ASK THE QUESTION

Question: In adult patients considered obese (BMI >/=30), what is the cost effectiveness of comprehensive obesity management programs?

Background: The prevalence of obesity, which is defined as a body mass index (BMI) of greater than 30, has increased dramatically in the United States since the late 1990s (Ringel 2004). Currently, rates of obesity exceed 30% in most sex and adult age groups, whereas prevalence among children and adolescents, defined as a BMI of more than 95th percentile, has reached 17% (Flegal 2010). As BMI increases, there are significant increases in physician visits, emergency department visits, and health care costs, as well as impairment in work productivity (DiBonaventura 2015).

The alarming rates of the high prevalence of obesity have posed a significant public health concern as well as a substantial financial burden on our society because obesity is known to be a risk factor for many chronic diseases, such as type 2 diabetes, cancer, hypertension, asthma, myocardial infarction, stroke and other conditions (Hu 2008; Dixon 2010).

SEARCH FOR EVIDENCE

Databases included Ovid MEDLINE, Cochrane Database of Systematic Reviews, PsycINFO, and National Guideline Clearinghouse, also looked at references and citing articles

Search strategy included:

1. exp Obesity/dh, dt, nu, su, th [Diet Therapy, Drug Therapy, Nursing, Surgery, Therapy] (45078)
2. exp weight loss/ (36510)
3. (obes* or overweigh* or overnutrition or heavy).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (411617)
4. 2 and 3 (18901)
5. 1 or 4 (51769)
Office of Clinical Integration and EBP GRADE Table

6. exp Patient Care Team/ (63727)
7. exp Comprehensive Health Care/ (272153)
8. 6 or 7 (322250)
9. 5 and 8 (1310)
10. exp obesity/ (182823)
11. 8 and 10 (2364)
12. exp "Costs and Cost Analysis"/ (214842)
13. 11 and 12 (95)
14. exp obesity/ec (1647)
15. 8 and 14 (66)
16. 13 or 15 (117)
17. ((cost* or expens* or financ* or dollar* or reimburs*) adj10 ((comprehensiv* or team* or interdiscip* or inter-discip* or interprofession* or inter-profession*) adj7 ((obes* or overweigh* or weigh*) adj3 (manag* or treat* or therap* or interven* or program* or system* or counsel*)))).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier, synonyms] (7)
18. ((cost* or expens* or financ* or dollar* or reimburs*) adj10 ((comprehensiv* or team* or interdiscip* or inter-discip* or interprofession* or inter-profession*) adj7 ((lose* or loss* or losing or reduc* or drop* or shed* or manag*) adj3 weigh*)) adj3 (manag* or treat* or therap* or interven* or program* or system* or counsel*)).mp. (3)
19. 16 or 17 or 18 (123)
20. exp Economics/ (560532)
21. ec.fs. (392168)
22. 20 or 21 (683247)
23. 9 and 22 (101)
24. 19 or 23 (156)
25. limit 24 to english language (144)
26. limit 24 to abstracts (124)
27. 25 or 26 (152)
CRITICALLY ANALYZE THE EVIDENCE

The literature search resulted in a number of studies evaluating the cost-effectiveness of various interventions. In order to simplify the review process, we grouped the evidence into five categories: (1) Bariatric Surgery; (2) Pharmacologic; (3) Behavioral; (4) Primary Care Weight Management Program; and (5) Lifestyle Intervention.

**Bariatric Surgery:** Four studies were found that evaluated the cost-effectiveness of bariatric surgery, one systematic review and three non-randomized studies. The systematic review (Campbell 2016) included 77 studies in 17 countries, with 56% studies were conducted in the United States. Incremental cost-effectiveness ratios (cost/QALY gained) for cost utility studies which reported in USD revealed base-care valuations of \( \leq 6,500 \)/QALY gained. One simulation model study (Hoerger 2010) analyzed the cost-effectiveness of bariatric surgery in severely obese (BMI \( \geq 35 \) kg/m\(^2\)) adults with diabetes. The study found that bypass surgery had cost-effectiveness ratios of $7,000/QALY and $12,000/QALY for severely obese patients with newly diagnosed and established diabetes respectively. Banding surgery had cost-effectiveness ratios of $11,000/QALY and $13,000/QALY for the respective groups. A retrospective study (McEwen 201) assessed the cost, quality of life impact, and the cost-utility of bariatric surgery in a managed care population. The study found the cost-utility ratio for bariatric surgery versus no surgery was approximately $1,400 per QALY. Finally, a retrospective cohort study (Warren 2015) created a model on the cost-effectiveness of increasing the number of bariatric surgical operations performed on patients with Type II Diabetes Mellitus (T2DM). The 10-year aggregate cost savings of bariatric surgery compared with a control group is $2.7 million/1000 patients; the total (direct and indirect) cost savings is $5.4 million/1000 patients.

