

Clinical Science

High-volume surgeons vs high-volume hospitals: are best outcomes more due to who or where?



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Abstract

BACKGROUND: High-volume hospitals are purported to provide “best” outcomes. We undertook this study to evaluate the outcomes after pancreaticoduodenectomy when high-volume surgeons relocate to a low-volume hospital (ie, no pancreaticoduodenectomies in >5 years).

METHODS: Outcomes after the last 50 pancreaticoduodenectomies undertaken at a high-volume hospital in 2012 (ie, before relocation) were compared with the outcomes after the first 50 pancreaticoduodenectomies undertaken at a low-volume hospital (ie, after relocation) in 2012 to 2013.

RESULTS: Patients undergoing pancreaticoduodenectomies at a high-volume vs a low-volume hospital were not different by age or sex. Patients who underwent pancreaticoduodenectomy at the low-volume hospital had shorter operations with less blood loss, spent less time in the intensive care unit, and had shorter length of stay ($P < .05$ for each); 30-day mortality and 30-day readmission rates were not different.

CONCLUSIONS: The salutary benefits of undertaking pancreaticoduodenectomy at a high-volume hospital are transferred to a low-volume hospital when high-volume surgeons relocate. The “best” results follow high-volume surgeons.

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The impact of surgeon and/or hospital volume and experience is of great interest when comparing outcomes after pancreaticoduodenectomy. Surgeon volume and experience is an important determinant of outcomes after high-risk procedures, for example, pancreaticoduodenectomy.^{1,2} Surgeon experience and frequency in which pancreaticoduodenectomy is undertaken has proven to have an effect on postoperative outcomes.³⁻⁶ Similarly, improved

outcomes for high-risk procedures are more likely to be achieved at high-volume hospitals, presumably because of sufficient resources and experience.⁷⁻¹¹ Although high-risk procedures (ie, pancreatic resection) have been undertaken at high-volume, and to a lesser extent, low-volume hospitals for a number of years, most agree that high-volume hospitals offer advantages, which may be intangible.¹²⁻¹⁴ Notably, high-volume hospitals and high-volume surgeons are generally inextricably related.

Hospital-volume standards as set by the Leapfrog criteria have proven to improve patient safety.¹⁵ Leapfrog has identified that 12 or more pancreaticoduodenectomies per year must be undertaken at a hospital for it to be identified as a high-volume hospital. A hospital would certainly be denoted as a low-volume hospital if no pancreaticoduodenectomies

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have been undertaken there in more than 5 years.^{16,17} The preponderance of data supports that high-volume hospitals are purported to provide “best” outcomes and patients treated there are denoted to receiving the “best” care. Notably, the arrival of high-volume surgeons can quickly transform a low-volume hospital into a high-volume hospital. It is not clear if postoperative outcomes are more dependent on surgeon volume or hospital volume, as their relationship is generally inextricable. The postoperative outcomes of patients do not demonstrate if surgeon volume vs hospital volume will portend better outcomes.

Outcomes after pancreaticoduodenectomy for 2 high-volume surgeons are detailed herein, first while at a high-volume hospital and then at what had been a low-volume hospital to better understand the interplay between surgeon volume and hospital volume in predicting outcomes after pancreaticoduodenectomy. We undertook this study to evaluate the outcomes after pancreaticoduodenectomy when high-volume surgeons relocate to a low-volume hospital. In undertaking this study, we hypothesized that “best” results are surgeon dependent and relatively independent of hospital volume and that the “best” results transfer with the surgeons when they relocate to a low-volume hospital.

Methods

Patients were entered into a database with institutional review board approval after patient informed consent. Outcomes after the last 50 pancreaticoduodenectomies undertaken by 2 surgeons at a high-volume hospital (using the Leapfrog definition) in 2012 (ie, before relocation) were compared with the outcomes after the first 50 pancreaticoduodenectomies undertaken by the same 2 surgeons at a low-volume hospital (no pancreaticoduodenectomy in over 5 years) in 2012 to 2013 (ie, after relocation). Operative time is defined as the time from when an incision is made to the application of dressing. After discharge, patients were prospectively followed.

Comparisons were undertaken using Mann-Whitney *U*-test or chi-square test, where appropriate. For contingency testing, where appropriate, Fisher exact test was used for summing small *P* values. Significance was accepted with 95% probability. Data were maintained on a spreadsheet (Excel; Microsoft, Redmond, WA) and analyzed using GraphPad InStat, version 3.06 (GraphPad InStat; GraphPad Software, Inc., San Diego, CA). Where appropriate, data are presented as median or median (mean \pm standard deviation).

Results

One hundred patients (56 men) were included in this analysis. Their median age was 70 years with an American Society of Anesthesiologists (ASA) class of 3. The median operative time was 252 minutes with an estimated blood loss (EBL) of 300 mL. The median intensive care unit (ICU) stay was 2 days and hospital length of stay (LOS)

was 9 days. The 30-day readmission rate for all patients was 20% with a 30-day mortality of 5% (Table 1). Overall, 80 patients had a malignancy (Table 2).

For patients undergoing pancreaticoduodenectomy at the high-volume hospital, 30 patients were men, and the median age was 70 years with an ASA class of 3. ASA classes were as follows: 1 (0%), 2 (6%), 3 (82%), and 4 (12%; Table 3). The median operative time was 305 minutes with an EBL of 350 mL. The median ICU stay was 3 days, and hospital LOS was 8 days. The 30-day readmission rate for patients was 19% with 6% of 30-day mortality (Table 1). Forty-five patients (90%) had a malignancy (Table 2).

For the low-volume hospital, 26 patients were men, and the median age was 69 years with an ASA class of 3. ASA classes were as follows: 1 (0%), 2 (36%), 3 (54%), and 4 (10%; Table 3). The median operative time was 205 minutes with an EBL of 260 mL. The median ICU stay was 1 day, and hospital LOS was 7 days. The 30-day readmission rate for patients was 20% with 4% of 30-day mortality (Table 1). Thirty-five patients (70%) had a malignancy (Table 2).

Patients undergoing pancreaticoduodenectomies at the high-volume vs the low-volume hospital were not different by sex or age (Table 1). More patients at the high-volume hospital underwent pancreaticoduodenectomy for malignancy than at the low-volume hospital ($P < .05$) (Table 1). Patients who underwent pancreaticoduodenectomy at the low-volume hospital had shorter operations with less blood loss, spent less time in the ICU, and had shorter hospital LOS ($P < .05$ for each; Table 1); 30-day mortality and 30-day readmission rates were not different (Table 1).

There was a significant difference in ASA class between the high-volume and low-volume hospital ($P = .001$; Table 3). There was no significant difference in margin status between high-volume and low-volume hospitals. At the high-volume hospital, 40 patients had an R0 resection and 7 patients had an R1 resection compared with 33 R0 resections and 13 R1 resections at the low-volume hospital (Table 4). There was no significant difference in T and N categories, but there was a significant difference in the American Joint Committee on Cancer stage between the high-volume and low-volume hospital ($P = .017$; Table 4).

Comments

It has been well established that patients undergoing pancreaticoduodenectomy at a high-volume hospital have lower in-hospital morbidity and mortality than patients undergoing pancreaticoduodenectomy at a low-volume hospital.^{4,7,18–20} The portability of these outcomes was here-to-date unknown. Herein, we document the salutary benefits associated with high-volume surgeons who relocate to a low-volume hospital. For pancreaticoduodenectomy, the benefits of a high-volume hospital can accompany high-volume surgeons when they relocate to a low-volume hospital; it seems that optimal outcomes

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