



Mental Health Assessment and Psychosocial Interventions for Bariatric Surgery

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PREFACE

Quality Enhancement Research Initiative's (QUERI) Evidence-based Synthesis Program (ESP) was established to provide timely and accurate syntheses of targeted healthcare topics of particular importance to Veterans Affairs (VA) clinicians, managers and policymakers as they work to improve the health and healthcare of Veterans. The ESP disseminates these reports throughout the VA, and some evidence syntheses inform the clinical guidelines of large professional organizations.

QUERI provides funding for four ESP Centers and each Center has an active university affiliation. The ESP Centers generate evidence syntheses on important clinical practice topics, and these reports help:

- develop clinical policies informed by evidence;
- guide the implementation of effective services to improve patient outcomes and to support VA clinical practice guidelines and performance measures; and
- set the direction for future research to address gaps in clinical knowledge.

In 2009, the ESP Coordinating Center was created to expand the capacity of HSR&D Central Office and the four ESP sites by developing and maintaining program processes. In addition, the Center established a Steering Committee comprised of QUERI field-based investigators, VA Patient Care Services, Office of Quality and Performance, and Veterans Integrated Service Networks (VISN) Clinical Management Officers. The Steering Committee provides program oversight, guides strategic planning, coordinates dissemination activities, and develops collaborations with VA leadership to identify new ESP topics of importance to Veterans and the VA healthcare system.

Comments on this evidence report are welcome and can be sent to Nicole Floyd, ESP Coordinating Center Program Manager, at Nicole.Floyd@va.gov.

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EXECUTIVE SUMMARY

INTRODUCTION

Obesity rates in the US have risen to near epidemic levels. While caloric restriction, exercise, and behavioral modification remain mainstays for the treatment of overweight individuals (BMI 25 to <30), these strategies have not produced sustainable long-term weight loss in the severely obese (BMI \geq 40). Bariatric surgery has become increasingly popular for the treatment of severe obesity, and has been linked to sustainable weight loss.

A variety of surgical procedures have been used to induce weight loss for severely obese patients. They result in weight loss via different mechanisms: mechanically restricting the size of the stomach, bypassing a portion of the intestines, or by a combination of these mechanisms. Additionally, there is evidence that these procedures generate alterations in gastric and neuropeptides that play a role in weight loss and early satiety.

Currently, the most common procedures performed are done laparoscopically, and they include gastric banding (adjustable gastric band), gastric bypass (Roux-en-Y gastric bypass (RYGB)) and gastric sleeve. The biliopancreatic diversion and vertical banded gastroplasty (VBG) are performed infrequently and are primarily done by select surgeons and centers (specifics of these procedures will not be described in detail).

Gastric banding achieves weight loss by creating gastric restriction. The uppermost portion of the stomach is encircled by a band to create a gastric pouch with a capacity of 15 to 30 cc. The band consists of an inflatable doughnut-shaped balloon whose diameter can be adjusted by adding or removing saline via a reservoir port beneath the skin. The bands are adjustable allowing the size of the gastric outlet to be modified, depending on the rate of a patient's weight loss.

Gastric bypass achieves weight loss through a combination of gastric restriction and malabsorption. Reduction of the stomach to a small gastric pouch results in feelings of satiety following even small meals. This small pouch is connected to the lower segment of the small intestine, bypassing the proximal small intestine. Thus, absorptive function is reduced. Possibly also aiding weight loss is the production of unpleasant gastrointestinal symptoms following ingestion of particular foods: symptoms include abdominal pain, cramping, and diarrhea.

Gastric sleeve is a more recently adopted procedure where the stomach is stapled into a tube. This procedure has been gaining interest as it is relatively simple to perform and offers a lower post-operative complication rate. It appears to have successful weight loss results and improvements in comorbidities, but longer term results, beyond 5 years, are not yet known.

However, not all patients receive equal benefit from bariatric surgery. Psychosocial factors are commonly cited as important predictors of post-operative outcomes. Many bariatric practices formally screen for mental health conditions during the pre-operative assessment in order to select patients they believe have with the highest likelihood of success; others, including the Veterans Health Administration, do not require formal psychosocial evaluation.

Given the increased interest in surgical weight loss and the desire to select patients who will benefit the most from this intervention, the 3 key questions for this review are as follows:

Key Question 1. What is the prevalence of mental health conditions among bariatric surgery candidates?

Key Question 2. What is the association between pre-operative mental health conditions and bariatric outcomes, including weight loss, quality of life, adherence to behavioral guidelines, risk of suicide, prevalence of mental health conditions, and peri-operative complications?

Key Question 3. Is there evidence to support any pre-operative intervention for patients with mental health disorders to improve post-operative bariatric outcomes, including weight loss?

METHODS

Data Sources and Searches

We searched PubMed, MEDLINE on OVID, and PsycINFO using a broad set of search terms including “bariatric” or “obesity” or the names of the various surgical procedures and then terms for mental health conditions, maladaptive eating, binge eating, and other eating disorders.

Because a member of our team had participated in an earlier systematic review on the related topic of pre-operative predictors of weight loss following bariatric surgery¹ and our review of that project’s search strategy and methods for identifying relevant articles gave us confidence their results were relevant to our needs, we used their search and results to cover the period from 1988 through 2010, and therefore ran our searches from October 2009 through August 2014. We then supplemented these 2 searches with a “related articles” search in PubMed between January 1990 and August 2014 to identify literature related to a key article by Malik and colleagues,² as well as a targeted search in the psychological literature database PsycINFO for articles related to bariatric surgery and mental health conditions published between January 2009 and August 2014. Additional studies were recommended for inclusion by technical expert panel members and peer reviewers.

Study Selection

For Key Question 1, studies with data about prevalence were included based on the population being studied and the sample size. Studies were included if they met one of the following criteria: (1) data were from a study with random or consecutive sampling and a sample size of at least 200 subjects; (2) data were from a clinical trial; (3) study reported data on United States Veterans; or (4) if not meeting any of the criteria 1-3, then if data were reported for over 500 patients or for multiple sites. Included studies had to measure specific mental health conditions or eating disorders using a formal method (such as a validated instrument or the Structured Clinical Interview). Studies had to report actual prevalence data. In addition, we required pre-operative classifications of mental health conditions and eating disorders to be made pre-operatively; in other words, we excluded studies that asked patients to recall their historical pre-operative health status. For Key Question 2, we used the same criteria to restrict the studies to those of better quality or greater generalizability. Each study had to report post-operative assessment of one of our outcomes of interest. For Key Question 3, the assessed intervention had to occur pre-operatively, while the outcomes had to be post-operative, and the target of the intervention related to eating disorders, mental health comorbidities, or quality of life.

Data Abstraction and Quality Assessment

Data were extracted by 2 independent reviewers, and discrepancies were reconciled by the entire study team.

For Key Question 1 and Key Question 2, articles about prevalence and association were assessed for the representativeness to some larger population of the included participants.

For Key Question 3, articles addressing pre-operative interventions were assessed for quality using a modified Cochrane Risk of Bias tool. This tool provides a framework for systematically assessing the degree of bias for comparative studies. Systematic biases can either over- or underestimate the effect size. Studies are rated on 6 types of bias: selection, performance, detection, attrition, reporting, and other. We applied this tool to the 5 intervention studies. Of note, this tool is not specific to randomized clinical trials. Only 2 of the criteria concern blinding and allocation. The additional criteria cover bias related to outcomes and other confounders (risk predictors) and are appropriate to assess for intervention studies, regardless of study design.

Data Synthesis and Analysis

The data synthesis is narrative. For Key Question 1 we calculated the weighted median for prevalence estimates, and compared these between subjects of studies based on study design and sample. Studies for Key Questions 2 and 3 were summarized narratively.

RESULTS

Results of Literature Search

From our systematic database searches, we identified 1,275 citations. We combined these with 79 references identified in an article by Livhits and colleagues and 9 references identified by a panel of experts. After dual title, abstract, and full article review, 66 references were included, with 54 addressing Key Question 1, 24 addressing Key Question 2, and 5 addressing Key Question 3.