*Quality of Evidence: Moderate*

**Pharmacologic:** Two studies were found evaluating the cost-effectiveness of pharmacologic interventions in patients considered obese. One systematic review (Ara 2012) in the United Kingdom evaluated the clinical effectiveness and cost-effectiveness of three pharmacological interventions. The study found a large variation in the results reported in the 16 identified published economic evaluations with incremental cost-effectiveness ration (ICERs) ranging from £970 to £59,174 per QALY when comparing the active interventions with lifestyle advice. A retrospective study (Counterweight Project 2008) quantified the influence of body mass index (BMI) on prescribing costs, and then the potential savings attached to implementing a weight management intervention, known as the Counterweight Weight Management Program. Modelling weight reductions achieved by the program would potentially reduce prescribing costs by pound 6.35 (men) and pound 3.75 (women) or around 8% of program costs at one year, and by pound 12.58 and pound 8.70, respectively, or 18% of program costs after two years of intervention.

*Quality of Evidence: Low*

**Behavioral:** Two studies were found evaluating the cost-effectiveness of behavioral interventions. One economic evaluation study (Hoerger 2015) examined the potential cost effectiveness of Medicare’s intensive behavioral therapy for obesity. Based on assumptions for the maximal intervention effectiveness, intensive behavioral therapy is likely to be cost saving if costs per session equal the current reimbursement rate ($25.19) and will provide a cost-effectiveness...
ratio of $20,912 per quality-adjusted life-year if costs equal the rate for routine office visits. A RCT (Quattrin 2017) reported the cost-effectiveness of long-term weight change for family-based behavioral treatment (FBT) compared with an attention-controlled information control (IC) group. The incremental cost-effectiveness ratios (ICERs) for children and parents’ %OBMI were $116.1 and $83.5 per U of %OBMI, respectively. Parental ICERs were also calculated for body weight and BMI and were $128.1 per 1, and $353.8/per kilogram, respectively.

**Quality of Evidence: Low**

### Primary Care Weight Management Program:
Three non-randomized studies evaluated the cost-effectiveness of primary care weight management programs. One cross-sectional study (Tigbe 2013) quantified the relationship between BMI and total healthcare expenditure with the patient as the unit of analysis. Adjusted total annual healthcare cost was £16 (95% CI 11-21) higher per unit BMI. All cost categories were significantly (P<0.003) higher for those with BMI >40 compared with BMI <20kgm (-2): prescription drugs (men: £390 versus £16; women: £211 versus £73), hospitalization (men: £72 versus £0; women: £243 versus £107), primary care (men: £191 versus £69; women: £268 versus £153) and outpatient care (£234 versus £107 women only). A retrospective study (Trueman 2010) evaluated the long-term cost-effectiveness through its potential to reduce obesity-related conditions and associated healthcare resource use, with improved health outcomes. Quality-adjusted Life-Year cost was £2017 where background weight gain was limited to 0.5 kg/year, and £2651 at 0.3 kg/year. Another retrospective study (Tsai 2013) conducted an economic analysis of a clinical trial of obesity treatment that was implemented in six primary care practices. The incremental cost per kilogram-year lost was $292 for Enhanced Brief LC compared to Usual Care (95% CI $38 to $394). The incremental cost per QALY was $115,397, but the 95% CI were undefined.

**Quality of Evidence: Low**

### Lifestyle Intervention:
One RCT (Wolf 2007) evaluated the program and health care costs of a lifestyle intervention in a high-risk obese population. The study found that net cost of the intervention was $328 per person per year. After incorporating program costs, mean health plan costs were $3,586 (95% confidence interval [CI]: $-8,036, $-25, P<0.05) lower in case management compared to usual care.

**Quality of Evidence: Low**

In conclusion, there is moderate to low quality of evidence on the cost-effectiveness of obesity interventions. The majority of modalities (Pharmacologic; Behavioral; Primary Care Weight Management Program; and Lifestyle Intervention) were rated low due to inconsistency because of variation in interventions and economic evaluations, and due to imprecision when studies included few patients and/or events. Additionally, the bariatric surgery modality was rated as moderate overall. Another limitation in the evidence is that the studies looked at individual interventions rather than the cost-effectiveness of a comprehensive obesity center that includes all modalities.

