

Massachusetts Division of
Health Care Finance and Policy

ANALYSIS IN BRIEF

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Hospital Resource Use on End-of-Life Patients Varies

Caring for end-of-life (EOL) patients is expensive due to the many severe illnesses usually present near death and the way the American health care system typically treats, and sometimes over-treats, those illnesses. About one-quarter of Medicare expenditures are for the final year of life, a ratio unchanged in twenty years.¹

Researchers at Dartmouth Medical School conducted several studies on resource use variation in EOL care across different regions in the US as well as among individual hospitals.² These studies focused on resource use by Medicare patients during their final six months and final year of life, including both inpatient and outpatient care, and found substantial variation across different regions and hospitals. These variations did not reflect patient preference nor the power of care to extend life, instead they were correlated with where patients happened to live, the availability of local health care resources, and individual physician practice style. More importantly, these studies found that more intense intervention did not improve patient longevity and was associated with higher patient and family dissatisfaction with the quality of care.

Adapting the Dartmouth methodologies, the Division of Health Care Finance and Policy (DHCFP) used statewide hospital discharge data to explore a narrower area of EOL care: inpatient resource use during hospitalizations that culminated in patient death (terminal hospitalizations). With the goal of providing useful information to patients, providers, and health care payers, DHCFP analysts looked at various factors that could affect variation in resource use among Massachusetts hospitals during these terminal hospitalizations. This issue of *Analysis in Brief* presents the findings of the DHCFP study.

Data, Caveats, and Measures

The Division of Health Care Finance and Policy has collected data on inpatient hospital stays from all Massachusetts acute care hospitals for more than 20 years. This database contains comprehensive patient-level information including socio-demographics, and clinical and financial data.³ The Fiscal Year 2004 (FY04) Hospital Discharge Database included information on a total of 840,470 inpatient hospital stays.

EOL patients, as defined by this study, either died in a Massachusetts hospital or were discharged to hospice care. Such patients included those not traditionally defined as EOL, i.e. previously healthy accident victims or victims of violence who were admitted to a hospital and then died. Since management and physician practice style may vary among different campuses of the same hospital system, each hospital campus was analyzed separately in the DHCFP study.

To ensure the comparability of resource use among hospitals, the DHCFP study excluded patients from six non-acute and specialty hospitals.⁴ This resulted in the final study population of 19,579 terminal patients, including 17,982 patients who died in hospitals and 1,597 patients who were discharged to hospice care. It is important to note that when a patient enters the hospital, it may not yet be apparent that it will be a terminal hospitalization; if it were obvious, some treatment decisions undoubtedly would be different. Also, the DHCFP study was not designed to look at quality of care; all care was considered good quality care.

Five indicators were used to measure resource use on terminal patients: percentage of patients who had any Intensive Care Unit (ICU) admission, percentage of patients who had an ICU stay lasting seven days or longer, percentage of patients

who had more than three significant procedures,⁵ average hospital length of stay (LOS), and average total hospital charge per patient.

It is always a major concern to appropriately adjust for differences in illness severity when comparing patient care across hospitals. Focusing on the final hospitalization of terminal patients (who were presumably so sick that they died) automatically adjusts, albeit partially, for severity differences. The DHCFP study also controlled for age, a confounding factor that may contribute to variation in resource use, by dividing EOL patients into three age groups: <65, 65-79, and ≥80.

DHCFP analysts then examined, for EOL patients, the top five DRGs (based on all patient refined version 15 DRG or APR15DRG), the top five primary diagnoses (ICD9 codes), the top five significant procedures (ICD9 codes), and the percentage transferred from another acute hospital or from a nursing home. In addition, based on APR15DRG cost weights DHCFP analysts calculated a Case Mix Index (CMI) separately for teaching and community hospital groups to measure EOL patient illness severity and resource use intensity. By comparing the CMI ratio of teaching to community hospitals to the ratio of total hospital charge per patient of teaching and community hospitals, DHCFP analysts isolated the impact of CMI on hospital charges from other factors such as physician practice style and treatment charge.