Summary of Results for Key Question 1

We identified 54 studies meeting criteria for quality and informative estimation of prevalence. Five of these studies were about VA samples. The assessed populations, not counting the VA samples (that were predominantly male), were relatively similar. In most studies, 67 to 85% of subjects were female, their mean age was mid-40 years of age, and the mean body mass index (BMI) was 45 to 50 kg/m².

The weighted median prevalence of each disorder across all studies was:

Table 1. Mental Health Conditions in Bariatric Surgery Candidates and Patients

Mental Health Conditions	Weighted Median
Anxiety	15%
Depression	25%
Any mood disorder	27%
Eating Disorders	16%
Personality Disorders	1%
Post-Traumatic Stress Disorder	1%
Psychosis	1%
Substance abuse disorders*	7%
Suicidal ideation/suicidality	11%

* Substance abuse disorders refers to alcohol and drug abuse or those merely described as substance abuse. Tobacco use was not included.

Some mental health conditions varied in their prevalence estimate. This variability is unexplained, but is probably related to how the diagnosis was made, sample sizes, and real differences between populations.

Studies of Veterans, however, reported the highest prevalence of all mental health diagnoses except eating disorders, and in some cases these differences were quite marked. For example, the median prevalence of post-traumatic stress disorder (PTSD) in Veteran samples was 24% compared to 1% overall. Additional sources of variation were likely attributable to the method used to make the diagnosis, geographic variations in the populations themselves, and chance (in particular, the Veteran samples were small relative to the other studies, with sample sizes of 25-102 subjects).

Summary of Results of Key Question 2

We identified 24 studies reporting data on the association between pre-operative mental health diagnoses and post-operative outcomes. Three articles specifically addressed outcomes among Veteran populations. The most consistent evidence suggests lower rates of depression, fewer symptoms of depression, and decreased usage of anti-depressant therapies after bariatric surgery. The majority of studies found no association between the presence of any Axis I disorder—including depression—and weight outcomes.

Depression improved following bariatric surgery in all 8 studies measuring changes in mental health outcomes. The evidence for an association between bariatric surgery and rates of alcohol abuse was mixed, and appeared to depend on the type of surgery being performed. Two studies found increased rates of alcohol consumption, alcohol abuse, and treatment for alcohol dependence after bariatric surgery, but only for patients undergoing RYGB as opposed to LAGB.

Two studies specifically reported on suicide, one finding increased rates compared to an age- and sex-matched US population and another suggesting increased rates compared to non-surgical, severely obese controls.

All 5 studies measuring quality of life showed improvements following bariatric surgery. In studies using a scale with multiple domains, there was improvement across all components with larger and more sustainable changes being seen in physical status than in mental status. There was no clear evidence on post-operative changes in PTSD or bipolar disorder. Minimal evidence exists regarding changes in cognitive function, and results appear to vary by domain.

There is insufficient evidence to determine the relationship between pre-operative mental health conditions and post-operative weight loss outcomes.

Summary of Results of Key Question 3

We identified no studies assessing the effect of a pre-operative intervention targeted at mental health conditions or eating disorders that assessed post-operative outcomes. We did identify 5 studies of interventions aimed at improving pre-operative conditions or behaviors in bariatric surgery candidates that measured changes in pre-operative status. None provided significant evidence that such interventions may improve pre-operative mental health conditions or eating disorders or pre-operative weight loss.

DISCUSSION

Key Findings and Quality of Evidence

Key Question 1

Summary of Findings

Bariatric surgery candidates and those receiving surgery have depression, anxiety, and certain eating disorders (eg, binge eating) at rates equal to or exceeding 15%. Other mental health disorders, such as psychoses, are less frequent. Published prevalence estimates vary, particularly for depression and binge eating disorder. The few assessments done in Veteran populations found higher proportions of comorbidities than are present in other populations, particularly PTSD.

Quality of Evidence

We judged the quality of evidence as moderate for the overall conclusion that mental health conditions and eating disorders are common in bariatric patients. The exact estimates we judge as low, due to the inconsistency noted, particularly for depression and eating disorders. All estimates for Veterans are judged low due to the small number of patients assessed (at most about 300 patients).

Key Question 2

Summary of Findings

There are conflicting data regarding the impact of mental health conditions on post-operative outcomes, including weight loss, mental health symptoms, quality of life, and suicide. The most consistent evidence suggests lower rates of depression, fewer symptoms of depression, and decreased usage of anti-depressant therapies after bariatric surgery. A causal role of bariatric surgery cannot be established with the existing studies. Aside from depression, only quality of life demonstrated consistent improvement across multiple studies, although the use of different scales and timelines complicates the evaluation. There is insufficient evidence to determine the relationship between pre-operative mental health conditions and post-operative weight loss outcomes.

Quality of Evidence

The quality of evidence is moderate that bariatric surgery is associated with lower rates and fewer symptoms of depression, compared to pre-operative status. The quality of evidence is low regarding the association between bariatric surgery and quality of life improvements following surgery. All other associations between mental health conditions and outcomes following bariatric surgery are judged very low-quality evidence.

Key Question 3

Summary of Findings

There were no studies that assessed the impact of a pre-operative intervention on mental health disorders to post-operative outcomes following bariatric surgery, such as surgical weight loss including prevalence of the mental health disorders. Five low-quality studies reported pre-operative improvements in targeted mental health behaviors, as well as pre-operative physician-supervised weight loss before surgery and substance abuse, for bariatric surgery candidates.

Quality of Evidence

There is no evidence specific to Key Question 3 and only low-quality evidence that interventions to change pre-operative psychosocial factors have clinically important effects on pre-operative status.

Applicability

There are striking differences in the gender of patients assessed in VA compared to non-VA populations, as 70% to 80% of non-VA patients are female while 70% to 80% of VA patients are male. From the limited VA studies that have been done, the prevalence of mental health conditions and eating disorders is higher than in non-VA populations. Therefore, generalizing results from the non-VA population to the VA population needs to be done with caution.

Research Gaps/Future Research

In order to generate VA-relevant data, a more broadly-based data collection effort is needed among Veterans seeking bariatric surgery. This should include a sufficient number of sites to be representative of diversity in the VA, and use the same standardized instruments for classifying disorders. A protocol for follow-up of such patients could help answer questions about the association between pre-operative mental health conditions and post-operative outcomes. To assess the effectiveness of pre-operative interventions, randomized clinical trials are necessary.

Conclusions

Mental health conditions and eating disorders are common in bariatric surgery candidates and patients, in particular depression, anxiety, and binge eating disorders. There is inconsistent evidence about the effect of mental health conditions and eating disorders on subsequent post-operative outcomes, with the exception of improvement in depression and possibly quality of life. There are no studies assessing the effect of pre-operative interventions aimed at mental health conditions or eating disorders. There is insufficient evidence to recommend for or against routine specialized pre-operative mental health screening in bariatric surgery candidates in addition to the existing general evaluation by the surgical and/or medical bariatric team.

Abbreviations Table

AUDIT	Alcohol Use Disorders Identification Test
BDI	Beck Depression Inventory
BED	Binge Eating Disorder
BES	Binge Eating Syndrome
BMI	Body Mass Index
BPD	Biliary Pancreatic Diversion
CBT	Cognitive Behavioral Therapy
CI	Confidence Interval
DSM-IV	Diagnostic and Statistical Manual, 4th Edition
EBI	Eating Behavior Inventory
EDE	Eating Disorders Examination
EDO	Eating Disorders in Obesity questionnaire
ESP	Evidence-based Synthesis Program
GIQLI	Gastrointestinal Quality of Life Instrument
HADS	Hospital Anxiety and Depression Scale
HAM-D	Hamilton Depression Rating Scale
HR	Hazard Ratio
HRQOL	Health-Related Quality of Life
HVE	High-Volume Exercise
ICD-9	International Classification of Diseases, 9th edition
IWQOL	Impact of Weight on Quality of Life
LABS	Longitudinal Assessment of Bariatric Surgery
LAGB	Laparoscopic Adjustable Gastric Band
LASA	Linear Analog Scale Assessment
MCS	Mental Component Score
MMPI-2	Minnesota Multiphasic Personality Inventory-2
OCD	Obsessive Compulsive Disorder
PCS	Physical Component Score
PHQ-9	Patient Health Questionnaire-9
PTSD	Post-Traumatic Stress Disorder
QEWP-R	Questionnaire of Eating and Weight Patterns, Revised
Q-LES-Q	Quality of Life Enjoyment and Satisfaction Questionnaire
QOL	Quality of Life
RCT	Randomized Controlled Trial
RYGB	Roux-en-Y gastric bypass
SCID	Structured Clinical Interview for DSM
SF-36	Short Form-36
SOS	Swedish Obese Subjects
VBG	Vertical Banded Gastroplasty
Y-BOCS	Yale-Brown Obsessive Compulsive Scale