**PICO Question:** In adult patients considered obese (BMI >/=30), what is the cost effectiveness of comprehensive obesity management programs?

<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Purpose of Study</th>
<th>Study Design &amp; Methods</th>
<th>Sample</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lower Quality Rating if:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Studies inconsistent (wide variation of treatment effect across)</td>
</tr>
</tbody>
</table>
### Office of Clinical Integration and EBP GRADE Table

<table>
<thead>
<tr>
<th>Total # of Studies: 4</th>
<th># of Systematic Reviews: 1</th>
<th># of Non-Randomized Studies: 3</th>
</tr>
</thead>
</table>

**Campbell, J.A., et al., 2016, Obesity Reviews**

To summarize and synthesize a diverse range of economic evaluations on bariatric surgery

Systematic Review; Multiple perspectives

77 studies representing 17 countries (56% USA)

Despite study heterogeneity, common themes emerged, and important gaps were identified. Most studies adopted the healthcare system/third-party payer perspective; reported costs were generally healthcare resource use (inpatient/shorter-term outpatient). Out-of-pocket costs to individuals, family members (travel time, caregiving) and indirect costs due to lost productivity were largely ignored. Costs due to reoperations/complications were not included in one-third of studies. Body-contouring surgery included in only 14%. One study evaluated long-term waitlisted patients. Surgery was cost-effective/cost-saving for severely obese with type 2 diabetes mellitus. Study quality was inconsistent.

**Incremental cost-effectiveness ratios (cost/QALY gained) for cost utility studies that reported in USD from 2010 to 2014 revealed base-case valuations of ≤$6,500/QALY gained.** One study was an exception and reported $17,300/QALY gained for ORYGBP (an open procedure). These valuations still fall well below the accepted willingness to pay threshold of ≤$50,000/QALY.

**Study Limitations = None**

**Systematic Review**

- Review did not address focused clinical question
- Search was not detailed or exhaustive
- Quality of the studies was not appraised or studies were of low quality
- Methods and/or results were inconsistent across studies

**Studies, populations, interventions, or outcomes varied**

- Studies are indirect (PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)

- Studies are imprecise (When studies include few patients and few events and thus have wide confidence intervals and the results are uncertain)

- Publication Bias (e.g., pharmaceutical company sponsors study on effectiveness of drug, only small, positive studies found)

- Increase Quality Rating if:
  - Large Effect
  - Dose-response gradient
  - Plausible confounders or other biases increase certainty of effect

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**Hoerger, T.J., et al., 2010, Diabetes Care**

To analyze the cost-effectiveness of bariatric surgery in severely obese (BMI ≥35 kg/m²) adults who have diabetes, using a validated diabetes cost-effectiveness model

Simulation Model; Societal

The Centers for Disease Control and Prevention—RTI Diabetes Cost-Effectiveness Model was expanded to incorporate bariatric surgery. Model estimated the costs, quality-adjusted life-years (QALYs), and cost-effectiveness of gastric bypass surgery relative to usual diabetes care and of gastric banding surgery relative to usual diabetes care. The cost-effectiveness of each type of surgery for severely obese

In all analyses, bariatric surgery increased QALYs and increased costs. Bypass surgery had cost-effectiveness ratios of $7,000/QALY and $12,000/QALY for severely obese patients with newly diagnosed and established diabetes, respectively. Banding surgery had cost-effectiveness ratios of $11,000/QALY and $13,000/QALY for the respective groups. In sensitivity analyses, the cost-effectiveness ratios were most affected by assumptions about the direct gain in QoL from BMI loss following surgery.

