Original Article

Hospital End-of-Life Treatment Intensity Among Cancer and Non-Cancer Cohorts

Amber E. Barnato, MD, MPH, MS, Elan D. Cohen, MS, Keili A. Mistovich, MD, MPH, and Chung-Chou H. Chang, PhD

Department of Medicine (A.E.B., C.-C.H.C., E.D.C.), University of Pittsburgh School of Medicine; Department of Health Care Policy and Management (A.E.B.) and Department of Biostatistics (C.-C.H.C.), University of Pittsburgh Graduate School of Public Health; and Children's Hospital of the University of Pittsburgh Medical Center (K.A.M.), Pittsburgh, Pennsylvania, USA

Abstract

Context. Hospitals vary substantially in their end-of-life (EOL) treatment intensity. It is unknown if patterns of EOL treatment intensity are consistent across conditions.

Objectives. To explore the relationship between hospitals' cancer- and non-cancer-specific EOL treatment intensity.

Methods. We conducted a retrospective cohort analysis of Pennsylvania acute care hospital admissions for either cancer or congestive heart failure (CHF) and/or chronic obstructive pulmonary disease (COPD) between 2001 and 2007, linked to vital statistics through 2008. We calculated Bayes's shrunken case-mix standardized (observed-to-expected) ratios of intensive care and life-sustaining treatment use among two EOL cohorts: those prospectively identified at high probability of dying on admission and those retrospectively identified as terminal admissions (decedents). We then summed these to create a hospital-specific prospective and retrospective overall EOL treatment intensity index for cancer vs. CHF/COPD.

Results. The sample included 207,523 admissions with 15% or greater predicted probability of dying on admission among 172,041 unique adults and 120,372 terminal admissions at 166 hospitals; these two cohorts overlapped by 52,986 admissions. There was substantial variation between hospitals in their standardized EOL treatment intensity ratios among cancer and CHF/COPD admissions. Within hospitals, cancer- and CHF/COPD-specific standardized EOL treatment intensity ratios were highly correlated for intensive care unit (ICU) admission (prospective $\rho = 0.81$; retrospective $\rho = 0.78$), ICU lengths of stay ($\rho = 0.76$; 0.64), mechanical ventilation ($\rho = 0.73$; 0.73), and hemodialysis ($\rho = 0.60$; 0.71) and less highly correlated for tracheostomy ($\rho = 0.43$; 0.53) and gastrostomy ($\rho = 0.29$; 0.30). Hospitals' overall EOL intensity index for cancer and CHF admissions were correlated (prospective $\rho = 0.75$; retrospective $\rho = 0.75$) and had equal group means (P-value = 0.631; 0.699).

Conclusion. Despite substantial difference between hospitals in EOL treatment intensity, within-hospital homogeneity in EOL treatment intensity for cancer- and non-cancer populations suggests the existence of condition-insensitive institutional norms of EOL treatment. J Pain Symptom Manage 2015;49:521–529. © *2015 American Academy of Hospice and Palliative Medicine. Published by Elsevier Inc. All rights reserved.*

Key Words

Terminal care, end-of-life care, intensive care, mechanical ventilation, hospital, variation, cancer, congestive heart failure, chronic obstructive pulmonary disease, health services, utilization

Introduction

Hospitals vary substantially in their end-of-life (EOL) treatment intensity, as measured by their spending in the last two years of life among Medicare fee-for-service decedents with life-limiting illnesses[1] or as measured by intensive care unit (ICU) and life-sustaining treatment (LST) use among elders at a high probability of dying (HPD) on admission.[2]

Address correspondence to: Amber E. Barnato, MD, MPH, MS, Institute for Clinical Research Education, University of Pittsburgh, 230 McKee Place, Suite 600, Pittsburgh, PA 15213, USA. E-mail: barnae@upmc.edu

Accepted for publication: July 6, 2014.