In addition to patient demographic characteristics and illness severity, the availability of health care resources sometimes affects utilization (i.e., supply stimulates demand). In order to test this hypothesis among these patients, DHCFP analysts ran a simple regression between the percentage of terminal patients with an ICU admission (dependent variable) and the ratio of ICU beds to the total number of beds in a hospital (independent variable) separately among teaching and community hospitals.

Patient Demographics

Among the DHCFP study population of 19,579 terminal patients, fewer than half (8,360) received their care at one of the Commonwealth's 17 teaching hospitals (6,984 beds); the remaining 11,219 patients were treated at 59 community hospitals (8,843 beds). The terminal patients at community hospitals were significantly older: over half were ages ≥80 compared to one-third at teaching hospitals. There were also more women and whites at community hospitals than at teaching hospitals (see Table 1).

Table 1: Characteristics of Terminal Patients, FY04

		Teaching	Community	Total
Age	<65	33.5%	15.9%	23.4%
	65-79	33.7%	32.1%	32.8%
	≥80	32.8%	51.9%	43.8%
Sex	female	48.6%	53.2%	51.2%
	male	51.4%	46.8%	48.8%
Race	white	82.2%	94.6%	89.3%
	non-white	17.8%	5.4%	10.7%
Total		8,360 (100%)	11,219 (100%)	19,579 (100%)

Resource Use by Teaching and Community Hospitals

Significantly more resources were used to treat terminal patients at teaching hospitals than at community hospitals (see Table 2). More than 46% of the terminal patients at teaching hospitals used an ICU during their final hospital stay, compared to 36.8% at community hospitals. The ICU utilization rate at teaching hospitals was 26% higher than at community hospitals. Among terminal patients at teaching hospitals, 16.7% had an ICU stay lasting seven days or longer, compared to 9.1% at community hospitals. The likelihood of a long ICU stay was 84% higher at teaching hospitals than at community hospitals.

The percentage of terminal patients who had more than three significant procedures was 41.9% at teaching hospitals compared to only 22.0% at community hospitals: nearly double.

The average length of the final hospital stay of terminal patients was 10.5 days at teaching hospitals versus 7.3 days at community hos-

Table 2: Resource Use by Terminal Patients, FY04

	Teaching	Community	T/C Ratio
Any ICU day	46.4%	36.8%	1.26
Ages <65	54.1%	44.1%	1.23
Ages 65-79	46.8%	41.2%	1.14
Ages ≥80	38.0%	31.8%	1.19
ICU stay ≥7 days	16.7%	9.1%	1.84
Ages <65	20.8%	11.7%	1.78
Ages 65-79	17.8%	11.5%	1.55
Ages ≥80	11.5%	6.8%	1.69
>3 significant procedures	41.9%	22.0%	1.90
Ages <65	50.1%	32.0%	1.57
Ages 65-79	44.6%	26.6%	1.68
Ages ≥80	30.8%	16.1%	1.91
Average LOS, day	10.5	7.3	1.44
Ages <65	12.4	8.0	1.56
Ages 65-79	11.0	8.0	1.38
Ages ≥80	8.2	6.7	1.22
Total charge per patient	\$70,727	\$20,752	3.41
Ages <65	\$94,688	\$26,064	3.63
Ages 65-79	\$73,236	\$23,617	3.10
Ages ≥80	\$43,616	\$17,351	2.51

pitals. The average total charge per patient at teaching hospitals was 3.4 times higher than at community hospitals: \$70,727 versus \$20,752.⁶

Although the differences in resource use between teaching and community hospitals were smaller for the oldest patient age group (≥80) than for younger patient age groups, these differences were still significant (see Table 2). For example, the percentage of patients ages ≥80 staying in an ICU for seven or more days was 11.5% compared to 6.8% at community hospitals. The percentage of terminal patients ages ≥80 who had more than three significant procedures was 30.8% compared to only 16.1% at community hospitals. The average total charge per patient ages ≥80 at teaching hospitals was 1.5 times higher than at community hospitals: \$43,616 versus \$17,351.