**Study Limitations = None**

**Economic Evaluation**

- The research question is not clearly stated
- The perspective of interest is not clear (i.e., societal, patient, health system, payer)
- The source(s) of effectiveness estimates are not clearly stated
- The primary outcome measures are not clearly stated

- Increase Quality Rating if:
  - Large Effect
  - Dose-response gradient
  - Plausible confounders or other biases increase certainty of effect

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To summarize and synthesize a diverse range of economic evaluations on bariatric surgery

To analyze the cost-effectiveness of bariatric surgery in severely obese (BMI ≥35 kg/m²) adults who have diabetes, using a validated diabetes cost-effectiveness model

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**Study Limitations = None**

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**Study Limitations = None**

**Economic Evaluation**

- The research question is not clearly stated
- The perspective of interest is not clear (i.e., societal, patient, health system, payer)
- The source(s) of effectiveness estimates are not clearly stated
- The primary outcome measures are not clearly stated

- Increase Quality Rating if:
  - Large Effect
  - Dose-response gradient
  - Plausible confounders or other biases increase certainty of effect

- **To Retrospective Study; Payer**
- **Study Limitations = None**

- **Quality (certainty) of evidence for studies as a whole:**
  - High
  - Moderate
  - Low
  - Very Low

### Table 3—Life years gained and cost-effectiveness ratios (ratios to no surgery) for bariatric surgery

<table>
<thead>
<tr>
<th>Total</th>
<th>Remaining</th>
<th>Cost-effectiveness ratios to no surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient newly diagnosed diabetes</td>
<td>61,130</td>
<td>7,162</td>
</tr>
<tr>
<td>No surgery</td>
<td>60,428</td>
<td>23,142</td>
</tr>
<tr>
<td>Severe obesity (no surgery)</td>
<td>15,739</td>
<td>5,213</td>
</tr>
<tr>
<td>Bariatric surgery</td>
<td>98,029</td>
<td>11,129</td>
</tr>
<tr>
<td>Severe obesity (no surgery)</td>
<td>15,739</td>
<td>5,213</td>
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</tr>
<tr>
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<td>98,029</td>
<td>11,129</td>
</tr>
<tr>
<td>Bariatric surgery</td>
<td>98,029</td>
<td>11,129</td>
</tr>
</tbody>
</table>

One year after surgery, mean body mass index fell from 51 to 31 kg/m^2^ in women and from 59 to 35 kg/m^2^ in men with substantial improvements in comorbidities. Postsurgical mortality and morbidity were low. Total per member per month costs increased in the 6 months before bariatric surgery, were lower in the 12 months after bariatric surgery, but increased somewhat over the next 12 months. When presurgical quality of life was assessed prospectively, average health utility scores improved by 0.14 one year after surgery. In analyses that took a lifetime time horizon, projected future costs based on age and obesity and discounted costs and health utilities at 3% per year, the cost-utility ratio for bariatric surgery versus no surgery was approximately $1,400 per quality-adjusted life-year gained. In sensitivity analyses, bariatric surgery was more cost-effective in women, non-whites, more obese patients, and when performed laparoscopically. Although not cost-saving, bariatric surgery represents a very good value for money.

To develop a model on the cost-effectiveness of increasing the number of bariatric surgical operations performed on patients with Type II diabetes mellitus (T2DM) in the United States

Retrospective Cohort Study; Societal

Applied published population cost estimates (2012) for medical care of T2DM to a retrospective cohort of morbidly obese patients in South Carolina. Study compared differences in 10-year medical costs between those having bariatric surgery and controls.

371,200 people

Resolution of T2DM in the bariatric cohort was assumed to be 40 per cent. Considering only the direct medical costs of T2DM, the 10-year aggregate cost savings compared with a control group is $2.7 million/1000 patients; the total (direct and indirect) cost savings is $5.4 million/1000 patients. When considering resolution of T2DM alone, increasing the number of bariatric operations for a given population leads to a substantial cost savings over a 10-year period.

Study Limitations = None

Economic Evaluation

The research question is not clearly stated
The perspective of interest is not clear (ie., societal, patient, health system, payer)
The source(s) of effectiveness estimates are not clearly stated
The primary outcome measures are not clearly stated
The methods for the estimation of quantities and unit costs are not described

**PICO Question:** In adult patients considered obese (BMI >/=30), what is the cost effectiveness of comprehensive obesity management programs?

