



Patterns of palliative care utilization among patients with end stage liver disease during end-of-life hospitalizations: A population-level analysis

Lavi Oud

Division of Pulmonary and Critical Care Medicine, Department of Internal Medicine, Texas Tech University Health Sciences Center at the Permian Basin, Odessa, TX 79763, USA



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ABSTRACT

Purpose: To investigate the patterns and predictors of palliative care (PC) utilization across ICU- and non ICU-managed patients with end-stage liver disease (ESLD) during end-of-life hospitalization.

Materials and methods: The Texas Inpatient Public Use Data File was used to perform a retrospective, population-based cohort study of patients with ESLD and end-of-life hospitalization during 2005–2014. PC use among ICU- and non ICU-managed patients was examined. Logistic regression modeling was used to identify predictors of PC. **Results:** We studied 30,301 patients, of which 5484 (18.1%) had reported PC and 24,174 (79.8%) were admitted to ICU. Between 2005 and 2014 PC use among ICU- and non ICU-managed patients increased from 0.5% to 32.9% and 7.1% to 47.0%, respectively, while ICU admission rate rose from 76.5% to 82.9%. PC use was reduced with rising APR-DRG illness severity (adjusted odds ratio, “extreme” vs. “minor” 0.36 [95% confidence interval, 0.24–0.54]), ICU admission (0.60 [0.55–0.65]), and use of mechanical ventilation (0.75 [0.70–0.81]).

Conclusions: There was persistent gap in use of PC among ICU-managed patients with ESLD during end-of-life hospitalization. ICU utilization rose, unexpectedly, despite the increasing use of PC in this cohort, and PC utilization was, paradoxically, lower among patients with the highest need.

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1. Introduction

End-stage liver disease (ESLD) is associated with prevalent physical and psychological symptom burden, affecting patients and having an adverse impact on their family members [1,2]. Although the importance of early initiation of palliative care in this population is increasingly recognized [3,4], it continues to be underutilized [5–7] including, when employed, at the end-of-life [8].

Hospitalized patients with ESLD often undergo escalation of care intensity, including admission to ICU and use of life-support interventions. Recent studies demonstrated substantial improvement in short-term survival of ESLD patients admitted to ICU [9]. However, mortality remains high among ICU-managed patients with ESLD [9–11] and prior reports documented that the majority of terminal hospitalizations involve ICU care [2]. Palliative care should be, ideally, provided upon hospitalization to all patients with ESLD. However, palliative care would be especially crucial with the increased disease- and

intervention-related burdens prevalent among critically ill patients admitted to ICU.

Characterizing the contemporary patterns of palliative care utilization among patients with ESLD during terminal hospitalizations, across settings of escalating care intensity can inform efforts to better meet patients' and families' goals of care and possibly reduce avoidable use of critical care resources, when unlikely to meet patients' goals of care. In addition, data on palliative care utilization during terminal hospitalizations of patients with ESLD can be considered a performance improvement measure.

However, there is paucity of population-level data on palliative care utilization during terminal hospitalizations in these patients. A recent study of a national cohort in the United States demonstrated rapid rise in use of palliative care during terminal hospitalization of patients with ESLD [12]. However, patterns of palliative care use between patients managed on general wards and those with escalated care intensity involving the ICU were not examined [12].

In order to address the later knowledge gaps, we performed a population-based cohort study of patients with ESLD during terminal hospitalizations to: 1) characterize patterns of palliative care utilization across ICU- vs. non ICU-managed patients, both overall and over time and 2) determine the factors associated with palliative care utilization. Because illness- and therapy-related burdens would be expected to increase with escalating illness severity, we hypothesized that the rates of palliative care use among patients admitted to an ICU will be similar

E-mail address: lavi.oud@ttuhsc.edu.

or greater than among patients without ICU admission and will rise with increasing severity of illness and use of life-support interventions.

2. Materials and methods

2.1. Data sources and study population

We used the Texas Inpatient Public Use Data File (TIPUDF) to identify the target population. Briefly, the TIPUDF is an administrative data set maintained by the Texas Department of State Health Services [13] and includes inpatient discharge data from state-licensed, non-federal hospitals, and captures approximately 97% of all hospital discharges in the state. The state of Texas masks gender data of hospitalizations with a diagnosis of infection with the human immunodeficiency virus, ethanol or drug abuse.

We identified hospitalizations of patients aged ≥ 18 years during 2005–2014, who died during hospitalization (these hospital admissions were termed EOL hospitalization hereafter), and had a diagnosis of ESLD. ESLD was identified using a validated algorithm reported by Goldberg and colleagues [14], by the presence of International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes for cirrhosis, chronic liver disease, and at least two indicators of hepatic decompensation (see eTable 1 for details of ICD-9-CM codes). This approach has a positive predictive value of 89.3% for identifying ESLD [14]. Patients with liver transplantation were excluded. ICU admissions were identified based on unit-specific revenue codes for an intensive care unit or a coronary care unit. The study was determined to be exempt from formal review by the Texas Tech Health Sciences Center's Institutional Review Board due to use of a publicly available, de-identified data set.