Illness Severity

To explore the illness severity of terminal patients, DHCFP

examined various related factors. DHCFP analysts found that EOL patients at both teaching and community hospitals had the same top five primary diagnoses and top five significant procedures although they comprised a smaller proportion of the total population of terminal patients at teaching hospitals than at community hospitals.⁶ For example, while the top five primary diagnoses accounted for only 18% of all terminal patients at teaching hospitals, they accounted for 29% of terminal patients at community hospitals. This suggests that community hospitals had a more homogenous population of terminal

patients than did teaching hospitals. This was also true when DHCFP analysts compared the total percentage of the top five DRGs between teaching and community hospitals: 21% for teaching hospitals versus 33% for community hospitals (see Table 3). Three DRGs (720, 190, and 137) were among the top five DRGs for terminal patients at both teaching and community hospitals. The remaining two DRGs (136 and 4) most common at teaching hospitals represent

Table 3: Top Five DRGs of Terminal Patients, FY04

Teaching Hospitals			Community Hospitals		
APR15DRG	number of cases	percent of total	APR15DRG	number of cases	percent of total
720	477	5.7%	139	836	7.5%
190	340	4.1%	720	804	7.2%
137	333	4.0%	190	726	6.5%
136	302	3.6%	137	668	6.0%
4	290	3.5%	194	622	5.5%
Total	1,742	20.8%	Total	3,656	32.6%

DRG 4: Tracheotomy except for face, mouth, and neck diagnoses.

DRG 136: Respiratory malignancy.

DRG 137: Respiratory infections & inflammations.-

DRG 139: Simple pneumonia.

DRG 190: Circulatory disorder w AMI.-

DRG 194: Heart failure.

DRG 137: Respiratory infections & inflammations.-

DRG 190: Circulatory disorder w AMI.-

DRG 720: Septicemia.

more severe diseases than the remaining two DRGs (139 and 194) at community hospitals, suggesting that in FY04 teaching hospitals treated a more severely ill population of EOL patients than did community hospitals.

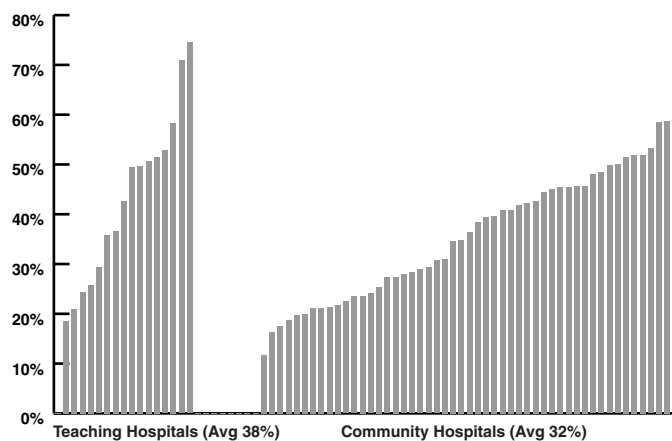
Among all terminal patients treated at teaching hospitals, 13.3% had been transferred there from a different hospital, compared to only 3.1% of the terminal patients treated at community hospitals. However, community hospitals had a much higher percentage of terminal patients transferred from nursing homes than did teaching hospitals: 7.6% versus 1.1%. Since transferring from another hospital is likely to be associated with increased illness severity and the need or desire for more intensive treatment, these transfer patterns are another indication that teaching hospitals treated sicker terminal patients than community hospitals.

Finally, the average CMI of terminal patients at teaching hospitals was significantly higher than the CMI at community hospitals: 2.97 versus 1.81. Since CMI represents a comprehensive measure of illness severity, this difference in CMI further indicates that the terminal patients treated at teaching hospitals were significantly sicker than the patients treated at community hospitals. When DHC FP analysis focused on the very old patient group (ages ≥ 80), teaching hospitals still had a significantly higher CMI than community hospitals (2.30 versus 1.62), although the difference was smaller than for terminal patients overall.