**Modality:** Pharmacologic; **Outcome:** Cost-Effectiveness

**Author/Date** | **Purpose of Study** | **Study Design & Methods** | **Sample** | **Outcomes** | **Design Limitations**
--- | --- | --- | --- | --- | ---
Ara, R., et al, Health Technology Assessment | To evaluate the clinical effectiveness and cost-effectiveness of three | Systematic Review; Societal | 94 studies involving 24,808 individuals were included in the clinical meta-analysis | There was a large variation in the results reported in the 16 identified published economic evaluations with incremental cost-effectiveness ration (ICERs) ranging from £970 to £59,174 per QALY when comparing the active interventions with lifestyle advice. Only one study compared | Study Limitations = None

**Economic Evaluation**

Review did not address focused clinical question
Search was not detailed or exhaustive

**Lower Quality Rating if:**

- Studies inconsistent (wide variation of treatment effect across studies, populations, interventions, or outcomes varied)
- Studies are indirect (PICO question is quite different from the
<table>
<thead>
<tr>
<th>Study</th>
<th>Pharmacological interventions in obese patients</th>
<th>Methodology and results</th>
<th>Quality of the studies was not appraised or studies were of low quality</th>
<th>Available evidence in regard to population, intervention, comparison, or outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Winchester, England), 2012</td>
<td>The active pharmacological interventions and the reported results suggested that rimonabant would be considered cost effective compared with either orlistat or sibutramine. These analyses were conducted before the withdrawal of both rimonabant and sibutramine. The results of the deterministic analyses conducted for the current study show that, compared with placebo, sibutramine 15 mg dominates (the average costs are lower and the average QALYs are higher) the other three active interventions. However, sibutramine and rimonabant have both been withdrawn because of safety concerns relating to potential treatment-induced fatal adverse events. When considering the potential increase in mortality, the treatments would no longer be considered cost-effective using a threshold of £20,000 per QALY if the proportion of patients who experienced a fatal adverse event was &gt; 1.8% (1.5%, 1.0%) for sibutramine 15 mg (sibutramine 10 mg, rimonabant). Comparing orlistat with placebo, orlistat would be considered cost-effective when using a threshold of £20,000 per QALY and the model is robust to variations in the key parameter values tested with the exception of the baseline BMI value.</td>
<td>☐ Quality of the studies was not appraised or studies were of low quality</td>
<td>☐ Methods and/or results were inconsistent across studies</td>
<td></td>
</tr>
<tr>
<td>Counterweight Project, T., <em>Journal of Health Services &amp; Research Policy</em>, 2008</td>
<td>To quantify the influence of body mass index (BMI) on prescribing costs, and then the potential savings. Paper and computer-based medical records were reviewed for all drug prescriptions over an 18-month period for randomly selected adult patients (18-75 years) stratified by BMI, from 23 primary care practices. The minimum annual cost of all drug prescriptions at BMI 20 kg/m² was £50.71 for men and £62.59 for women. Costs were greater by £5.27 (men) and £4.20 (women) for each unit increase in BMI, to a BMI of 25 (men £77.04, women £78.91), then.</td>
<td>Study Limitations = ☒ None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economic Evaluation</td>
<td>☐ The research question is not clearly stated</td>
<td>☐ The perspective of interest is not clear (ie., societal, patient, health system, payer)</td>
<td>☐ Studies are imprecise (When studies include few patients and few events and thus have wide confidence intervals and the results are uncertain)</td>
<td></td>
</tr>
<tr>
<td>Publication Bias</td>
<td>☐ Large Effect</td>
<td>☐ Dose-response gradient</td>
<td>☐ Plausible confounders or other biases increase certainty of effect</td>
<td></td>
</tr>
<tr>
<td>Increase Quality Rating</td>
<td>☐ Increase Quality Rating if: Large Effect</td>
<td>☐ Dose-response gradient</td>
<td>☐ Plausible confounders or other biases increase certainty of effect</td>
<td></td>
</tr>
<tr>
<td>Quality (certainty) of evidence for studies as a whole:</td>
<td>☐ High</td>
<td>☐ Moderate</td>
<td>☐ Low</td>
<td>☐ Very Low</td>
</tr>
</tbody>
</table>
attached to implementing a weight management intervention in seven UK regions. Drug costs from the British National Formulary at the time of the review were used. Multivariate regression analysis was applied to estimate the cost for all drugs and the 'top ten' drugs at each BMI point. This allowed the total and attributable prescribing costs to be estimated at any BMI. Weight loss outcomes achieved in a weight management program (Counterweight) were used to model potential effects of weight change on drug costs. Anticipated savings were then compared with the cost program delivery. Analysis was carried out on patients with follow-up data at 12 and 24 months as well as on an intention-to-treat basis. Outcomes from Counterweight were based on the observed lost to follow-up rate of 50%, and the assumption that those patients would continue a generally observed weight gain of 1 kg per year from baseline.