EVIDENCE REPORT

INTRODUCTION

Obesity rates in the US have risen to near epidemic levels. After a period of relative stability from 1960 to 1980, the proportion of adults with a body mass index (BMI) above 30 increased steadily to over 35% by 2010.^{3,4} Despite a plateauing of rates in recent years,⁵ the prevalence and consequences of obesity remain significant enough that the American Medical Association officially declared it a disease in 2013.⁶ Obesity has been linked to multiple negative health effects, including cardiovascular disease, Type 2 diabetes, hypertension, hyperlipidemia, and obstructive sleep apnea. Even after controlling for other risk factors, non-elderly individuals with a BMI of 30 to <35 have a 20% higher relative risk of death compared to their normal weight counterparts while those with a BMI ≥ 35 have more than an 80% higher risk, mostly due to the effects of cardiovascular disease.^{7,8}

While caloric restriction, exercise, and behavioral modification remain mainstays for the treatment of overweight individuals (BMI 25 to <35), these strategies have not been shown to produce sustained weight loss in the severely obese (BMI ≥ 35). As a reflection that more intensive strategies may be required in these patients, the National Institutes of Health established guidelines for weight loss surgery in 1991 that included a BMI ≥ 40 or a BMI ≥ 35 in the presence of significant comorbidities.⁹ Since that time, bariatric surgery has become increasingly popular for the treatment of obesity, and has been associated with greater and more sustained weight loss. Bariatric surgery has also increased short term resolution of medical comorbidities – including diabetes – when compared to non-surgical therapies.¹⁰⁻¹² However, concerns remain about the durability of improvements and the risks of surgery because outcomes beyond 5 years have not been published for US-based samples.

A variety of surgical procedures have been used to induce weight loss for severely obese patients. They result in weight loss via different mechanisms: mechanically restricting the size of the stomach, bypassing a portion of the intestines, or by a combination of these mechanisms. Additionally, there is evidence that these procedures generate alterations in gastric and neuropeptides that play a role in weight loss and early satiety.

Currently, the most common procedures performed are done laparoscopically, and they include gastric banding (adjustable gastric band), gastric bypass (Roux-en-Y gastric bypass) and gastric sleeve. The biliopancreatic diversion and vertical banded gastroplasty are performed infrequently and are primarily done by select surgeons and centers (specifics of these procedures will not be described in detail).

Gastric banding achieves weight loss by creating gastric restriction. The uppermost portion of the stomach is encircled by a band to create a gastric pouch with a capacity of 15 to 30 cc. The band consists of an inflatable doughnut-shaped balloon whose diameter can be adjusted by adding or removing saline via a reservoir port beneath the skin. The bands are adjustable allowing the size of the gastric outlet to be modified, depending on the rate of a patient's weight loss.

Gastric bypass achieves weight loss through a combination of gastric restriction and malabsorption. Reduction of the stomach to a small gastric pouch results in feelings of satiety following even small meals. This small pouch is connected to the lower segment of the small

intestine, bypassing the proximal small intestine. Thus, absorptive function is reduced. Possibly also aiding weight loss is the production of unpleasant gastrointestinal symptoms following ingestion of particular foods: symptoms include abdominal pain, cramping, and diarrhea.

Gastric sleeve is a more recently adopted procedure where the stomach is stapled into a tube. This procedure has been gaining interest as it is relatively simple to perform and offers a lower post-operative complication rate. It appears to have successful weight loss results and improvements in comorbidities, but longer term results, beyond 5 years, are not yet known.

Not all patients receive equal benefit from bariatric surgery. Some patients fail to lose adequate weight, lose but quickly regain weight, or have only marginal improvement in medical comorbidities. There is increasing interest in identifying bariatric candidates in whom surgery may be less effective, and in developing strategies to improve their post-operative outcomes.¹ Psychosocial factors are commonly cited as important predictors of post-operative outcomes.^{13,14} Many bariatric surgery programs formally screen for mental health conditions during the pre-operative assessment in an attempt to select patients with the highest compliance and likelihood of successful weight loss, as well to identify patients at risk for worsening mental health or substance abuse after the surgery.^{15,16} Others, including the Veterans Health Administration (VHA), do not require formal evaluation. Whether screening for mental health conditions in this population improves patient selection or post-operative outcomes remains unknown.

METHODS

TOPIC DEVELOPMENT

This project was nominated by Dr. Lisa Kearney, Senior Consultant for Technical Assistance, VA Central Office Mental Health Operations. Currently, the VHA does not have a policy requiring that all bariatric surgery candidates undergo a psychological evaluation prior to surgery. The Office of Patient Care Services and the Office of Clinical Operations are interested in reviewing the evidence for or against this practice to help determine if the VHA should implement mental health evaluations for bariatric surgery candidates prior to bariatric surgery. Initially, VA policy makers wanted to know if there was convincing evidence that routine specialized pre-operative screening for mental health conditions resulted in better patient outcomes, either in terms of patient selection for surgery or by identifying individuals who would benefit from a pre-operative intervention aimed at modifying mental health comorbidities. However, a preliminary literature search did not identify any studies that examined the impact of pre-operative mental health screening versus no screening on outcomes related to bariatric surgery. Therefore, with the input from a technical expert panel (TEP), this overarching goal was divided into 3 related questions for which a preliminary literature search indicated published data were likely to exist. Initial key questions were refined with input from a technical expert panel.

The final key questions are:

Key Question 1. What is the prevalence of mental health conditions among bariatric surgery candidates?

Key Question 2. What is the association between pre-operative mental health conditions and bariatric outcomes, including weight loss, quality of life, adherence to behavioral guidelines, risk of suicide, prevalence of mental health conditions, and peri-operative complications?

Key Question 3. Is there evidence to support any pre-operative intervention in patients with mental health disorders to improve post-operative bariatric outcomes, including weight loss? With the input from VA stakeholders and our technical experts, we further refined the term, “mental health conditions” to include:

1. The diagnosis of depression, anxiety, post-traumatic stress disorder, personality disorders, substance abuse disorders, or suicidality;
2. Eating disorders, primarily binge eating disorders.

Eating behaviors that are not classified as disorders, (eg, “grazing” and “cognitive restraint”), while important, were outside our scope of interest and were not included. We did not classify cigarette smoking as a substance use disorder.

“Candidates” was defined as persons seeking or being evaluated for possible bariatric surgery. We distinguish this population from a population of patients who all received bariatric surgery.

The PROSPERO registration number is CRD42014008675.

SEARCH STRATEGY

We searched PubMed, MEDLINE on OVID, and PsycINFO using a broad set of search terms including “bariatric” or “obesity” or the names of the various surgical procedures and then terms for mental health conditions, maladaptive eating, binge eating, and other eating disorders. Because a member of our team had participated in an earlier systematic review on the related topic of pre-operative predictors of weight loss following bariatric surgery¹ and our review of that project’s search strategy and methods for identifying relevant articles gave us confidence their results were relevant to our needs, we used their search and results to cover the period from 1988 through 2010, and therefore ran our searches from October 2009 through August 2014. We then supplemented these 2 searches with a “related articles” search in PubMed between January 1990 and August 2014 to identify literature related to a key article by Malik and colleagues,² as well as a targeted search in the psychological literature database PsycINFO for articles related to bariatric surgery and mental health conditions published between January 2009 and August 2014 (see full search strategy details in Appendix A). Additional studies were recommended for inclusion by technical expert panel members and peer reviewers.

STUDY SELECTION

After conducting an initial pilot screening of 200 titles in order to calibrate all 4 reviewers, all titles identified by the searches were independently reviewed by each of the 4 reviewers (AM, AD, MM, PS). Any title selected by at least one reviewer was included for abstract and full text review.

