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JOURNAL DISCUSSION
Supply-Sensitive Variations in Care
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Health care spending in the United States is expected to grow to 29 percent of the gross domestic product by the year 2030 [1]. This spending threatens to bankrupt the U.S. economy or, at least, crowd out investment in other critical services such as education. Research performed by the Dartmouth Atlas of Health Care is one effort being made to understand and develop solutions to rising health care costs. For many years, the Dartmouth Atlas has documented differences in spending and utilization of health care among medical centers in the United States.

Variations in End-of-Life Care
A significant contributor to variation in health care costs is the way that physicians provide end-of-life care to patients with chronic illnesses. In a recently published Dartmouth Atlas report [2], we consider the extent of this variation among major academic medical centers. For example, 66.6 percent of patients at one of the highest-spending institutions in the data set were likely to see 10 or more physicians during their last 6 months of life, while only 42.5 percent of patients at one of the lowest-spending institutions did—a difference of more than 20 percent. More aggressive care does not improve outcomes or quality [3], and, many times, it is more than the patient's preferences would dictate [4]. It also leads to a higher financial burden on the patient and on society.

In the same Dartmouth Atlas report [2], we examined the variation in medical care for Medicare beneficiaries among academic medical centers rated by *U.S. News and World Report* as the best hospitals for clinical excellence in 2012-2013 [5]. Our report also included several other notable teaching hospitals, for a total of 23 medical centers, reflecting a wide range of practice styles.

Table 1. Variation in resource utilization for chronically ill patients among 23 teaching hospitals [2]

Hospital	Hospital Care Intensity (HCI) Index	Hospital days per decedent, last 6 months of life	Physician visits per decedent, last 6 months of life	Percent of deaths occurring in hospital	Percent of deaths associated with ICU admission	Percent enrolled in hospice, last 6 months of life	Percent seeing 10 or more MDs, last 6 months of life
Cedars-Sinai Medical Center	2.06	19.0	72.6	42.1	38.2	32.8	65.3
NYU Langone Medical Center	1.73	19.1	58.5	34.3	23.8	39.2	66.6
Mount Sinai Medical Center	1.50	18.3	49.1	44.8	17.0	23.1	66.3
Ronald Reagan UCLA Medical Center	1.48	16.8	49.7	44.1	40.6	34.2	62.9
New York-Presbyterian Hospital	1.37	20.2	39.1	44.2	16.2	24.5	60.9
University of Pittsburgh Medical Center	1.28	12.8	42.5	31.7	23.6	48.8	59.2
Northwestern Memorial Hospital	1.28	14.9	42.0	38.4	29.1	44.2	62.8
Massachusetts General Hospital	1.19	15.5	34.7	34.4	17.9	44.9	59.9
Cleveland Clinic	1.12	16.0	35.3	35.4	26.2	46.2	60.4
Hospital of the University of Pennsylvania	1.08	14.7	30.6	26.0	19.8	57.9	61.7
University of Michigan Medical Center	1.07	14.3	30.8	22.8	11.9	59.1	60.8
Brigham and Women's Hospital	1.06	14.9	31.5	34.6	19.4	41.5	61.5
Johns Hopkins Hospital	1.01	13.6	23.4	30.2	19.9	49.4	45.7
Indiana University Health (Clarian Health)	0.96	12.6	30.3	26.2	21.2	51.2	57.0
Barnes-Jewish Hospital/Washington Univ.	0.95	14.1	28.9	31.4	17.8	48.7	52.9
UCSF Medical Center	0.92	13.2	28.3	37.8	22.7	39.0	53.4
Duke University Medical Center	0.87	13.6	24.2	30.7	22.1	47.9	54.8
Vanderbilt University Medical Center	0.80	11.5	26.6	25.9	21.1	56.3	56.3
University of Washington Medical Center	0.78	11.3	22.6	30.2	20.5	46.9	53.1
Stanford Hospital and Clinics	0.78	11.4	27.0	38.0	33.1	44.2	53.1
St. Mary's Hospital, Mayo Clinic	0.70	9.9	21.3	22.8	16.8	44.7	52.4
Scott & White Memorial Hospital	0.62	8.9	19.8	24.9	15.7	58.1	42.5
University of Utah Health Care	0.62	8.6	19.7	23.2	17.0	55.0	47.2
United States average	1.00	11.8	33.7	28.3	18.2	47.9	49.5

We found wide variation in the use of physicians, inpatient beds, and hospice among the 23 hospitals studied. Table 1 summarizes this variation with the hospitals ranked in order from the highest hospital care intensity (HCI) index to the lowest. The HCI index is a resource utilization measure that combines the number of days patients spent in the hospital and the average number of inpatient physician visits during the last 2 years of a patient's life. The highest HCI index is more than three times greater than the lowest among these medical centers. Patients who received most of their care at New York-Presbyterian Hospital spent more than twice as many days in the hospital as did those who received most of their care at University of Utah Health Care. And the University of Michigan Medical Center had more than twice the percentage of patients enrolled in hospice in the last 6 months of life as New York-Presbyterian Hospital did.

What Do These Variations Indicate?

These variations are examples of supply-sensitive care, services for which the supply of physicians and other resources—such as hospital beds—strongly influences the amount of care delivered. In areas with more hospital beds and more physicians, patients are admitted more frequently and see their physicians more often for reasons not necessarily justified by clinical condition (e.g., in one Dartmouth Atlas data set, "more than half of the variation in hospitalization rates for medical (non-surgical)

conditions is associated with bed capacity" [6]. This could be explained by current payment models that reward hospitals for fully utilizing the resources available. Just as an airline company wants to occupy the seats on its planes, providers are compelled to fill up the hospital beds and appointment slots that are available—to operate at full capacity.

Unfortunately, the supply of resources appears to be more powerful than patient preferences in guiding health care delivery. This was demonstrated by the SUPPORT study, a 2-year prospective observational study (phase 1) followed by a 2-year controlled clinical trial (phase 2) in the mid-1990s. The first phase indicated that patients preferred less care than they received at the end of their lives. Phase 2, during which patients were randomized to an intervention group and a control group, showed that even after efforts were made to improve communication between the physician, the patient, and the patient's family about these preferences, patients still received care that they did not desire [7]. In a follow-up study, Pritchard et al. demonstrated that the supply of beds and resources was more powerful in influencing clinical decision making than patient preferences [8]. These studies suggest that we are not respecting patients' preferences and instead letting the number of physicians and hospital beds dictate the care that patients receive.

As health care professionals, it is important that we understand the power of supply-sensitive care, and it is our responsibility to elicit our patients' preferences and ensure that the care we provide does not pointlessly exceed them.

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