

Blueprint for halving obesity: rapid review

Effectiveness of surgical interventions on clinical outcomes relating to obesity



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Summary table

Title	Review of the key results from the Swedish Obese Subjects (SOS) trial – a prospective controlled intervention study of bariatric surgery
Authors	Sjöström (2012)
Type of study	Swedish Obesity Subjects Study (SOS) Matched controlled intervention study – two arm non-randomised trial
Outcome variable	% body weight loss relative to baseline
Treatment	Bariatric surgery: gastric bypass (13%), banding (19%), and vertical banded gastroplasty (68%)
Control	Standard non-surgical treatment as usual, or no treatment at all
Magnitude of effect (Adults)	<p>Baseline body weight intervention = 121.0kg (SD, 16.6); Control = 114.7kg (SD, 16.5) Mean reductions in body weight at 2, 10, 15, and 20 years were;</p> <p><i>Surgery:</i> 23% (27.83kg), 17% (20.57kg), 16% (19.36kg), 18% (21.78kg) <i>Controls:</i> 0%, 1%, 1%, 1% respectively</p> <p>Initial loss of -27.83kg after two years. Subsequent weight gain was an average of 0.81kg per annum between two and 10 years and 0.34kg per annum over two and 20 years post operative.</p> <p>Differences by surgical procedure at two years post operative:</p> <ul style="list-style-type: none"> - Gastric bypass (-32%), Roux-en-Y bypass - Vertical banded gastroplasty (32%) - Banding (20%), gastric bands <p>At 10 years post operative:</p> <ul style="list-style-type: none"> - Gastric bypass (-25%) - Vertical banding gastroplasty (-16%) - Banding (-14%)

Rapid umbrella review

Background

Bariatric surgery is an intervention to alter the gastrointestinal anatomy as a means of achieving weight loss in patients living with obesity. It may be offered by the NHS to patients [with a BMI greater than 40](#) who have not been able to achieve clinically beneficial weight loss by other means, such as lifestyle, dietary and psychological interventions. Procedures, which include sleeve gastrectomy, gastric bypass and banded gastroplasty among several others, reduce the capacity of the stomach impacting a [variety of mechanisms](#) that control hunger. The outcome is that patients should feel less hungry and consume fewer calories, helping drive weight loss over time. According to NHS data [an average of 4,600 people per year underwent bariatric surgery in the UK between 2017 and 2022](#), including a drop in the surgery rates during the pandemic.

Objectives

The objective of this report is to summarise the best available evidence for the effectiveness of surgical interventions on clinical outcomes relating to obesity in adults.

Methods

We aimed to identify and synthesise reviews that include quantitative and/or qualitative research synthesis on the effectiveness of surgical interventions on dietary behaviours, clinically reliable obesity measures, or obesity status. We intended to identify and synthesise the review that was reflective of the best evidence, based on (a) suitability to research question, (b) year published and (c) quality of review as judged by JBI critical appraisal checklist. We consulted with an Expert Advisory Group (EAG) of leading academic experts to validate findings and provide guidance on alternatives where it was considered most current reviews did not capture the latest and or best evidence.

Eligibility criteria

Types of review. To be eligible for inclusion, sources were required to use a systematic review methodology (ie, use of systematic search and inclusion strategy to identify all available studies) and include quantitative analysis (eg, meta-analysis) of multiple studies. If the search did not identify any source where a meta-analysis has been conducted due to heterogeneity of outcomes of interest, we included reviews with narrative synthesis. No restrictions were applied regarding the design of the studies included in the systematic reviews.

Participants. To be eligible for inclusion, sources were required to examine the effect of surgical interventions in adults (>18y old) with overweight or obesity.

Intervention. Laparoscopic adjustable gastric banding, Roux-en-Y Gastric Bypass (RYGB), sleeve gastrectomy, one anastomosis gastric bypass (OAGB), single anastomosis duodeno-ileal bypass with sleeve (SADI-S), biliopancreatic diversion with duodenal switch (BPD/DS), endoscopic sleeve gastroplasty.

Comparator. We have not restricted inclusion by the comparator group. For reviews of randomised controlled trials, the comparator may be no intervention or a lower intensity intervention. For reviews of natural/quasi-experimental studies, a comparator group may consist of pre- versus post- interventions or may not be included. Other comparators include weight list control, diet and lifestyle advice.

Outcomes. The main outcome of interest was weight loss. To be eligible for inclusion, reviews needed to have included a clinical outcome [eg, mean difference in one or more of the following variables: weight, BMI, % fat, waist circumference, waist to hip ratio, waist to height ratio, percentage of excess weight loss (percentage of weight lost over a BMI 25kg/m²).

