Volume-outcome association in bariatric surgery: a systematic review
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CRD summary
The authors concluded that there was strong evidence of improved patient outcomes with high-volume surgeons and in high-volume hospitals. The evidence was less convincing for high-volume hospitals. The conclusions appear to reflect the data, but may be overstated given the quality of included studies.

Authors' objectives
To examine the association between annual hospital and surgeon case volume and patient outcomes in bariatric surgery.

Searching
MEDLINE, the Cochrane Database of Systematic Reviews, and Evidence Based Medicine Reviews: ACP Journal Club, Database of Abstracts of Review of Effects (DARE), Cochrane Central Register of Controlled Trials (CENTRAL), Cochrane Methodology Register, Health Technology Assessment (HTA) and NHS Economic Evaluation Database (NHSEED), was searched to April 2011. Search terms were reported. A manual search of reference lists of all relevant publications was undertaken.

Study selection
Eligible studies had to report on the effects of annual hospital volumes and/or annual surgeon volumes on patient outcomes following bariatric surgery, including mortality, morbidity, complications, rates of readmission and length of hospital stay. Review articles and commentaries were excluded from the review.

Most included studies evaluated in-hospital mortality and complication rates, with very few providing long-term results. Details on the types of bariatric operations were provided. Most studies were retrospective case series. Various cut-offs were presented. Almost all studies were conducted in the United States.

The authors did not state how many reviewers selected the studies.

Assessment of study quality
Cohort and case-control studies were quality assessed using the Newcastle-Ottawa Quality Assessment Scale, and case series were assessed using a 3-factor scale adopted from published criteria.

The authors did not state how many reviewers carried out the quality assessment.

Data extraction
Data were extracted relating to proportions, odds ratios, relative risks, and 95% confidence intervals.

One reviewer performed the data extraction.

Methods of synthesis
The studies were reported in a narrative synthesis.

Results of the review
Twenty-four studies were included in the review (458,032 patients): two prospective cohorts, three retrospective cohorts, two retrospective case-control studies and 17 retrospective case series. The overall methodological quality of the included studies was fair. Duration of follow-up ranged from hospital discharge to two years.

Thirteen studies (158,297 patients) reported on the association between annual surgeon volume and patient outcomes following bariatric surgery. All five cohort studies reported improved patient outcomes with increasing surgeon volumes, and evidence from eight retrospective case series was mixed. Overall, 11 studies demonstrated a positive association.
Seventeen studies (369,310 patients) reported on the association between annual hospital volume and patient outcomes. Two case control studies demonstrated no volume-outcome association, and 14 (out of 15) retrospective case series demonstrated that high-volume hospitals were associated with improved patient outcomes.

**Authors' conclusions**
There was strong evidence of improved patient outcomes with high-volume surgeons and also in high-volume hospitals. Evidence was less convincing for high-volume hospitals.

**CRD commentary**
The review question and inclusion criteria were clear. The search included several databases, but it was not clear if data in languages other than English, or unpublished studies were sought, which potentially introduced language and publication biases. It was unclear how many reviewers selected the studies for inclusion and it appeared that only one reviewer extracted the data, which may increase the potential for reviewer error and bias. Quality assessment was appropriately undertaken and considered in the analysis of the data, although it was not clear how many reviewers performed the quality assessment. As the authors correctly stated, meta-analysis would not have been appropriate due to heterogeneity between the studies. Some aspects of this review were well conducted, but reviewer error and bias may have been introduced.

The conclusions appeared to reflect the data, but given the "fair" quality of the included studies, it was possible that they were overstated. The review findings were likely to be most applicable to the organisation and delivery of health care in the United States.

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

**Practice:** The authors stated that data were too heterogeneous to make specific recommendations for minimum annual case volume requirements for practicing bariatric surgeons, but the results were in agreement with various guidelines on surgeon volume. They also stated that the review supports the concept of "Bariatric Surgery Centre of Excellence" accreditation.

**Research:** The authors stated that better quality national databases were needed to collect pertinent clinical information to allow for appropriate risk-adjustment. They also stated that future studies should focus on reporting mortality and complication rates at more than 90 days after the operation. Future research into the quality of care characteristics of successful bariatric programmes, and the elements of surgical training, patient selection, and complication recognition by high-volume surgeons was recommended.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.