After eliminating obviously irrelevant titles, we assessed abstracts or full text articles for eligibility. To be included at this stage, an article had to address at least one key question, report findings from primary research or be a systematic review, and report data for patients with a BMI of 35 or greater (Appendix B). All articles were screened independently by 2 reviewers, and all inclusion conflicts were discussed with the larger group.

Within each key question, additional criteria were specified so that the review would focus on the highest quality, and most relevant studies. For Key Question 1, studies with data on prevalence were included if they met one of the following criteria: (1) random or consecutive sampling and over 200 patients or multiple study sites; (2) studies that did not use random or consecutive sampling and over 500 patients; (3) all studies of US Veterans; and (4) all clinical trials, whether randomized or non-randomized. Studies had to measure specific mental health conditions or eating disorders and had to do so with a recognized method (such as a validated instrument or a clinical evaluation which was sometimes, but not always, the Structured Clinical Interview for DSM-IV (SCID)). Studies had to report the prevalence of patients with the condition, rather than an average score of the overall population on a diagnostic scale. For example, we included studies stating, “the percent of persons with major depressive disorder was 15%,” but not studies reporting, “the mean score on the Beck Depression Inventory was 25.” In addition, we required pre-operative classifications of mental health conditions and eating disorders to be made pre-operatively; in other words, we excluded studies that asked patients to recall their pre-operative health status. For Key Question 2, we used the same criteria to restrict the sample to the better quality, more relevant samples, but also required studies to report post-operative assessments of at least one target outcome. For Key Question 3, the assessed

intervention had to occur pre-operatively, the outcomes had to be post-operative, and the target had to be related to eating disorders or mental health comorbidities.

DATA ABSTRACTION

Data were extracted by 2 independent reviewers, and discrepancies were reconciled by the entire research team.

For Key Question 1 and Key Question 2, articles had data abstracted on the country of origin, whether findings were presented for US Veterans, sample analyzed, method of recruitment, details of the sample demographics, details of bariatric surgery, mental health diagnoses assessed, methods of assessment, and whether the assessments were kept confidential from the surgery team.¹⁷ This latter item was added at the suggestion of the TEP, as there is evidence that reported prevalence is higher when subjects are told their response will be kept confidential from the surgical team. After identification of studies meeting all eligibility criteria, the appropriate prevalence or outcome data were highlighted by the clinician data abstractor and then given to the research team statistician for extraction of quantitative data.

For Key Question 3, articles discussing pre-operative interventions had data abstracted on the intervention setting, patient characteristics, description of the intervention, description of the care or treatments to which the intervention was compared, type of bariatric procedure patients underwent post-intervention, outcomes assessed, instruments used to assess the outcomes, timing of the outcome assessment, and the article findings.

QUALITY ASSESSMENT

For Key Question 1 and Key Question 2, articles about prevalence and association were assessed for the representativeness of participants to some larger population.

For Key Question 3, articles addressing pre-operative interventions were assessed for quality using a modified Cochrane Risk of Bias tool to establish high, low, or unclear bias on 7 factors: outcome, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other bias.¹⁸

DATA SYNTHESIS

We constructed evidence tables showing characteristics and results for all included studies, organized by key question. We analyzed studies to compare their characteristics, methods, and findings. We summarized findings for each key question and drew conclusions based on qualitative synthesis of the findings. For Key Question 1, we graphed the prevalence data from each study. For studies reporting more than one method for a particular mental health condition, the most relevant measure was selected by the study team psychiatrist. We also calculated the weighted median value, and compared these values between studies with different populations and designs to test the stability of the estimates.

RATING THE BODY OF EVIDENCE

The evidence for Key Question 3 was assessed using the GRADE criteria, which uses the domains of study design limitations, inconsistency, indirectness, and imprecision in results.¹⁹ The evidence for Key Questions 1 and 2 were also assessed using the same domains. The

GRADE Working Group classified the quality of evidence across outcomes according to the following criteria:

- High = Further research is very unlikely to change our confidence on the estimate of effect.
- Moderate = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
- Low = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
- Very Low = Any estimate of effect is very uncertain.

PEER REVIEW

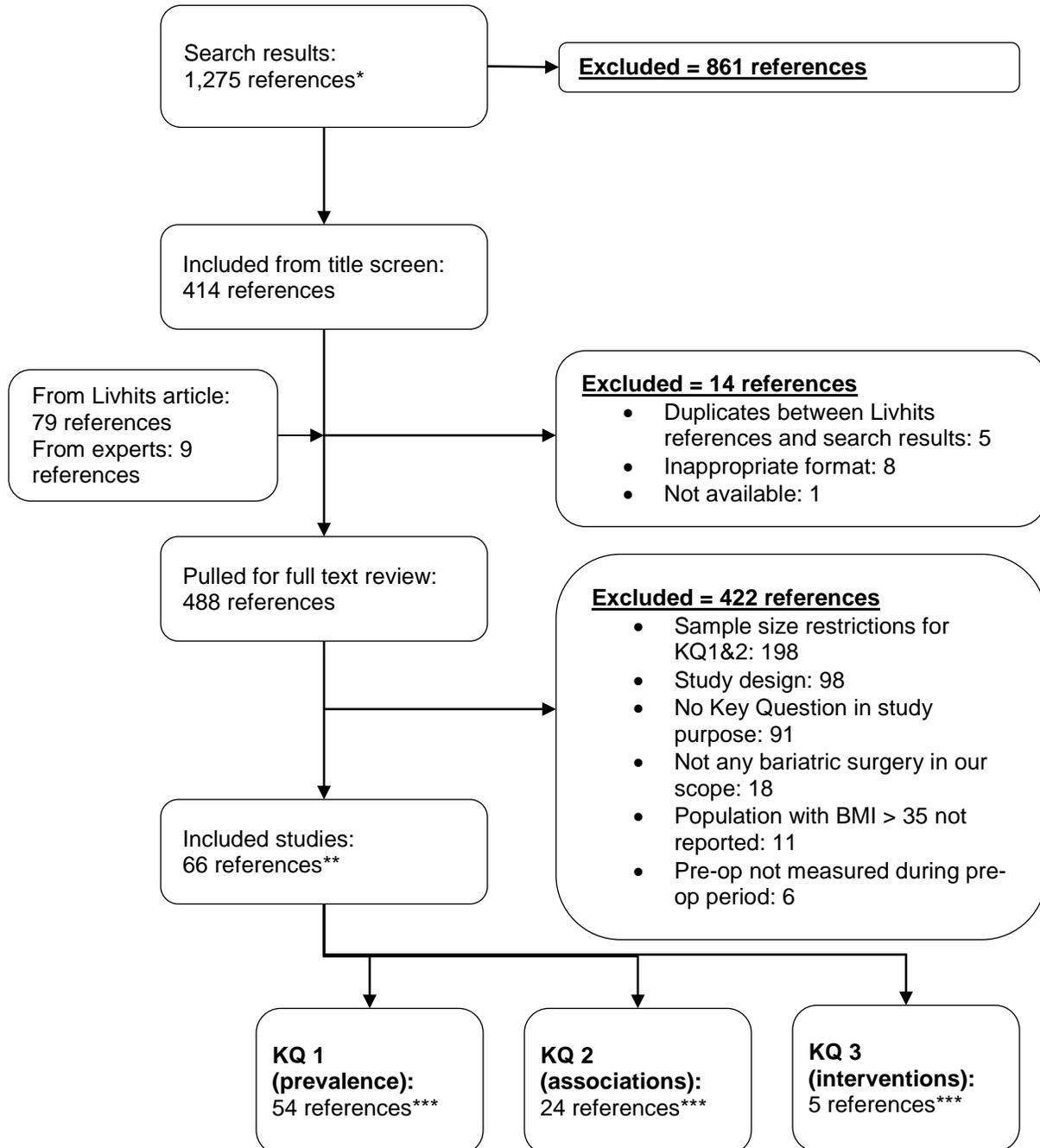
A draft version of this report was reviewed by 9 peer reviewers and 4 operational partners. Reviewer comments were addressed and our responses were incorporated into the final report. The complete set of comments and responses can be found in Appendix C.