by pound 7.78 and pound 5.53, respectively, to BMI 30 (men pound 115.93 women pound 111.23), then by pound 8.27 and pound 4.95 to BMI 40 (men pound 198.66, women pound 160.73). The relationship between increasing BMI and costs for the top ten drugs was more pronounced. Minimum costs were at a BMI of 20 (men pound 8.45, women pound 7.80), substantially greater at BMI 30 (men pound 23.98, women pound 16.72) and highest at BMI 40 (men pound 63.59, women pound 27.16). Attributable cost of overweight and obesity accounted for 23% of spending on all drugs with 16% attributable to obesity. The cost of the program was estimated to be approximately pound 60 per patient entered. Modelling weight reductions achieved by the Counterweight weight management program would potentially reduce prescribing costs by pound 6.35 (men) and pound 3.75 (women) or around 8% of program costs at one year, and by pound 12.58 and pound 8.70, respectively, or 18% of program costs after two years of intervention. Potential savings would be increased to around 22% of the cost of the program at year one with full patient retention and follow-up.

<table>
<thead>
<tr>
<th>PICO Question: In adult patients considered obese (BMI &gt;/=30), what is the cost effectiveness of comprehensive obesity management programs?</th>
<th>Lower Quality Rating if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modality: Behavioral; Outcome: Cost-Effectiveness</td>
<td>Studies inconsistent (wide variation of treatment effect across studies, populations,</td>
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<tr>
<td>Author/Date</td>
<td>Purpose of Study</td>
</tr>
<tr>
<td>Total # of Studies: 2 # of RCTs: 1 # of Non-Randomized Studies: 1</td>
<td></td>
</tr>
<tr>
<td>Hoerger, T.J., et al., American Journal of Preventive Medicine, 2015</td>
<td>To examine the potential cost effectiveness of Medicare’s intensive behavioral therapy for obesity, accounting for uncertainty in effectiveness and utilization</td>
</tr>
<tr>
<td>Quattrin, T., et al., Pediatrics, 2017</td>
<td>To report the cost-effectiveness of long-term weight change for family-based behavioral treatment (FBT) compared with an attention-controlled information control (IC) group</td>
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</tbody>
</table>
**PICO Question:** In adult patients considered obese (BMI ≥30), what is the cost effectiveness of comprehensive obesity management programs?

**Modality:** Primary Care Weight Management Program; **Outcome:** Cost-Effectiveness

<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Purpose of Study</th>
<th>Study Design &amp; Methods</th>
<th>Sample</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
</table>
| Tigbe, W.W., et al., *International Journal of Obesity*, 2013 | To quantify the relationship between BMI and total healthcare expenditure, with the patient as the unit of analysis | Cross-sectional study; Healthcare expenditure | 3,324 patients | In univariate analyses, significant associations (P<0.05) were found between total healthcare expenditure and all dependent variables (women>men, drinker-non-drinkers, smokers-non-smokers, and increasing with greater physical activity, age and BMI. In multivariate analysis, age, sex, BMI, smoking and alcohol consumption remained significantly associated with healthcare cost, and together explained just 5% of the variance in healthcare expenditure. Adjusted total annual healthcare cost was 16 pounds (95% CI 11-21) higher per unit BMI. All cost categories were significantly (P<0.003) higher for those with BMI >40 compared with BMI <20kgm (-2): prescription drugs | Study Limitations = None

**Economic Evaluation**
- The research question is not clearly stated
- The perspective of interest is not clear (i.e., societal, patient, health system, payer)
- The source(s) of effectiveness estimates are not clearly stated
- The primary outcome measures are not clearly stated
- The methods for the estimation of quantities and unit costs are not described

