



Volume-Outcome for Pancreatic Cancer: Finally Getting Under the Hood

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Hospital case volume for complex surgical operations has long been debated as an important contributor to patient postoperative outcomes. Over many years, numerous studies have consistently demonstrated a relationship between higher case volume and lower perioperative mortality for certain surgical procedures.^{1–3} These data have contributed to various initiatives focused on the concept of centralization of complex surgical care to the highest-volume centers with the most experience and, presumably, expertise. Specifically, for pancreatic cancer resection, prior work has shown shorter length of stay, fewer complications, and decreased overall mortality for patients treated at higher-volume facilities compared with lower-volume centers.^{4–6}

As yet, no study has clearly identified the patient or facility factors that explain the underlying reason why the volume-outcome relationship exists or the specific volume threshold that should be used to characterize a hospital as ‘high volume’. It can be inferred that higher case volume equates to more experience, which in turn is believed to be synonymous with higher quality care and better outcomes—in other words, ‘practice makes perfect’. However, there are likely other factors apart from case volume or experience alone that contribute to the better patient outcomes observed at higher-volume centers (e.g., the availability of

advanced medical services and infrastructure, established care processes and care pathways, etc.). For example, care at certain low-volume centers has been associated with similar perioperative outcomes when compared with hospitals meeting the Take the Volume Pledge threshold for high-volume pancreatic surgical care.⁷ Unfortunately, these other factors are difficult to characterize and measure in observational studies, and a randomized study to definitively evaluate this topic does not seem feasible.

In this issue of *Annals of Surgical Oncology*, Kemp Bohan et al. utilize the National Cancer Data Base (NCDB) to perform an observational cohort study of patients who underwent surgical resection for pancreatic adenocarcinoma between 2004 and 2016.⁸ The authors’ overall aim was to try to better understand potential factors that either confound and/or mediate the association between hospital case volume, academic facility status, and patient travel distance (academic facility status and travel distance being considered as possible surrogates for higher-volume facilities) with patient outcomes. Consistent with the established literature on the topic, the authors demonstrate a significantly lower risk of death for patients who underwent surgical resection at a high-volume facility (defined as ≥ 20 cases/year) compared with those who underwent resection at middle- (11–19 cases/year) or lower-volume (< 11 cases/year) centers. Taking a deeper dive into the data, the authors performed mediation analyses to better understand the degree to which specific patient and facility variables may have contributed to this observed association. When considering these other factors, the degree of benefit associated with care at high-volume centers was attenuated by approximately 25–40%. These findings led the authors to justifiably conclude that case volume in and of itself is an oversimplified metric for defining hospitals’

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quality of care for patients with pancreatic cancer. These data suggest there are in fact other factors that likely play a critical role in patient outcomes and a one-size-fits-all approach to centralization of care for pancreatic cancer may not be optimal.

In theory, centralization makes sense. As a patient, we would all intuitively prefer to seek care at a facility that performs a complex operation more frequently. Advocates of centralization would attest that for certain operations associated with higher complication rates, such as pancreatic resection, large high-volume facilities with more established infrastructure and a greater complement of ancillary resources (e.g., radiology, advanced endoscopy, surgeons with expertise in hepatopancreatobiliary surgery, interventional radiology, critical care services, etc.) are able to deliver complex surgical care with better outcomes.^{9,10} Opponents of centralization would argue a blanket policy that all patients should receive care at high-volume centers is not a viable approach within the United States healthcare system for economic, practical, and even ethical reasons.^{11,12} It is even possible uniform centralization could have a negative effect on patient access to care, autonomy, and could exacerbate existing disparities in care that primarily affect the most vulnerable patients.^{13,14}

Centralization would also mean there would be a finite number of surgeons and hospitals available to perform pancreatectomy for cancer.⁷ This has the potential to not only adversely affect patient wait times for surgical care but could also have substantial economic consequences for patients. Even modest volume thresholds can significantly increase the travel burden on patients and their support network.¹⁵ In addition, there could be substantial negative consequences for health systems. Specifically, the work by Kemp Bohan et al. suggests the patients who are least able to travel longer distances, and concurrently more likely to have worse perioperative outcomes, might be most affected by this type of policy change and therefore most likely to stay at lower-volume centers. To this point, the authors demonstrate patients who had pancreatectomy at high-volume centers were more likely to be White, privately insured, and financially able to travel a greater distance for care. The findings were similar for those who received care at Academic Centers. Finally, many low-volume centers likely represent the safety net for more rural communities. This is certainly not a reason to suggest these types of facilities should be providing complex surgical care that they are ill-equipped to provide. But not all high-volume (or low-volume) centers are created equally. In fact, there are likely many smaller, lower-volume facilities that are perfectly capable of safely and effectively treating patients with pancreatic cancer.

Case volume alone is a blunt instrument and the current study does a nice job of highlighting this important point. While the ease with which case volume can be measured and its consistent association with better surgical outcomes are certainly appealing features, it is also important to remember that surgical care is only one part of the multimodal treatment needed to offer pancreatic cancer patients the best chance for long-term survival. As such, there are numerous other metrics that should be considered in concert with volume: ability to initiate chemotherapy (neoadjuvant or adjuvant) in a timely fashion; availability of high-quality imaging; the surgical expertise available; availability of gastroenterology and interventional radiologist expertise. If a hospital that does not meet a volume threshold is able to provide all these services, does this mean it cannot adequately provide pancreatic cancer care? Perhaps rather than focusing on case volume alone, we should instead focus on whether facilities have the available advanced medical services needed to appropriately care for these patients.

Undoubtedly, there are medically and surgically complex patients (e.g., patients with a potentially hostile abdomen from prior operations, borderline resectable pancreatic cancer patients who might require vascular reconstruction, and/or patients with complex comorbid conditions) who should be considered for referral to larger, higher-volume facilities where there may be a fuller complement of advanced medical services. However, this should be part of an initiative that emphasizes individualized cancer care by identifying patients who stand to gain the most from referral to a higher-volume center (which in many cases might be located at a distance from their home). Once we are able to identify these patients, we should then consider how we can facilitate them receiving care at these facilities since not all patients have the same level of caregiver support and financial resources to travel. Until we can figure out how to make access to high-volume care a reality for all patients (or at least those who stand to benefit the most from it), we should continue to seek other approaches for defining the quality of cancer care beyond case volume alone.

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