RESULTS

LITERATURE FLOW

From the literature searches, we identified 1,275 reference citations. We selected 414 potential citations for inclusion, excluding 861 citations. We combined this list of 414 potential includes with the 79 references identified in the article by Livhits and colleagues and the 9 references identified by experts. When combined, 14 references were excluded as duplicates, leaving 488 references for full text review. Once the 488 full texts were reviewed, 422 were excluded from the report. The other 66 references were included, with 54 addressing Key Question 1, 24 addressing Key Question 2, and 5 addressing Key Question 3. Figure 1 details the review process and the number of references related to each of the key questions, as well as the counts for exclusion categories after the title screening had been completed.

Figure 1. Literature Flow Chart



* New searches: 937 total after removed within-search duplicates and obviously non-relevant hits. Removed 7 inter-search duplicates for total of 930

** Manuscript reference list includes additional references cited for background and methods plus websites relevant to key questions.

Key Question 1: What is the prevalence of mental health conditions among bariatric surgery candidates?

We identified 240 articles reporting data on prevalence. From these, we selected the following articles as being the best quality, most informative, or most specific to VA.

- Studies with consecutive or random sampling of candidates for bariatric surgery or who had received surgery, with a sample size of at least 200 subjects;
- Studies with non-consecutive/non-random sampling of candidates for bariatric surgery or who had received surgery, as long as the sample size was greater than 500 or it was multisite;
- All studies specific to VA patients, regardless of sample size;
- Data from randomized controlled trials (RCTs) (which typically enroll highly selected populations, reducing generalizability, but typically assess patients in greater depth and with more rigor).

Using these criteria, we identified the following: 15 and 13 studies, respectively, that assessed consecutive or random samples of surgical candidates or patients receiving surgery ($N > 200$ or multisite); 8 and 7 studies, respectively, that assessed non-consecutive/non-random samples of surgical candidates or patients receiving surgery ($N > 500$ or multisite); 5 studies specific to VA, and 6 studies that were RCTs. Details of each included study are presented in Table 2. The assessed populations, not counting the VA sample, were relatively similar. In most studies, 67 to 85% of subjects were female, their mean age was mid-40 years of age, and the mean BMI was 45 to 50 kg/m^2 . The VA samples were predominantly men, but otherwise had similar demographics (mean BMI=42-52 kg/m^2 , slightly older mean age of 48-52 years of age).

Figure 2 presents the data for the prevalence of anxiety, depression, eating disorders, personality disorders, psychosis, PTSD, substance use disorders, and suicidality/suicidal ideation. In the figure, the different symbols represent the different kinds of studies listed above, and the size of the symbols is proportionate to its sample size.

We calculated the weighted median prevalence for the various conditions and disorders, which are as follows:

Table 1. Mental Health Conditions in Bariatric Surgery Candidates and Patients

Mental Health Conditions	Weighted Median
Anxiety	15%
Depression	25%
Any mood disorder	27%
Eating Disorders	16%
Personality Disorders	1%
Post-Traumatic Stress Disorder	1%
Psychosis	1%
Substance abuse disorders	7%
Suicidal ideation/suicidality	11%

* Substance abuse disorders refers to alcohol and drug abuse or those merely described as substance abuse. Tobacco use was not included.

Some studies reported both “lifetime” and “current” prevalence, in which case we used the “current” prevalence data. If a study did not state it, we assumed presented data were “current” prevalence.

Some included studies were by the same authors and had similarly-described patient populations. It was not possible for us to determine whether or not these samples overlapped. So, in order to prevent “double counting,” we performed a sensitivity analysis that included only one value for each of the mental health conditions per group of related studies. This sensitivity analysis yielded median results little changed from the primary analysis.

Some mental health conditions varied greatly in their prevalence estimates. This variation was not consistently related to the sample characteristics. For example, the median prevalence of depression in the studies reporting consecutive or random sampling is 15% and 25% for candidates and patients undergoing surgery, respectively; the corresponding values for studies that used other methods to enroll patients reported estimates of 38% and 28%, respectively. The one exception to this conclusion is studies of Veterans, which reported the highest prevalence of all mental health diagnoses; in some cases these differences were quite marked. For example, the median prevalence of PTSD in Veteran samples was 24% compared to 1% overall and substance abuse was 24% compared to 2-7%. The sources of variation across samples are most likely attributable to the method used to make the diagnosis, geographic variations in the populations themselves, and chance (in particular, the Veteran samples were small relative to the other studies, with sample sizes between 25-102). So few studies reported that the mental health assessment was kept confidential that we were unable to do a sensitivity analysis on this as a source of variation. A prior study has reported that confidential assessments report a higher prevalence of mental health conditions.¹⁷

An additional assessed factor was quality of life (QOL). This was measured with either the Short Form-36 or the Impact of Weight on Quality of Life (IWQOL) instrument. One study using the GIQLI (gastrointestinal quality of life instrument) was not included here, as it is scored on a

different range and therefore not comparable to the rest of the included studies. Results are in Figure 3.

The weighted median QOL value was 52 (out of a score of 100 points), which is approximately the population average (SF-36 data for women aged 35-44, which is closest to this study population).

The highest outlier study for eating disorders came from a study of 25 bariatric surgery candidates identified from the MOVE! clinic (a weight loss clinic) at the VA San Diego Healthcare System.²⁰ The high outlier status may be due to particulars of this patient population or variability due to small sample size.

Summary of Findings

Bariatric surgery candidates and those receiving surgery have depression, anxiety, and certain eating disorders (*eg*, binge eating) at rates equal to or exceeding 15%. Other mental health disorders, such as psychoses, are less frequent. Published prevalence estimates vary, particularly for depression and binge eating disorder. The few assessments done in Veteran populations found higher proportions of comorbidities than are present in other populations, particularly PTSD.

Quality of Evidence for Key Question 1

We judged the quality of evidence as moderate for the overall conclusion that mental health conditions and eating disorders are common in bariatric patients. The exact estimates we judge as low, due to the inconsistency noted, particularly for depression and eating disorders. All estimates for Veterans are judged low due to the small number of patients assessed (at most about 300 patients).

Table 2. Evidence Table of Studies of Prevalence of Mental Health Conditions in Bariatric Surgery Patients or Candidates

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Articles with Consecutive or Random Sampling of Candidates for Surgery (n=15)						
Allison, 2006 ²¹ USA	Candidates (% receiving surgery not stated)	Consecutive patients with extreme obesity seeking bariatric surgery at a university-based program; response rate=98%	N=210 82% female Mean BMI=50.4 Mean age=44.4	Not stated	Binge eating disorder Bulimia nervosa	QEWP-R Clinical interview <i>Not stated</i>
Castellini, 2013 ²² Italy	Candidates (% receiving surgery not stated)	Consecutive patients referring for the first time to the obesity surgery clinic; response rate=88%	N=394 73% female Mean BMI=44.6 Mean age=45	Not stated	Depression Binge eating Obsessive compulsive disorder Generalized anxiety disorder	SCID <i>Not stated</i>
Chen, 2012 ²³ USA	Candidates (% received surgery not stated)	Consecutive patients enrolling in screening for bariatric surgery at the University of Chicago	N=334 76% female Mean BMI=49.2 Mean age=44	Not stated	Suicide Ideation	BDI-II <i>Not stated</i>
Chen, 2012 ²⁴ USA	Candidates (% receiving surgery not stated)	Consecutive adult candidates for bariatric surgery at the University of Chicago; 2008-2010, response rate not stated	N=396 76% female Mean BMI=49 Mean age=44	Not stated	Suicide ideation	Suicidal behaviors questionnaire <i>Not stated</i>
Grothe, 2014 ²⁵	Candidates (% receiving surgery not stated)	Consecutive patients seeking bariatric surgery at a large academic medical center, 2009-2011; response rate not stated	N=935 75% female Mean BMI=46.9 Mean age=47	Not stated	Bipolar disorder	Mood Disorder Questionnaire Clinical interview <i>Not stated</i>
Hall, 2013 ²⁶ USA	Candidates (% receiving surgery not stated)	Consecutive patients referred for psychological evaluation prior to RYGB at an urban academic medical center	N=505 84% female Mean BMI=50.7 Mean age=41.9	100% RYGB	Depression, personality disorders	Beck Depression Inventory II Personality Assessment Inventory: Depression Scale Semi-Structured Clinical