Information sources and article selection

The search strategy was designed to identify syntheses of research evidence such as systematic reviews between the year 2010 and the date of search. Initial keywords were identified via scoping review of relevant papers and reports as well as via MEDLINE using the MeSH function. A search was performed in MEDLINE and the

Cochrane Database of Systematic Reviews. Grey literature was searched using Google and Google Scholar (limited to the first 10 pages) to identify relevant reports.

Screening

Due to the rapid nature of the reviews, a single reviewer screened titles and abstracts and discussed any uncertainty with a second reviewer. For relevant titles/abstracts, the full text was retrieved for full text review. One reviewer reviewed the full texts and discussed uncertainties with a second reviewer. An expert panel reviewed the research findings and offered guidance, noting areas where the latest and most pertinent evidence on the effects of surgical interventions on obesity may have been overlooked in the search results.

Assessment of methodological quality

Systematic reviews that included a quantitative synthesis of the effectiveness of surgical interventions on clinical outcomes relevant to individuals with obesity were considered for inclusion. If more than one review was identified, we selected the review that better answered our research question. If multiple reviews were identified, we selected the highest quality and up-to-date review for data extraction. The quality of reviews was appraised by one reviewer and verified by a second reviewer using the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses.

Results

A total of 2,119 articles were identified through databases including PubMed and Cochrane. Grey literature searches identified an additional 46 articles. After removing duplicates (N=3), the total number of articles was 2,116, which underwent the screening phase. This led to the exclusion of 1,827 titles and 160 abstracts. Subsequently, 129 full-text articles were assessed for eligibility, of which 127 were excluded and two were included for full text review.

The most recent meta-analyses examining the impact of surgery on weight loss are now more than 10 years old and exclude the most current and highest quality evidence on the long-term impacts of surgical interventions for weight loss. Following the recommendation of the EAG we instead selected evidence from the [Swedish](#)

[Obese Subjects Study \(SOS\)](#), a study which has been examining the long-term impact of bariatric surgery relative to treatment as usual since 1987. This evidence has been reviewed in [Sjöström \(2012\)](#) and a more recent analysis reported in [Sjöholm et al. \(2022\)](#).

Sjöström (2012) in a paper entitled 'Review of the key results from the Swedish Obese Subjects (SOS) trial – a prospective controlled intervention study of bariatric surgery' reviewed evidence on the impact of the SOS intervention on patient weight over follow-up periods ranging from 10 to 20 years. This study involved 2010 patients living with obesity who underwent weight loss surgery plus 2,037 matched controls. The majority of surgical patients had vertical banded gastroplasty (VBG) (68%) whilst the remainder underwent gastric bypass (GBP) (13%) or banding (19%). The control group had non-surgical treatment as usual. Participants were aged 37 to 60 years at baseline and were required to have a BMI above 34kg m² (male) or 38kg m² in (female).

Highly comprehensive matching procedures were implemented using 18 matching variables encompassing demographic and physiological characteristics (8), health and lifestyle (2) and psychological and psychosocial factors (6). Due to these rigorous matching criteria coupled with ethical considerations that precluded randomised allocation to groups, the control group exhibited a significantly lower baseline BMI than the intervention group.

Researchers followed up the patients at multiple time points at 4, 8, 10, 15 and 20 years. Good follow-up samples were sustained up until 10 years post intervention, followed by lower follow-up rates at 15 (control n = 556, intervention n = 676) and 20 years (control n = 176, intervention n = 145).

Findings

This is a non-exhaustive summary of Sjöström's (2012) findings. Please see the [original article](#) for more detail missing here.

Results were reported as a percentage body weight loss relative to baseline. Weight remained relatively static amongst the control group varying by +/- 3% over 20 years whereas the surgical intervention group on average experienced significant and lasting reductions in body weight over the whole period. The average alterations in

body weight following 2, 10, 15 and 20 years were 23%, 17%, 16% and 18% in the surgery group, and 0%, 1%, 1% and 1% in the control group, respectively. The most significant weight loss was observed within the first two years postoperative with some gradual weight regain occurring subsequently although weight loss remained substantially greater than the control group.

The authors reported separate effects for the three different surgical procedures. Greatest weight loss was associated with GBP (32%) in the first two years, followed by VBG (32%) and banding (20%). GBP was also associated with greatest weight loss at 10 years follow up (25%) whilst VBG and banding were associated with reductions of 16% and 14% respectively.

