

Surgical volume was not related to 30-day mortality in 8 common operations

Khuri SF, Daley J, Henderson W, et al., and the participants in the VA National Surgical Quality Improvement Program. Relation of surgical volume to outcome in eight common operations. Results from the VA National Surgical Quality Improvement Program. *Ann Surg.* 1999 Sep;230:414-32.

QUESTION

In patients having 1 of 8 common surgical procedures of intermediate complexity in Veterans Health Administration (VHA) hospitals, is surgical volume related to 30-day mortality and stroke?

DESIGN

6-year cohort study using the database of the Veterans Affairs (VA) National Surgical Quality Improvement Program.

SETTING

125 VA medical centers in the United States.

PATIENTS

68 631 patients (mean age 64 y, 97% men, 78% white) who were having 1 of 8 major surgical procedures: nonruptured abdominal aortic aneurysm repair, vascular infrainguinal reconstruction, carotid endarterectomy (CEA), lung lobectomy or pneumonectomy, open cholecystectomy, laparoscopic cholecystectomy, colectomy, and total hip arthroplasty.

ASSESSMENT OF RISK FACTORS

Preoperative risk factors that are predictive of 30-day mortality were identified in logistic regression models constructed for each operation. An additional model was constructed to identify risk factors predictive of stroke within 30 days of CEA.

MAIN OUTCOME MEASURES

30-day mortality for all procedures and stroke within 30 days for CEA.

MAIN RESULTS

The 30-day mortality rates by procedure were 4.7% for abdominal aortic aneurysmectomy, 3.1% for infrainguinal vascular reconstruction, 1.2% for CEA, 5.5% for lobectomy-pneumonectomy, 2.8% for open cholecystectomy, 0.5% for laparoscopic cholecystectomy, 6.9% for colectomy, and 1.0% for total hip arthroplasty. Use of Pearson correlation coefficients showed no statistically significant correlation between procedure or specialty volume and risk-adjusted 30-day mortality in any of the 8 operations ($P \geq 0.08$). A slight correlation

was seen between specialty volume and stroke within 30 days of CEA: As specialty volume increased, risk-adjusted stroke rate decreased ($P = 0.03$). When hospitals were grouped into quartiles by annual procedure volume, no interquartile differences were seen in the ratio of observed to expected deaths for any procedure. Use of a mixed-effects hierarchical logistic model did not show a relation between annual hospital procedure or specialty volume and risk-adjusted 30-day mortality.

CONCLUSION

In patients having 1 of 8 common surgical procedures of intermediate complexity in Veterans Health Administration hospitals, surgical volume was not related to 30-day mortality or stroke within 30 days of carotid endarterectomy.

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COMMENTARY

During the past 2 decades, substantial evidence has accrued describing strong relations between hospital volume and mortality with many surgical procedures (1). In contrast, Khuri and colleagues found no such association between hospital volume and 30-day mortality with 8 common inpatient operations in the U.S. VHA system. Their careful analysis was based on data from the VA National Surgical Quality Improvement Program, which maintains a large, prospective outcomes registry rich in clinical detail.

One possible explanation for the discrepancy is that volume-outcome relations described in previous studies were mostly based on administrative data and could be attributable to inadequate case-mix adjustment. This explanation seems unlikely because, to date, no evidence exists of systematic differences in patient age, illness severity, or other measurable risk factors between high- and low-volume providers. In this study, expected mortality rates for each procedure were nearly identical across VA hospitals in different volume strata. It is more likely that the lack of an association between hospital procedural volume and mortality in this study may reflect structural and organizational factors unique to the VHA system. Compared with low-volume hospitals in the private sector, low-volume VA hospitals may seem to "overperform" because their staff members often include high-volume surgeons from university affiliates. Conversely, high-volume VA hospitals may seem to "underperform" if, as the authors

acknowledge, they have substantially lower procedural volumes than high-volume centers in the private sector.

Khuri and colleagues were unable to find any evidence to support regionalization of intermediate-complexity surgery in the VHA system. A lack of surgeon-specific data in this study, however, precludes examination of possible relations between surgeon-related volume and outcome, which might suggest alternate care models. Given the lack of generalizability of these data, it is clear that no conclusions can be drawn about the benefit of regionalization of either intermediate- or high-complexity surgery in the broader health care system outside of the VHA. A growing body of evidence exists, however, suggesting an inverse relation between hospital volume and early adverse outcomes in both intermediate- and high-complexity surgery (2-4). More work needs to be done to tease out the factors that may contribute to the observed results.

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