A systematic review and meta-analysis of the relationship between hospital/surgeon volume and outcome for radical cystectomy: an update for the ongoing debate


CRD summary
The review concluded that compared with low-volume providers, high-volume providers tended to have significantly lower rates of postoperative mortality with cystectomies in patients with bladder cancer; further criteria were needed to direct centralisation initiatives. This review was limited by differences across the included studies, but the authors’ conclusions and recommendations reflect this and appear reasonable.

Authors' objectives
To assess the hospital/surgeon volume-outcome relationship for radical cystectomy for bladder cancer.

Searching
PubMed, EMBASE and The Cochrane Library were searched to September 2010. Search terms were reported. Reference lists of relevant studies were handsearched.

Study selection
Studies of radical cystectomy for bladder cancer were eligible for inclusion if they reported on surgical or hospital volume as a variable. Studies had to report on postoperative mortality or survival as an outcome and had to describe multiple hospitals or surgeons. Studies had to use a multivariate analysis to correct for at least gender and age. Volume had to be defined as a distinct cut-off value. Systematic reviews and other studies that did not use primary data were excluded.

The included studies considered primarily hospital volume as the independent factor; some studies also considered surgical volume. Most studies were from USA; studies from UK, The Netherlands and Canada were represented. The definition of low volume varied from one to nine procedures and the cut off for high volume varied from four to 24 procedures per year. In over half of the studies the cut off point for recording mortality was 30 days.

Two reviewers independently performed study selection.

Assessment of study quality
Study quality was assessed using Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) criteria.

The authors did not state how many reviewers were involved in validity assessment.

Data extraction
Data were extracted on postoperative mortality and survival for the highest- and lowest-volume groups in each study, and used to calculate odds ratios (ORs) or hazard ratios (HRs), together with 95% confidence intervals (CIs).

The authors did not state how many reviewers were involved in data extraction.

Methods of synthesis
A random-effects meta-analysis was used to calculate pooled odds ratios and hazard ratios, together with 95% CIs. Statistical heterogeneity was assessed using the $I^2$ statistic ($I^2 > 50\%$ indicated notable heterogeneity). Publication bias was assessed using funnel plots and Egger's test.

Sensitivity analyses were performed for data overlap, comorbidity, country of origin, data source, urgency of operation and clustering. Meta-regression was used to explore the relationship between effect size and volume cut-off point.

Results of the review
Ten observational studies were included in the review (196,978 patients). Study sample sizes varied from 518 to
112,616 patients. All results were risk-adjusted for age and gender and most were also adjusted for comorbidity and urgency of operation.

**Hospital volume (seven studies)**: Compared with low-volume providers, there was a statistically significantly lower risk of postoperative mortality with high-volume hospitals (OR 0.55, 95% CI 0.44 to 0.69, I²=50%). Sensitivity analysis indicated no differences with any of the variables studied. Meta-regression did not find a relationship between volume cut-off point and the strength of the relationship. No publication bias was detected.

**Surgeon volume (three studies)**: Compared with low-volume surgeons, there was a statistically significantly lower risk of postoperative mortality with high-volume surgeons in two studies (OR 0.58, 95% CI 0.46 to 0.73, I²=50%). Sensitivity analysis could not be performed due to data limitations.

**Authors’ conclusions**
Compared with low-volume providers, high-volume providers tended to have significantly lower rates of postoperative mortality with cystectomies in patients with bladder cancer, but further criteria are needed to direct centralisation initiatives.

**CRD commentary**
Inclusion criteria for the review were clearly defined and three relevant data sources were searched. It was unclear whether language restrictions were imposed and so the risk of language bias was uncertain. Publication bias was assessed and was not detected with hospital volume, although the meaningfulness of this assessment was questionable as there were fewer than 10 studies. Attempts were made to reduce reviewer error and bias during study selection; it was unclear whether any similar attempts were made for quality assessment and data extraction.

Quality assessment indicated that most studies were of good methodological quality, had large sample sizes and controlled for confounding factors. Studies were combined using random-effects meta-analysis, although moderate statistical heterogeneity remained in some of the analyses. There were notable differences in the cut-off points for volume across studies, with considerable overlap between low- and high-volume definitions across studies, which the authors acknowledged. There were different definitions of postoperative mortality and limited data on longer-term survival.

This review was limited by the differences across the studies, but the authors’ conclusions and recommendations reflect this and appear reasonable.

**Implications of the review for practice and research**

**Research**: The authors stated that the Dutch Association of Urology implemented a national quality of care registration programme for all patients by surgery for muscle-invasive bladder cancer. The authors noted that it was essential to measure the amount of care provided as a whole and in different parts of the country to identify essential structural and organisational characteristics that effect outcomes after radical cystectomy surgery for patients with bladder cancer.

**Practice**: The authors stated that a minimum volume standard should not be the only criterion in the accreditation of cystectomy centres.

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