0885-3924/$ - see front matter
http://dx.doi.org/10.1016/j.jpainsymman.2014.06.017

It is unknown whether hospital-specific patterns of EOL treatment intensity are consistent across diagnosis groups. Prior studies have documented differences in treatment intensity and spending at the EOL when the patient's death is unexpected.[3,4] Although cancer and prevalent non-cancer organ failures such as congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) are all chronic, eventually fatal illnesses with similar mean survival,[5–7] cancer has a different meaning to providers, patients, and families than CHF and COPD. Specifically, there is less resistance to the acknowledgment that cancer is a terminal condition than there is for advanced CHF and COPD. Some of this resistance is cultural, but some of it is a result of different functional trajectories near the EOL[8] and the greater variance in survival for organ failure than for cancer.[3] Greater confidence in the accuracy of mean prognostic estimates for cancer than other chronic eventually fatal illnesses may result in more frequent prognostic disclosure to patients with cancer and, perhaps, greater willingness to discuss less intensive treatment options.[9] These phenomena likely contribute to the overrepresentation of cancer patients in hospice programs[10–12] and their underrepresentation among terminal ICU admissions.[13] It is possible that greater willingness to label certain cancer patients as terminal, when compared with similarly sick CHF and COPD patients, may result in cancer patients with lower statistical probability of death being acknowledged as dying, whereas a CHF or COPD patient may require a higher statistical probability, or even be actively dying (i.e., failing to respond to the highest intensity medical care[9,14–16]) when they are acknowledged to be dying.

The purpose of the present study was to compare hospitals' cancer- and non-cancer EOL treatment intensity. We hypothesized that hospitals' EOL treatment intensity for cancer and non-cancer admissions would vary substantially across hospitals but would be highly correlated within hospitals. We additionally hypothesized that hospitals' EOL treatment intensity would be systematically lower for cancer admissions than for non-cancer admissions.

Methods

This was a retrospective analysis of acute care hospital admissions recorded in Pennsylvania Health Care Cost Containment Council (PHC4) hospital discharge data between April 1, 2001 and December 31, 2007, linked to Pennsylvania Department of Health Vital Statistics death records through December 31, 2008. The study was reviewed and approved by the University of Pittsburgh Institutional Review Board.

Sample

PHC4 data contain a predicted probably of inhospital mortality calculated from key clinical findings (KCFs) abstracted from the medical chart during the first 48 hours of admission. For each discharge, hospital staff abstract KCFs from the medical record. These KCFs encompass more than 250 data elements, including vital signs, other physical examination findings, and results of laboratory, pathology, and imaging studies. The accuracy and reliability of abstracted data are very high when compared with actual patient charts. PHC4 randomly selects 10% of all Pennsylvania hospitals for audit each year. Ten patient charts are then selected at each hospital and reabstracted. These audits confirm a 95% consistency since 1999. Incomplete recordkeeping, although, will result in inaccuracies; for example, if a finding is not recorded in the patient chart, it is assumed to be not present. It is possible that there might be systematically less rigorous charting of medical history on a severely ill patient with CHF who is well known to admitting staff through frequent readmissions when compared with a new patient (Peg Richards, RN, University of Pittsburgh Medical Center Health System, personal communication). This problem is common to even the most sophisticated physiology-based risk prediction tools, such as the Acute Physiology and Chronic Health Evaluation III, which similarly rely on the patient chart. The KCFs collected are diagnosis specific, and so risk prediction models are similarly diagnosis specific. The KCFs recorded are the worst measures in the first 48 hours (e.g., the lowest systolic blood pressure); additional KCFs abstracted include certain preadmission findings recorded in the chart (e.g., electrocardiogram or imaging results in the previous 60 days). No treatment information is abstracted. These KCFs are imported into ATLAS software (ATLAS.ti Scientific Software Development GmbH, Berlin, Germany) along with administrative fields (e.g., age, gender, race) and sent to Cardinal Health Information Companies (CHIC) to calculate an admission risk of death. CHIC-MediQual uses a validated proprietary prediction model developed by CHIC. In a recent study of five conditions and three surgical procedures, the mean c-statistic of inpatient mortality models was 0.88 (SD 0.01).[17] Although PHC4 generally only releases categorical admission severity groups (ASGs) for researchers to use in their risk-adjusted outcomes by hospital (an ASG of 0 = probability of death of 0–0.001, ASG 1 = 0.002–0.011, ASG 2 = 0.012–0.057, ASG 3 = 0.058–0.499, and ASG 4 = 0.500–1), we obtained the continuous predicted probability of death at admission for use in the present study.

Following our prior work,[2,18] we used this continuous probability of death to identify a cohort as