Resource Use among Individual Hospitals

In addition to the difference in resource use between teaching

Figure 1: Percent of Patients Ages ≥ 80 with Any ICU Admission during their Terminal Hospitalization, by Hospital, FY04



and community hospitals, there was also substantial variation among individual hospitals within both groups. In order to control for the impact of patient age on resource use by individual hospitals, DHC FP analysis focused on resource use only for the oldest patient group (≥ 80). Figure 1 divides hospitals into two panels (teaching and community); each bar represents one hospital (or a hospital campus). The variation in ICU use among individual hospitals was substantial both within the teaching hospital group and within the community hospital group. For patients ages ≥ 80 the rate of admission to an ICU ranged from 18.6% to 74.5% at teaching hospitals, and from 11.7% to 67.6% at community hospitals.

Figure 2: Average Total Hospital Charge⁷ per Terminal Patient Ages ≥ 80 , by Hospital, FY04

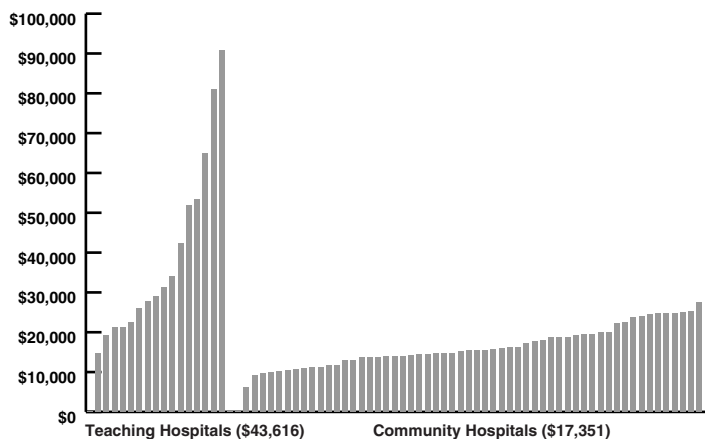
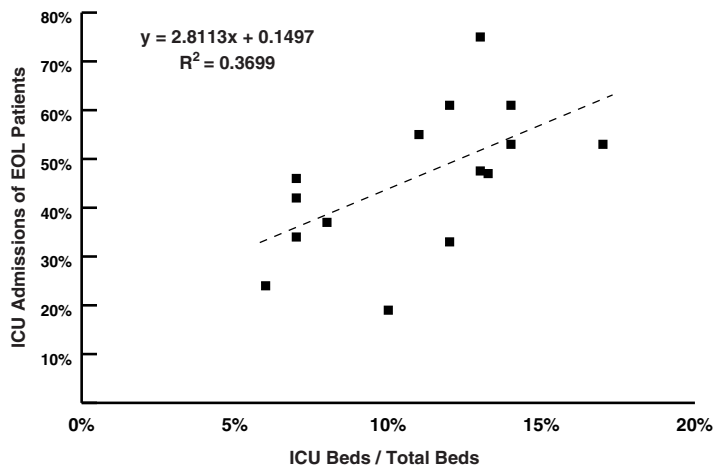


Figure 3: ICU Admission Rate of Terminal Patients in Relation to the ICU Bed Rate for Teaching Hospitals, FY04



The variation in total hospital charges among hospitals was also substantial (see Figure 2); for teaching hospitals, the average hospital charge per terminal patient ages ≥ 80 ranged from \$14,794 to \$90,679, and for community hospitals, from \$6,095 to \$28,134.

ICU Use and ICU Bed Availability

The ratio of hospital ICU beds to the total number of hospital beds was used to try to predict each hospital's ICU admission rate of terminal patients. When DHCFP conducted this analysis for all hospitals, no clear relationship emerged between ICU utilization and ICU bed availability. However, when separate analyses were conducted for teaching hospitals and for community hospitals, the results were different. For teaching hospitals, a greater number of ICU beds was positively associated with a higher ICU utilization rate with a predictability rate of 37% (see Figure 3). In contrast, no clear association was seen among community hospitals (data not shown here).

