

Making the Case to Study the Volume-Outcome Relationship in Hematologic Cancers

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Abstract

The positive relationship between the volume of health services (hospital and physician) and health-related outcomes is established in the complex surgical treatment of cancers and certain nononcologic medical conditions. However, this topic has not been systematically explored in the medical management of cancers. We summarize the limited current state of knowledge about the volume-outcome relationship in the management of hematologic cancers and provide reasons why further research on this subject is necessary. We highlight the relatively low annual volume of hematologic cancers in the United States, the increasing complexity of making a diagnosis due to constant change in classification and prognostication, the rapid availability of novel agents with unique mechanisms of action and toxicities, and the proliferation of treatment guidelines distinct to each disease subtype. We also discuss the potential implications pertaining to medical practice and trainee education, including effects on quality of care, access and referral patterns, and subspecialty training.

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In 2000, the Institute of Medicine (IOM) convened a workshop to review the current understanding of the relationship between volume of health services and health-related outcomes.¹ It reported on its systematic review of 135 studies concerning 27 conditions and procedures that included cancer surgery. The conclusion was that for a variety of surgical procedures and certain medical conditions, higher volume (whether assessed by hospital or physician) is associated with better health outcomes even after adjusting for case-mix differences. In particular, a statistically significant positive association was found in 71% and 69% of studies of hospital and physician volumes, respectively.² More importantly, a significant volume effect was found in all 16 studies judged to have the soundest research methods. The 2 medical conditions included in the review showing significant volume-outcome associations were acquired immunodeficiency syndrome and myocardial infarction. The IOM report highlighted the fact that it did not find a single study that investigated the volume-outcome relationship in the medical management of cancer. One of its recommendations for new areas of research was to examine the volume-outcome

relationship for chronic conditions such as cancer and nonsurgical procedures.¹

PATIENT VOLUME AND PHYSICIAN SPECIALIZATION ASSOCIATED WITH BETTER OUTCOME IN CANCER SURGERY

For surgery, the volume-outcome relationship is particularly dramatic for certain low-frequency, high-risk, cancer surgical procedures, such as pancreatectomy and esophagectomy, with short-term mortality rates 2 to 3 times greater in low- vs high-volume hospitals.¹ Subsequent systematic reviews and population-based studies have shown similar outcomes, and the findings have been replicated in other countries.³⁻⁷ Although there is recognition that the volume-outcome relationship has its limitations and that unmeasured processes of care are also important factors, the IOM panel concluded that volume may still be the best proxy for quality.¹

Surgeon specialization has also been shown in multiple studies to have a positive outcome for patients with cancer undergoing surgery. A recent review revealed that of 20 of the 27 studies that examined long-term survival for 5 cancers, including colorectal, melanoma, breast, bladder, and ovarian, all but 2 found that patients operated on by specialty surgeons had



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significantly better long-term survival rates. The 2 negative studies showed the same trend in favor of specialization but did not reach statistical significance. The main limitation of these findings is that not all the studies adjusted for discrepancies in volume between specialty and general surgeons.⁸ This positive association was also seen in noncancer surgical procedures.⁴

LIMITED STUDIES ON PHYSICIAN CHARACTERISTICS AND QUALITY OF MEDICAL CANCER CARE

In the years since the 2000 IOM workshop, a limited number of research papers have been published investigating physician characteristics and the outcome of medical cancer care. Using the Surveillance Epidemiology and End Results (SEER)—Medicare database, a few studies in solid tumors have shown that physician characteristics may affect the quality of medical cancer care, such as delivery of guideline-based treatments (treatments received by patients with stage III colorectal cancer who saw a medical oncologist, a radiation oncologist, and a surgeon were more likely to comply with National Comprehensive Cancer Network guidelines, odds ratio=20.6), choice of treatment (patients with localized prostate cancer who consulted with a radiation oncologist were 20 times more likely to have radiation as primary treatment as opposed to those who saw a urologist only), and cancer screening (colonoscopy performed by gastroenterologists was associated with lower risk of subsequent death from colorectal cancer compared with that performed by nongastroenterologists, odds ratio=0.6).⁹⁻¹¹

Similarly, there is a paucity of studies in hematologic cancers. One study in 1987 demonstrated that patients with Hodgkin lymphoma (HL) treated in the community had mortality rates that, on average, were 1.5 times higher than those in patients treated at National Cancer Institute—designated comprehensive cancer centers.¹² A population-based study of all patients with acute myelogenous leukemia (AML) in Ontario, Canada, from 1964 through 2003 showed that referral to specialized cancer centers was associated with a longer 3-year overall survival rate (hazard ratio [HR]=1.3) independent of other relevant clinical factors.¹³ However, a similar study in England and Wales consisting of adolescents and young adults with AML

and acute lymphoblastic leukemia (ALL) diagnosed between 1984 and 1994 did not show a survival advantage of centralized treatment.¹⁴ Another population-based lymphoma study in Nebraska showed that survival disparity exists among rural residents according to the type of physician. Between 1992 and 2006, individuals treated by community-based oncologists had a higher relative risk of death compared with those cared for by university-based oncologists.¹⁵ A Mayo Clinic study in 2011 showed that disease-specific expertise influenced time to treatment and treatment outcome in patients with chronic lymphocytic leukemia (CLL). Compared with those cared for by CLL hematologists, patients who were cared for by non-CLL hematologists had shorter time to first chemotherapy (HR=2.4) and overall survival (HR=1.5), even when adjusted for pertinent clinicopathologic risk factors.¹⁶ These studies strongly suggest that physician specialization, among other characteristics, may also have a strong effect on the outcome of medical cancer care because complex processes of treatment decision making are usually involved. However, none of these studies adjusted for the actual volume of patients seen.

COMPELLING REASONS TO PERFORM VOLUME-OUTCOME STUDIES IN HEMATOLOGIC CANCERS

In addition to the paucity of data as described previously herein, there are several compelling reasons to perform further studies in patients with hematologic cancers, as discussed in the following subsections.

Disparity in Outcome of Patients With Hematologic Cancers Is Understudied

Treatment and outcome disparities in patients diagnosed as having hematologic cancers are poorly understood. Previous studies have focused primarily on sociodemographic factors, showing inferior outcomes in minority groups in general and in adolescents and young adults with ALL treated with adult protocols.¹⁷⁻²² Very few studies have investigated the actual volume-outcome relationship in hematologic patients. A study from the Center for International Blood and Marrow Transplant Research in 2005 involved patients with leukemia and lymphoma receiving autologous and human leukocyte antigen—identical sibling allogeneic

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