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
						Interview <i>Not stated</i>
Hayden, 2014 ²⁷	Candidates (98% received surgery)	Consecutive patients meeting eligibility criteria for bariatric surgery at one institution, 2007-2009; response rate = 75%	N=204 82% female Mean BMI=42.7 Mean age=45	100% LAGB	Any Axis I disorder Any mood disorder Major depressive disorder Dysthymia Bipolar disorder Any anxiety disorder Panic disorder OCD PTSD Generalized anxiety disorder Schizophrenia Alcohol abuse Binge eating disorder	SCID <i>Not stated</i>
Hayden, 2012 ²⁸ Australia	Candidates (% receiving surgery not stated)	Consecutive adult candidates for bariatric surgery at Monach University in Australia; 2007-2009; response rate=85%	N=201 82% female Mean BMI=43 Mean age=45	Not stated	Major depressive disorder Bipolar disorder	SCID <i>Not stated</i>
Kalarchian, 2007 ²⁹ USA	Candidates (% receiving surgery not stated)	Consecutive candidates seeking bariatric surgery at a large urban medical center; dates not stated; response rate=29%	N=288 83% female Mean BMI=52.2 Mean age=46.2	Not stated	Any Axis I disorder Any Axis II disorder Major depressive disorder Bipolar Panic disorder OCD PTSD Generalized anxiety disorder	SCID SF-36 <i>Not stated</i>

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
					Binge eating disorder Bulimia nervosa Anorexia Alcohol abuse Drug abuse HRQOL	
Lester, 2011 ³⁰ Italy	Candidates (% receiving surgery not stated)	Consecutive patients seeking bariatric surgery referred for mental health evaluation	N=69 80% female Mean weight=116 kg Mean age=45	Not stated	Suicide Depression Not stated	MMPI-2 <i>Not Stated</i>
Marek, 2014 ³¹	Candidates (% receiving surgery not stated)	Consecutive patients seeking bariatric surgery at one hospital, 2009-2012; response rate = 97%	N=1,283 72% female Mean BMI=49.2 Mean age=46	Not stated	Binge eating disorder	Clinical interview BES Chart review <i>Not stated</i>
Marek, 2013 ³² USA	Candidates (% received surgery not stated)	Consecutive patients seeking surgery at one site (Cleveland clinic); all administered pre-op evaluation, dates not stated)	N=982 67% female Mean BMI=49.2 Mean age=46	Not stated	Mental disorders, personality disorders, Maladaptive eating, substance abuse, sexual abuse Suicide/death ideation, anxiety, depression	Chart review, semi- structured interview <i>Not stated</i>
Mauri, 2008 ³³ Italy	Candidates (% receiving surgery not stated)	Consecutive candidates for bariatric surgery presenting to the University of Pisa; 2001-2006; response rate not stated	N=282 80% female Mean BMI=43.5 Mean age=42	Not stated	Any Axis I disorder Any Axis II disorder Major depressive disorder Bipolar OCD PTSD Generalized anxiety disorder Binge eating disorder Bulimia nervosa HRQOL	SCID HAM-D Bulimic Investigatory Test, Edinburgh Q-LES-Q <i>Not stated</i>

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Wee, 2013 ³⁴ USA	Candidates (% receiving surgery not stated)	Consecutive patients seeking weight loss identified via appointments (70% response rate) at 2 academic medical centers	N=574 73% female Mean BMI=61.2 Mean age=43	Not stated	Quality of Life	IWQOL SF-36 <i>Not Stated</i>
Windover, 2010 ³⁵ USA	Candidates (43.6% received surgery)	Consecutive patients seeking surgery at Cleveland Clinic 2006- 2008	N=1,020 76.6% female Mean BMI=50.3 Mean age=46.4	66.5% RYGB 16.9% Adjustable banding 12.4% Sleeve	Suicide Attempts	Semi-structured Interview <i>Not stated</i>
Cremieux, 2010 ³⁶ USA	All received surgery	All patients in a proprietary database of 5,000,000 Americans who had received bariatric surgery and had continuous insurance coverage	N=5,502 83% female Mean BMI not stated Mean age=44	73% RYGB Mix of other procedures	Depressive Disorders	Claims data <i>Not applicable</i>
Cunningham, 2012 ³⁷ USA	All received surgery	Random sample of procedures done in Jan 2002-Nov 2004	N=350 80% female Mean BMI=47.2 Mean age=47	100% RYGB	Depression, generalized anxiety disorder, dysthymic disorder	Semi-structured interview, BDI II <i>Not stated</i>
Dixon, 2003 ³⁸ Australia	All received surgery	Consecutive patients receiving bariatric surgery at a university program, 1999-2003; response rate not stated	N=487 85% female Mean BMI=44.1 Mean age=41.2	100% LAGB	Depression	BDI <i>Not stated</i>
Dixon, 2001 ³⁹ Australia	All received surgery	Consecutive patients receiving bariatric surgery at a single institution, 1998-2001; response rate not stated	N=459 85% female Mean BMI=45.0 Mean age=41	100% LAGB	QOL	SF-36 <i>Not applicable</i>

Herpertz, 2006 ⁴⁰ Germany	All received surgery	Consecutive patients at 6 German hospitals were approached day of admission (dates not stated)	N=153 67% female Mean BMI=51 Mean age=39	Not stated	Substance Abuse Disorder Mood Disorders Anxiety Disorders Eating Disorders	Composite International Diagnostic Interview Structured Interview for Anorexia and Bulimia Nervosa <i>Not stated</i>
Hood, 2012 ⁴¹ USA	All received surgery	Consecutive patients referred for RYGB at an urban medical center	N=530 84% female Mean BMI=50.7 Mean age=41.9	100% RYGB	Maladaptive eating	Binge Eating Scale <i>Not stated</i>
Legenbauer, 2011 ⁴² Germany	All received surgery	Consecutive patients receiving surgery in 6 German hospitals (99% of patients participated) (dates not stated)	N=151 67% female Mean BMI=51 Mean age=39	Mix of gastric banding and gastroplasty	Depressive Disorder Eating Disorders	Composite International Diagnostic Interview Structured Interview for Anorexia and Bulimia <i>Not stated</i>
Legenbauer, 2009 ⁴³ Germany	All received surgery	Patients at 6 German hospitals were approached on the day of admission	N=151 68% female Mean BMI=51 Mean age=39	Gastric bypass	Any Mental Disorder Depressive Disorders Anxiety Disorders Binge Eating Behaviors	Composite International Diagnostic Interview Structured Interview for Anorexia and Bulimia Nervosa <i>Not stated</i>
Mitchell, 2014 ⁴⁴	All received surgery	Patients who received bariatric surgery as part of the LABS-2 study, 2006-2009; response rate=92%	N=2,266 79% female Median BMI=45.9 Median age=46	Various	Binge eating disorder Bulimia nervosa Quality of life	LABS-2 survey on eating disorders SF-36 IWQOL-Lite <i>Not stated</i>
Ostlund, 2013 ⁴⁵ Sweden	All received surgery	Jan 1980 to Dec 2006; nationwide population based cohort	N=11,115 77% female Mean BMI=Not stated Mean age=40.1	37% RYGB 63% other	Depression, substance abuse, suicide attempt, alcohol abuse	ICD-9 or 10 codes for above from national databases <i>Not applicable</i>
Raebel, 2006 ⁴⁶ USA	All received surgery	All patients receiving surgery in 10 sites sharing a clinical information system 2005-2009	N=11,719 81% female Mean BMI=44 Mean age=47	76% RYGB Mix of procedures	Depression, anxiety, substance abuse, bipolar disorder, PTSD	Medical records diagnosis <i>Not applicable</i>