These results suggest that if they have more ICU beds teaching hospitals tend to use the ICU more for terminally ill patients than do community hospitals. Given the older patient mix at community hospitals, this more con-

servative treatment approach is understandable.

Discussion and Conclusions

Teaching hospitals treat a younger and more severely ill group of terminal patients than community hospitals, which partly explains the more intensive resource use at teaching hospitals, such as more frequent and longer ICU admissions, more procedures, and longer LOS, all of which result in a higher total hospital charge per patient. A

clear division exists between teaching and community hospitals in terms of treating terminal patients in different age groups. In FY04, teaching hospitals treated 61% of all terminal patients ages < 65 with the remaining 39% treated at community hospitals. In contrast, teaching hospitals admitted only 32% of terminal patients ages ≥ 80 while community hospitals admitted 68%. DHCFP also found some evidence to suggest that the availability of more ICU beds among teaching hospitals was positively associated with more ICU use for terminal patients.

However, even after controlling for differences in patient age and illness severity, teaching hospitals tended to manage terminal patients with substantially more resources (and more expensive resources) than community hospitals. This is best illustrated by comparing, for teaching and community hospitals, the ratio of case mix index to the ratio of average charge per EOL patient (see Table 4).

Table 4: Average Case Mix Index and Charge per Terminal Hospitalization, FY04

	CMI	Ratio	Charge	Ratio
Teaching Hospitals	2.97	$\frac{1.6}{1}$	\$70,727	$\frac{3.4}{1}$
Community Hospitals	1.81		\$20,752	

community hospitals, this more con-

Analysis in Brief

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Greater resource use on EOL care at teaching hospitals could also be due to differences in physician practice style and/or patient preference for aggressive EOL care. Since more than 75% of the patient records included in this analysis showed neither the presence nor the absence of “do not resuscitate” orders, DHCFP could not determine whether there were significant differences between patient preferences at teaching and community hospitals.

Additional Caveats

This study was based on administrative data that may not contain sufficient information to fully adjust for differences in patient severity, and especially, patient/family preference. Focusing on the final inpatient episode of terminal patients’ lives reflects only a partial picture of resource use in EOL care. Moreover, some hospitalizations that emerge as terminal are not obviously so throughout.

¹ Hogan C., et al., “Medicare Beneficiaries’ Costs of Care in the Last Year of Life”, *Health Affairs*, July/August 2001.

² *The Dartmouth Atlas of Health Care*, Chapter Six: The Quality of Care in the Last Six Months of Life, www.dartmouthatlas.com/99US/toc6.php. Wennberg JE., et al., “Use of Medicare Claims Data to Monitor Provider-Specific Performance among Patients with Severe Chronic Illness,” *Health Affairs*, Web Exclusive, October 7, 2001. Wennberg JE., et al., “Evaluating the Efficiency of California Providers in Caring for Patients with Chronic Illness,” *Health Affairs*, Web Exclusive, November 16, 2005.

³ Massachusetts Division of Health Care Finance and Policy, Inpatient Hospital Discharge Database, <http://www.mass.gov/dhcfp>.

⁴ The excluded six hospitals are: Kindred Hospital North Shore, Kindred Hospital Boston, Caritas Norcap Lodge, Providence Hospital, Massachusetts Eye & Ear, and Children’s Hospital.

⁵ Significant procedures are hospital procedures that affect hospital reimbursement.

⁶ The top five primary diagnoses are: DX 486: pneumonitis, organism unspecified; DX 0389: unspecified septicemia; DX 4280: CHF; DX 5070: pneumonitis due to inhalation of food or vomitus; DX 51881: respiratory failure. The top five significant procedures are: 3893: venous catheterization, not elsewhere classified; 9604: insertion of endotracheal tube; 9671: continuous mechanical ventilation for <96 consecutive hours; 9672: continuous mechanical ventilation for 96 consecutive hours or more; 9904: transfusion of packed cells.

⁷ Hospital “charges” or “list prices” do not necessarily reflect the actual amounts paid to the hospital for patient care. Most payers, including Medicare, pay the hospital substantially less than charges, but neither hospitals nor payers make the actual payment information available to the public.