2.2. Outcomes

Our primary outcomes were: a) use of palliative care among decedents with and without preceding admission to ICU and b) predictors of use of palliative care for the whole cohort. Palliative care was identified using ICD-9-CM code V66.7. This code, first addressed by the Coding Clinic in 1996 [15], identifies measures of palliative care irrespective of whether it involved a consultation or was integrated into routine clinical practice by clinician team [16]. Secondary outcomes included temporal patterns of use of palliative care among decedents with and without ICU admission, and ICU admission rates.

2.3. Study variables

We abstracted data on patients' age, gender, race/ethnicity, health insurance, comorbid conditions (based on the Deyo modification of the Charlson Comorbidity Index [17,18]), use of invasive mechanical ventilation (termed mechanical ventilation hereafter), hemodialysis, and blood transfusion (see eTable 1), All Patients Refined Diagnosis Related Groups (APR-DRG) severity of illness indicators, year of hospitalization and hospitals' teaching status.

2.4. Data analysis

We summarized the data as frequencies percentages for categorical variables and as mean (standard deviation [SD]) for continuous variables. Chi-square test was used for group comparisons involving categorical variables. The APR-DRG severity of illness categories were converted to a 4-level quantitative score (e.g., "mild" = 1, "extreme" = 4), as previously described by Baram et al. [19]. Logistic regression modeling was used to examine temporal trends of use of PC and rates of ICU admissions. Model findings were reported as odds ratios (OR) and 95% confidence intervals (95% CI).

We used multivariate logistic regression modeling to examine potential independent predictors of palliative care, following examination for multicollinearity. Univariate logistic regressions were first carried out, with covariates with $p < .1$ considered for multivariate analysis. The multivariate logistic model included the following covariates: age, race/ethnicity, health insurance, Deyo comorbidity index, APR-DRG severity of illness, blood transfusion, hemodialysis, mechanical ventilation, ICU admission, teaching status of facilities, and year of admission. Covariates were entered using backward stepwise selection. We reported model findings as adjusted odds ratios (aOR) and 95% CI.

Because gender was commonly suppressed in the cohort we performed separate exploratory modeling of the predictive role of gender in use of palliative care, using similar multivariate logistic regression modeling as reported for the whole cohort.

Data management was performed using Excel and Access (Microsoft, Redmond, Washington) and statistical analyses were performed with MedCalc version 18 (MedCalc Software, Ostend, Belgium). A 2-sided p value $< .05$ was considered statistically significant.

3. Results

3.1. Cohort characteristics

There were 30,301 EOL hospitalizations of patients with ESLD during the study period, of which 24,174 (79.8%) had an ICU admission. Palliative care was reported in 5484 (18.1%) patients.

Table 1

The characteristics of patients with end stage liver disease during end-of-life hospitalization, with and without admission to ICU.

Variables	All (n = 30,301)	ICU (n = 24,174)	Non-ICU (n = 6127)
Age, years, n (%)			
18–44	2630 (8.7)	2280 (9.4)	350 (5.7)
45–64	17,798 (58.7)	14,775 (61.1)	3023 (49.3)
≥ 65	9873 (32.6)	7119 (29.5)	2754 (45.0)
Gender, n (%) ^a			
Female	7614 (43.1)	5866 (44.6)	1748 (43.0)
Race/ethnicity, n (%)			
White	13,923 (45.9)	10,931 (45.2)	
Hispanic	10,932 (36.1)	8925 (36.9)	2007 (32.8)
Black	3055 (10.1)	2488 (10.3)	567 (9.3)
Other	2343 (7.7)	1809 (7.5)	534 (8.7)
Missing	48 (0.2)	21 (-0.1)	27 (0.4)
Health insurance, n (%)			
Private	8417 (27.8)	6460 (26.7)	1957 (31.9)
Medicare	11,162 (36.8)	8603 (35.6)	2559 (41.8)
Medicaid	4377 (14.4)	3733 (15.4)	644 (10.5)
Uninsured	5617 (18.5)	4798 (19.8)	819 (13.4)
Other	674 (2.2)	547 (2.3)	127 (2.1)
Missing	54 (0.2)	33 (0.1)	21 (0.3)
Deyo comorbidity index ^b	6.0 (2.7)	5.9 (2.6)	6.2 (2.9)
APR-DRG SOI, n (%) ^c			
Min or Moderate	172 (0.6)	59 (0.2)	113 (1.8)
	958 (3.2)	356 (1.5)	602 (9.8)
Major extreme	5820 (19.2)	3293 (13.6)	2527 (41.2)
	23,351 (77.1)	20,466 (84.7)	2885 (47.1)
Blood transfusion, n (%)	14,227 (47.0)	12,831 (53.1)	1396 (22.8)
Hemodialysis, n (%)	5635 (18.6)	5226 (21.6)	409 (6.7)
Mechanical ventilation, n (%)	15,062 (49.7)	14,420 (59.7)	642 (10.5)
Palliative care, n (%)	5484 (18.1)	3914 (16.2)	1570 (25.6)
Teaching hospital, n (%)	10,106 (33.4)	8480 (35.1)	1626 (26.5)

Percentage figures may not add to 100 due to rounding.

^a Gender data were available for 17,680 patients for the whole cohort and for 13,612 and 4068 for those with and without ICU admission, respectively; the percent figures for gender in each column refer to that column's denominator for gender.

^b mean (SD).

^c APR-DRG: All Patients Refined Diagnosis Related Groups; SOI: severity of illness score.

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