Wolnerhanssen, 2008 ⁴⁷ Switzerland	All received surgery	All patients with obesity treated with LAGB (probably at one Swiss hospital); 1996-2004; response rate not stated	N=380 78% female Median BMI=43.4 Median age=40	100% LAGB	Binge eating disorder	Clinical interview <i>Not stated</i>
Won, 2014 ⁴⁸	All received surgery	All patients undergoing bariatric surgery at a single institution, 2008-2011; response rate not stated	N=485 81% female Mean BMI=47.8 Mean age=46	100% laparoscopic RYGB	Any Axis I disorder Major depressive disorder Anxiety disorder Bipolar disorder	Clinical interview BDI-II Burns Anxiety Inventory Y-BOCS Weight and Lifestyle Inventory <i>Not stated</i>
Articles with Non-consecutive and Non-random Sampling of Candidates for Surgery (n=8)						
Adams, 2010 ⁴⁹ USA	Candidates (50% received surgery)	Patients seeking bariatric surgery from 3 bariatric surgeons in Utah; non-bariatric seeking patients from a large database	N=835 84% female Mean BMI=47 Mean age=44	Gastric bypass	Quality of Life	IWQOL-Lite, SF-36 <i>Not stated</i>
Apovian, 2013 ⁵⁰ USA	Candidates Assessment of Bariatric Surgery (ABS) study (100% received surgery)	Patients were “systematically” recruited at 2 academic medical centers in Boston (Response Rate=70%)	N=536 76% female Mean BMI=46.8 Mean age=44	55.4% RYGB 44.6% adjustable gastric banding	Quality of life	Impact of weight on quality of life (IWQOL)-Lite <i>Not stated (but yes in another ABS study)</i>
Caixas, 2013 ⁵¹ Spain (and compared to previously collected US data)	Candidates (% receiving surgery not stated)	June 2010 to Dec 2010 (Spain) recruited by hospital staff, non-obese Spanish subjects were recruited from hospital or university staff, acquaintances, or relatives with the same exclusion criteria as those of the patients. Non-obese control; patients attending an outpatient unit at 16 university hospitals in Spain, Duke database for North American subjects	N=400 Spanish Obese N=400 Spanish non-obese N=400 North American Obese N=400 North American non-obese For obese patients: 75% female Mean BMI=45.9 Mean age=43.1	Not stated	QOL, eating disorders, depression, anxiety, bipolar, schizophrenic disorder	Impact of weight on quality of life (IWQOL)-Lite, not stated for mental health condition <i>Not stated</i>

Corsica, 2012 ⁵² USA	Candidates (% receiving surgery not stated)	Patients seeking surgery at a major urban medical center	N=790 85% female Mean BMI=50 Mean age=42	Gastric bypass, adjustable gastric band (proportions not stated)	Depression, binge eating	Beck Depression Inventory Binge Eating Scale <i>Not stated</i>
Corsica, 2010 ⁵³ USA	Candidates (% receiving surgery not stated)	Patients seeking surgery at a major urban medical center	N=546 85% female Mean BMI=50 Mean age=43	Gastric bypass, adjustable gastric band (proportions not stated)	Anxiety, depression, personality disorder, mania, schizophrenia, alcohol abuse, drug abuse, suicide ideation	Personality Assessment Inventory, BDI II <i>Not stated</i>
Kudsi, 2013 ⁵⁴ USA	Candidates (>80% received surgery) Assessment of Bariatric Surgery (ABS) study	“Systematic” sample of patients seeking surgery at 2 academic medical centers in Boston (2008 – 2010), physicians gave permission for the research team to contact, response rate=75%	N=653 75% female Mean BMI =46.5 Mean age=44	Not stated	Alcohol abuse	AUDIT <i>Kept confidential from surgery team</i>
Lier, 2012 ⁵⁵ Norway	Candidates (90% received surgery)	Patients referred for bariatric surgery from GPs in Norway. 99 subsequently participated in an RCT, 45 did not consent to participate in the RCT but are included in the prevalence data.	N=141 73% female Mean BMI=45.2 Mean age=42	100% RYGB	Axis II disorders, anxiety, depression, QOL, Axis I disorders	MINI, DSM IV Axis II, “questionnaires on anxiety, depression, and QOL” <i>Not stated</i>
Lin, 2013 ⁵⁶ Taiwan	Candidates (54% received surgery)	Recruited from obesity surgery center, details not provided	N=841 69% female Mean BMI=35.7 Mean age=35.5	Not stated	depression, dysthymic disorder, general anxiety disorder, binge eating disorder, major depressive disorder, adjustment disorder, sleep disorder, psychotic disorder, bulimia nervosa, bipolar disorder, organic mental disorder, anxiety disorders; alcohol-related disorder, substance abuse, mood disorder, eating disorder, psychotic disorder	Taiwanese Depression Questionnaire, Chinese Health Questionnaire, Structured Clinical Interview for DSM IV <i>Not stated</i>

