Higher hospital volume was associated with lower operative mortality and shorter length of stay after hepatic resection

Glasgow RE, Showstack JA, Katz PP, et al. **The relationship between hospital volume and outcomes of hepatic resection for hepatocellular carcinoma.** Arch Surg. 1999 Jan; 134:30-5.

Question
In patients having major hepatic resection for hepatocellular carcinoma, are in-hospital mortality rate and length of hospital stay associated with hospital volume?

Design
5-year retrospective cohort study using data from the California Office of Statewide Health Planning and Development.

Setting
138 acute-care hospitals in California, USA.

Patients
507 patients (median age 62 y, 58% men, 52% white) who were having major hepatic resection for hepatocellular carcinoma between 1990 and 1994.

Assessment of risk factors
Age, sex, year of surgery, source of admission, type of resection (hepatic lobectomy or partial hepatectomy), chronic liver disease, and other preoperative comorbid illnesses (coronary artery disease, chronic obstructive pulmonary disease, diabetes mellitus, congestive heart failure, nutritional deficiencies, and intra-abdominal haemorrhage). Hospitals were divided into quartiles: 1 to 2, 3 to 6, 7 to 16, and ≥ 17 hepatic resection operations per 5 years.

Main outcome measures
Operative mortality rate (OMR) and length of hospital stay.

Main results
The overall crude OMR was 14.8%. The crude OMRs decreased with increasing hospital volume ($P < 0.001$); the inverse relation persisted when patient risk adjustment was done (Table). The mean length of hospital stay was 12.9 days. Length of stay decreased with increasing hospital volume; the relation also persisted with adjustment for patient risk factors (Table). Further, hospitals with lower volumes (1 to 2 or 3 to 6 operations) were more likely to have patients with hospital stays > 14 days.

Conclusion
In patients having major hepatic resection for hepatocellular carcinoma, higher hospital volume was associated with lower in-hospital mortality rates and lengths of hospital stay.

Source of funding: No external funding.

For correspondence: Dr. S.J. Mulvihill, Department of Surgery, Room U-122, University of California—San Francisco Medical Center, San Francisco, CA 94143-0788, USA. FAX 415-476-8694.

Operative mortality rate and length of hospital stay for hepatic resections for hepatocellular carcinoma by hospital volume*

Hospital volume (number of operations/5 y)	Mean operative mortality rate	Mean length of hospital stay
1 to 2	22.7%	14.3 d
3 to 6	13.3%	13.4 d
7 to 16	15.4%	13.1 d
≥ 17	9.4%	11.3 d

*Data are risk adjusted for hospital volume, age, sex, year of surgery, source of admission, type of resection, presence of chronic liver disease, and presence of other preoperative comorbid illnesses.

Commentary

At first glance, the conclusions of the study by Glasgow and colleagues seem obvious. The objective of this retrospective study was to determine whether the outcomes for high-risk surgery, such as hepatic resection for hepatocellular carcinoma, correlated with hospital volume. The authors used in-hospital mortality and length of stay as measures of surgical complication rate and morbidity. A direct relation between hospital volume and improved outcomes was found, suggesting that patients requiring high-risk surgery should be referred to regional centres of excellence.

Several caveats to this conclusion must be made. First, it is known that in busy hospitals patient length of stay can be influenced by the pressure of new patient admissions from the emergency room. Further, the criteria for bed use are different in inner-city public hospitals than in other medical centres. How these factors affect the 11.3-day adjusted length of stay in the high-volume group compared with the 14.3-day length of stay in the low-volume group is not known. Second, could the lower OMR in the high-volume group have been caused by better selection of patients and multidisciplinary team management rather than hospital volume or the skill and experience of the surgeon? Third, in the patients who died, the statistical comparison of the length of stay in the 2 groups is not stated. Fourth, it would be helpful to see a comparison of the proportions of patients with comorbid diseases or severe liver disease and associated complications. We know that the severity and number of comorbid diseases or the severity of cirrhosis and portal hypertension increase both morbidity and mortality after hepatic resection for hepatocellular carcinoma.

The results of this study, although interesting and important, should promote prospective multicentre studies that address these specific issues. Publication of the results of these studies should precede the recommendation that high-risk procedures be regionalised to centres of excellence.

Jacob Korula, MD
University of Southern California School of Medicine
Los Angeles, California, USA