Coma Scale, injury severity score, number of end-stage comorbidities.
*Odds ratio is statistically significant.
†Discharged to hospice, long-term acute care, or skilled nursing facility.

medical record without cumbersome or extensive multifactorial scoring or resource-intensive and impractical bedside tests. The prognostic data derived from the PPS, alone or in combination with other frailty-oriented assessments, could inform communication, advance care planning, and goals-of-care discussions in the ICU early in admission and could help guide-shared decision-making to ensure that care provided is concordant with patient preferences and priorities.

The use of triggers to prompt palliative care intervention is increasingly emphasized both for the care of the elderly, and for the care of complex surgical patients in the ICU,[29] but few triggers have been tested in clinical practice. Early and appropriate palliative care is known to decrease length of stay, hospital costs, and quality of end-of-life care without affecting mortality rates.[29] Ernst et al[9] showed that implementing a frailty screening program in an elective surgical evaluation unit decreased mortality rates and increased palliative care consults.

To effectively and meaningfully decrease the prevalence of unmet palliative care needs in the trauma population, a trigger would need to be capable of predicting which patients are likely to have poor-functional outcomes. Given that our results demonstrating that the PPS, a proven functional assessment tool, is independently associated with poor-functional outcomes at discharge as well as mortality, we are optimistic regarding its potential as a trigger for palliative care assessment on admission for elderly trauma patients. If PPS assessment had been a standardized element in the care of the patients in our cohort, it could have triggered a palliative care intervention for the 52% of the survivors with serious disability who did not receive palliative care.

The limitations of our study are apparent. This is a single-site study with an established trauma ICU palliative care service and several surgeons who are board certified in hospice and palliative care medicine, and the results may not be generalizable to other centers. However, the fact that we identified significant gaps in the palliative care services provided suggests that other centers would have an even greater proportion of patients with unmet palliative care needs. Indeed, in resource-constrained settings, accurate triggers for the allocation of scarce palliative care resources become all the more important. Furthermore, this is a retrospective study; the PPS was abstracted from chart data, and not provided in real time to clinicians caring for the patients. To fully validate the PPS as an accurate predictor of outcome and an appropriate trigger for palliative care, a prospective study is required. Finally, this study did not measure long-term outcomes beyond hospital discharge, which are important in understanding the trajectory of injury and recovery in the elderly.

Conclusion

Despite the increasing availability of palliative care, elderly trauma patients continue to have unmet palliative care needs. This is especially true for those who survive their hospital stay but have diminished functional outcomes. It is increasingly clear that frailty and preinjury function are more important predictors of outcome than severity of injury in this population. A prognostic tool capable of predicting poor-functional outcomes on admission to the trauma center would be valuable as a trigger for delivery of palliative care services, and our analysis demonstrates the potential of the PPS in this role. Further study is needed to prospectively validate the utility, feasibility, and value of the PPS in clinical practice as a predictor of outcomes that are meaningful to elderly injured patients.

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