Additionally, compared to treatment as usual, bariatric surgery was associated with a sustained reduction in overall mortality [adjusted hazard ratio (HR) = 0.71, 95% confidence interval (CI) 0.54– 0.92; $p = 0.01$]. Significant long-term reductions in diabetes prevalence, stroke and myocardial infarction and cancer incidence were also reported.

Limitations

The main limitation of this study was that patients were not randomly allocated to the treatment or control group. Whilst the matching procedures were highly robust, it did mean that self-selection for surgical treatment led to significantly higher BMI in the intervention group. Another limitation of the study was that 20 year follow-up data collection had not been completed, reducing the available sample size.

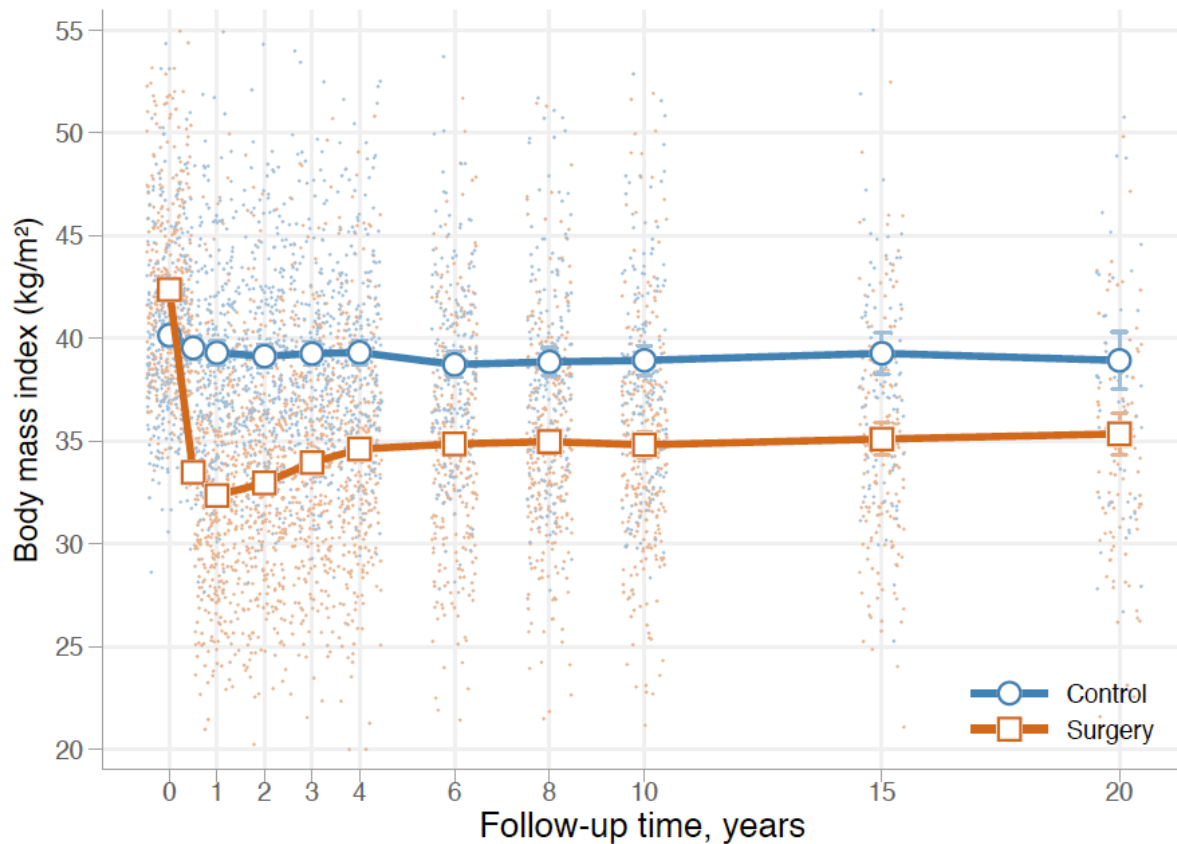


Figure 1: Displays change in BMI relative to baseline over time. Lines are estimated means from a mixed model with adjustment for sex and age. Dots represent observed values from individual participants. The y-axis is truncated at a body mass index of 20 and of 55kg/m², but all observations were used in the estimation of means. Reproduced from supplementary material by [Sjöholm et al. \(2022\)](#)¹

¹ American Diabetes Association, 2022, 'Association of bariatric surgery with cancer risk and mortality in adults with obesity', *Diabetes Care*, vol. 45, no. 2, pp. 444–452. Available at: <https://doi.org/10.2337/dc21-1234>