**Quality (certainty) of evidence for studies as a whole:**
- ☐ High
- ☐ Moderate
- ☐ Low
- ☒ Very Low

**Lower Quality Rating if:**
- ☐ Studies inconsistent (wide variation of treatment effect across studies, populations, interventions, or outcomes varied)
- ☐ Studies are indirect (PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)
- ☐ Studies are imprecise (When studies include few patients and few events and thus have wide
<table>
<thead>
<tr>
<th>Study Limitations = None</th>
<th>Economic Evaluation</th>
<th>The research question is not clearly stated</th>
<th>The perspective of interest is not clear (i.e., societal, patient, health system, payer)</th>
<th>The source(s) of effectiveness estimates are not clearly stated</th>
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<tbody>
<tr>
<td>Trueman, P., et al, International Journal of Clinical Practice, 2010</td>
<td>To evaluate the long-term cost-effectiveness through its potential to reduce obesity-related conditions and associated healthcare resource use, with improved quality of life</td>
<td>Retrospective Study; Societal</td>
<td>Using the 2006 National Institute of Clinical Excellence (NICE) obesity health economic model, a primary care weight management program (Counterweight) was analyzed, evaluating costs and outcomes associated with weight gain for three obesity-related conditions (type 2 diabetes, coronary heart disease, colon cancer). Sensitivity analysis</td>
<td>1,906 patients</td>
<td>Mean weight changes in Counterweight attenders was -3 kg and -2.3 kg at 12 and 24 months, both 4 kg below the expected 1 kg/year background weight gain. Counterweight delivery cost was £59.83 per patient entered. Even assuming dropouts/non-attenders at 12 months (55%) lost no weight and gained at the background rate, Counterweight was ‘dominant’ (cost-saving) under ‘base-case scenario’, where 12-month achieved weight loss was entirely regained over the study period. The results are uncertain due to publication bias and quality of evidence.</td>
</tr>
<tr>
<td>Publication Bias (e.g., pharmaceutical company sponsors study on effectiveness of drug, only small, positive studies found)</td>
<td>Increase Quality Rating if:</td>
<td>Large Effect</td>
<td>Dose-response gradient</td>
<td>Plausible confounders or other biases increase certainty of effect</td>
<td>Quality (certainty) of evidence for studies as a whole:</td>
</tr>
</tbody>
</table>
The methods for the estimation of quantities and unit costs are not described.

| Tsai, A.G., et al., *International Journal of Obesity*, 2013 | To conduct an economic analysis of a clinical trial of obesity treatment that was implemented in a Retrospective Study; Payer Conducted within-trial cost-effectiveness analysis of a primary care-based obesity intervention. Study participants were randomized to: Usual Care (quarterly visits with their primary care provider); Brief Lifestyle Counseling (Brief LC; 390 individuals) | Weight losses after 2 years were 1.7, 2.9, and 4.6 kg for Usual Care, Brief LC, and Enhanced Brief LC, respectively (p = 0.003 for comparison of Enhanced Brief LC vs. Usual Care). The incremental cost per kilogram-year lost was $292 for Enhanced Brief LC compared to Usual Care (95% CI $38 to $394). The incremental cost per QALY was $115,397, but the 95% CI were |

| The research question is not clearly stated |
| The perspective of interest is not clear (i.e., societal, patient, health system, payer) |
PICO Question: In adult patients considered obese (BMI >/=30), what is the cost effectiveness of comprehensive obesity management programs?

**Modality:** Lifestyle Intervention; **Outcome:** Cost-Effectiveness

<table>
<thead>
<tr>
<th>Author/Date</th>
<th>Purpose of Study</th>
<th>Study Design &amp; Methods</th>
<th>Sample</th>
<th>Outcomes</th>
<th>Design Limitations</th>
</tr>
</thead>
</table>
| Wolf, A.M., et al., *Journal of the American Dietetic Association*, 2007 | To evaluate the program and health care costs of a lifestyle intervention in a high-risk obese population | RCT; Twelve-month randomized controlled trial comparing lifestyle case management to usual care. Lifestyle case management entailed individual and group education, support, and referrals by registered dietitians. Those in the usual-care group received educational material. Total costs were modeled using the four-equation model using previous year cost as a predictor. | 147 members | Net cost of the intervention was $328 per person per year. After incorporating program costs, mean health plan costs were $3,586 (95% confidence interval [CI]: $8,036, $25, P<0.05) lower in case management compared to usual care. The difference was driven by group differences in medical (-$3,316, 95% CI: -$7,829 to -$320, P<0.05) but not pharmaceutical costs (-$239, 95% CI: -$870 to $280, not statistically significant), with fewer inpatient admissions and costs among case management compared to usual care (admission prevalence: 2.8% vs 22.5% respectively, P<0.001). | Study Limitations = None
**Economic Evaluation**
- The research question is not clearly stated
- The perspective of interest is not clear (ie., societal, patient, health system, payer)
- The source(s) of effectiveness estimates are not clearly stated
- The primary outcome measures are not clearly stated
- The methods for the estimation of quantities and unit costs are not described
- Studies are indirect (PICO question is quite different from the available evidence in regard to population, intervention, comparison, or outcome)
- Studies are imprecise (When studies include few patients and few events and thus have wide confidence intervals and
REFERENCES