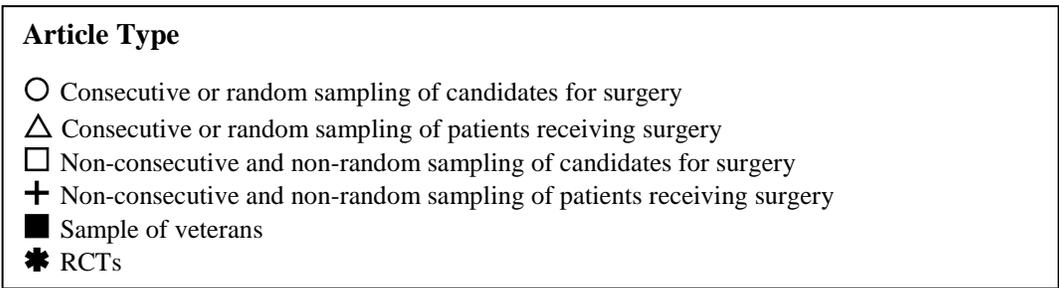
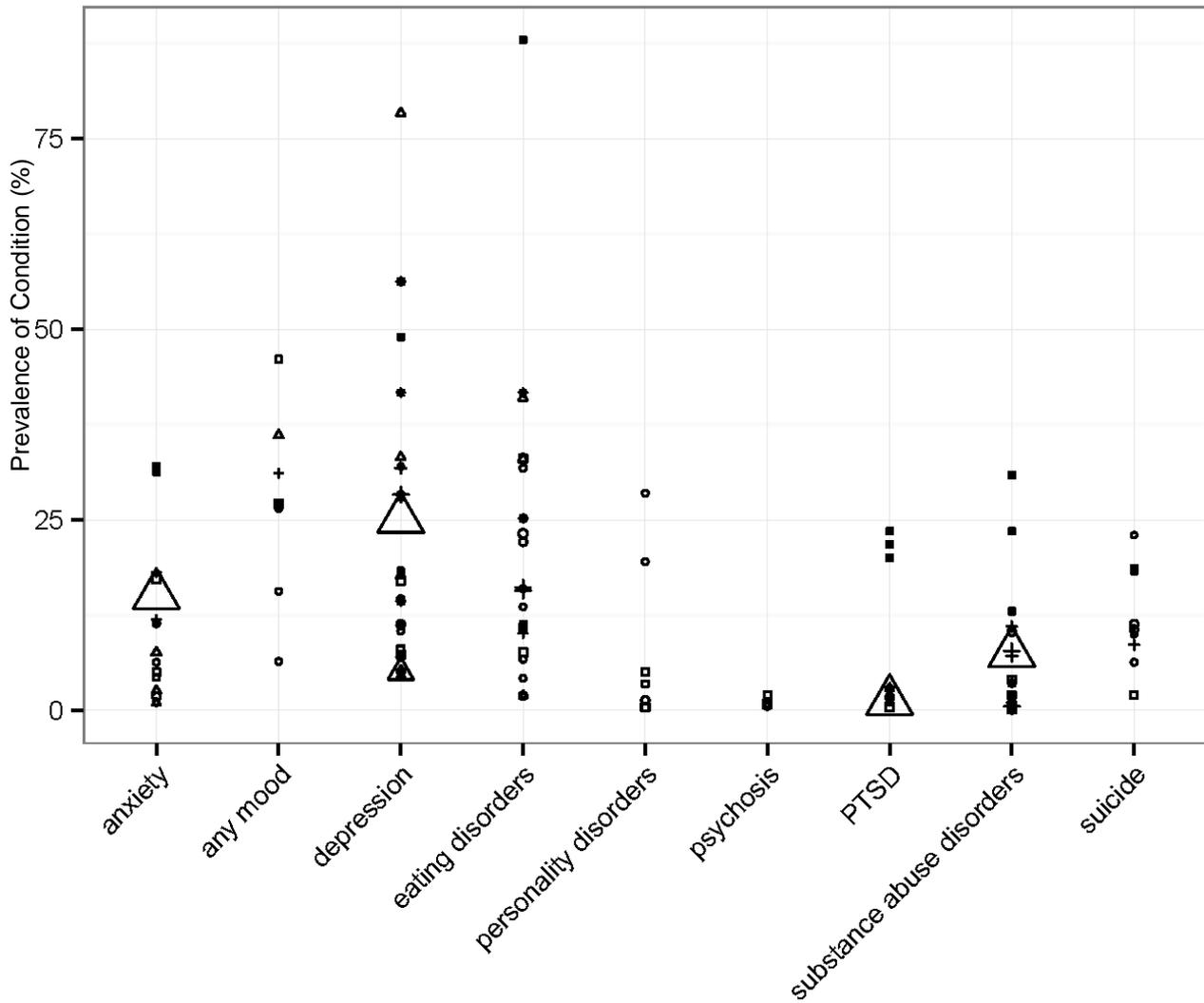
Articles with Non-consecutive and Non-random Sampling of Patients Receiving Surgery (n=7)						
Heinberg, 2012 ⁵⁷ USA	All received surgery at the Cleveland Clinic (year not stated)	Patients who had surgery and completed 2 or more follow up visits (64% of total sample)	N=608 75% female Mean BMI=48.1 Mean age=Not stated	67% RYGB 17% Adjustable gastric banding 13% Sleeve	Binge eating, suicide history, substance abuse	Binge Eating Scale, MMPI-2-RF, Cleveland Clinic Behavioral Rating System, semi-structured psychiatric interviews <i>Not stated</i>
King, 2013 ⁵⁸ USA	All received surgery	From the LABS-2 observational study, participants in LABS-2 who underwent surgery and had adequate data on an activity monitor Feb 2006-Feb 2009	N=850 79.2% female Mean BMI=45.8 Mean age=45	Not stated	QOL, depression, treatment for mental health recently, alcohol use disorder, anxiety impaired mental health functioning	SF-36 MD, BDI, Self-reported for treatment, psychiatric and emotional test survey, AUDIT <i>Not stated</i>
King, 2012 ⁵⁹ USA	All received surgery	From the LABS-2 observational study, participants in LABS-2 who underwent surgery and completed AUDIT Feb 2006-Feb 2009	N=1945 78.8% female Mean BMI=45.8 Mean age=47	69.9% RYGB 25.2% Adjustable gastric banding 0.8% Biliopancreatic diversion 1.5% Banded gastric bypass 2.6% Sleeve	QOL, depression, alcohol abuse, maladaptive eating, past year treatment psychotic or emotional problem	SF-36, BDI, AUDIT <i>Not stated</i>
Mitchell, 2014 ⁴⁴ USA	All received surgery	From the LABS-2 observational study, Feb 2008 - Feb 2009	N=2,266 79% female Median BMI=45.9 Median age=46	Not stated (but in other LABS-2 reports the proportion receiving RYGB was approximately 70%)	Eating disorders, QOL	Survey SF-36 <i>Not stated</i>
Mitchell, 2014 ⁶⁰ USA	All received surgery	From the LABS-2 observational study, Feb 2008 - Feb 2009	N=2,146 78.5% female Median BMI=45.9 Median age=46	Not stated (but in other LABS-2 reports the proportion receiving RYGB was approximately 70%)	Depression	BDI <i>Not stated</i>

Mitchell, 2012 ⁶¹ USA	All received surgery	A sample of LABS-2 participants	N=199 83% female Median BMI=44.9 Median age=46		Major depressive disorder, dysthymia, any anxiety disorder, any eating disorder, post-traumatic stress disorder, any substance use disorder, binge eating disorder, QOL	BDI Eating Disorder Examination (EDE) Structured Clinical Interview SF-36 <i>Not stated</i>
Svensson, 2013 ⁶²	All received surgery	Patients participating in the surgical cohort portion of the Swedish Obese Subject (SOS) study, 1987-2001; response rate not stated	N=2,010 71% female Mean BMI=42.3 Mean age=47	68% VBG 19% gastric banding 13% RYGB	Self-reported alcohol problems	Self-reported alcohol consumption Answer to survey question: "Do you think you have alcohol problems?" <i>Not stated</i>
Articles with Samples of Veterans (n=5)						
Adams, 2012 ⁶³ USA	All received surgery	All patients receiving bariatric surgery at the Jackson, MS VA 2003-2008 No recent substance abuse or serious mental health problems	N=61 33% female Mean BMI=45.5 Mean age=48	41% had bypass procedures 59% had banding procedures	Tobacco use Substance abuse	Medical records, psychologist evaluation <i>Not stated</i>
Ikossi, 2010 ⁶⁴ USA	All received surgery	All patients undergoing laparoscopic RYGB at Palo Alto VA 2001-2007	N=102 20% female Mean BMI=48.5 Mean age=51	All received laparoscopic RYGB	PTSD	Medical record diagnosis
Rutledge, 2012 ⁶⁵ USA	All received surgery	All patients receiving with loss surgery at the San Diego VA	N=55 31% female Mean BMI=44 Mean age=52 Patients with substance use, cognitive impairment, <i>etc</i>	82% received RYGB 18% received adjustable band	Use of antidepressants for moods, anxiety disorders, use of anxiolytics, history of substance abuse, history of PTSD, history of suicide attempt, history of bipolar disorder	Medical record, clinical psychologist interview <i>Not stated</i>
Rutledge, 2011 ²⁰ USA	Candidates (% receiving surgery not stated)	Consecutive patients completing an intake class for MOVE at the San Diego VA and then advancing to surgery	N=25 16% female Mean BMI=42 Mean age=51	Not stated	Depression Anxiety Binge eating Substance abuse PTSD OCD Schizophrenia	23 item questionnaire <i>Not stated</i>

Rutledge, 2011 ⁶⁶ USA	All received surgery	All patients completing weight loss surgery at the San Diego VA 1998-2007. Participants had to achieve a pre-op weight loss of 5%. Patients with substance abuse or psychiatric admissions in the prior 12 months or dementia were excluded	N=60 28% female Mean BMI=45.1 Mean age=52	87% RYGB 13% adjustable gastric band	Depression Anxiety disorder Binge eating Substance abuse history Suicide attempts Percent using antidepressants Percent using anxiolytics	Medical record, clinical psychologist evaluation <i>Not stated</i>
Articles from RCTs (n=6)						
Arterburn, 2011 ⁶⁷ USA	Candidates and persons meeting NIH criteria (not seeking surgery yet, % received N/A)	Patients enrolled in an RCT assessing a video-based decision aid (2008-2009)	N=152 73% female Mean BMI=47 Mean age=50	Mix of procedures	Depression warranting treatment	PHQ-9 <i>Not stated</i>
Kalarchian, 2013 ⁶⁸ USA	Candidates (% received surgery not stated)	All patients who were at least 18 years of age and seeking bariatric surgery at a Bariatric Center of Excellence at a large, urban medical center were eligible. Dates not stated.	N=240 87% female Mean BMI=48 Mean age=45	Not stated	eating disorders, depression	BDI, EDE, EBI
Kalarchian, 2012 ⁶⁹ USA	All received surgery	Patients 21 years old were eligible to participate if they had undergone bariatric surgery 3 years before study enrollment and had lost 50% excess weight from before surgery to study enrollment; recruited from flyers; randomized to intervention or not arms pts enrolled in an RCT to test a pre-surgery lifestyle intervention. Excluded: psych problems sufficiently severe to require immediate treatment (dates not stated)	N=36 88.9% female Mean BMI=43.2 Mean age=52.5	Surgery not stated	Binge eating, depression substance problems	Self-report substance problems, eating disorder examination, Beck Depression Inventory <i>Not stated</i>

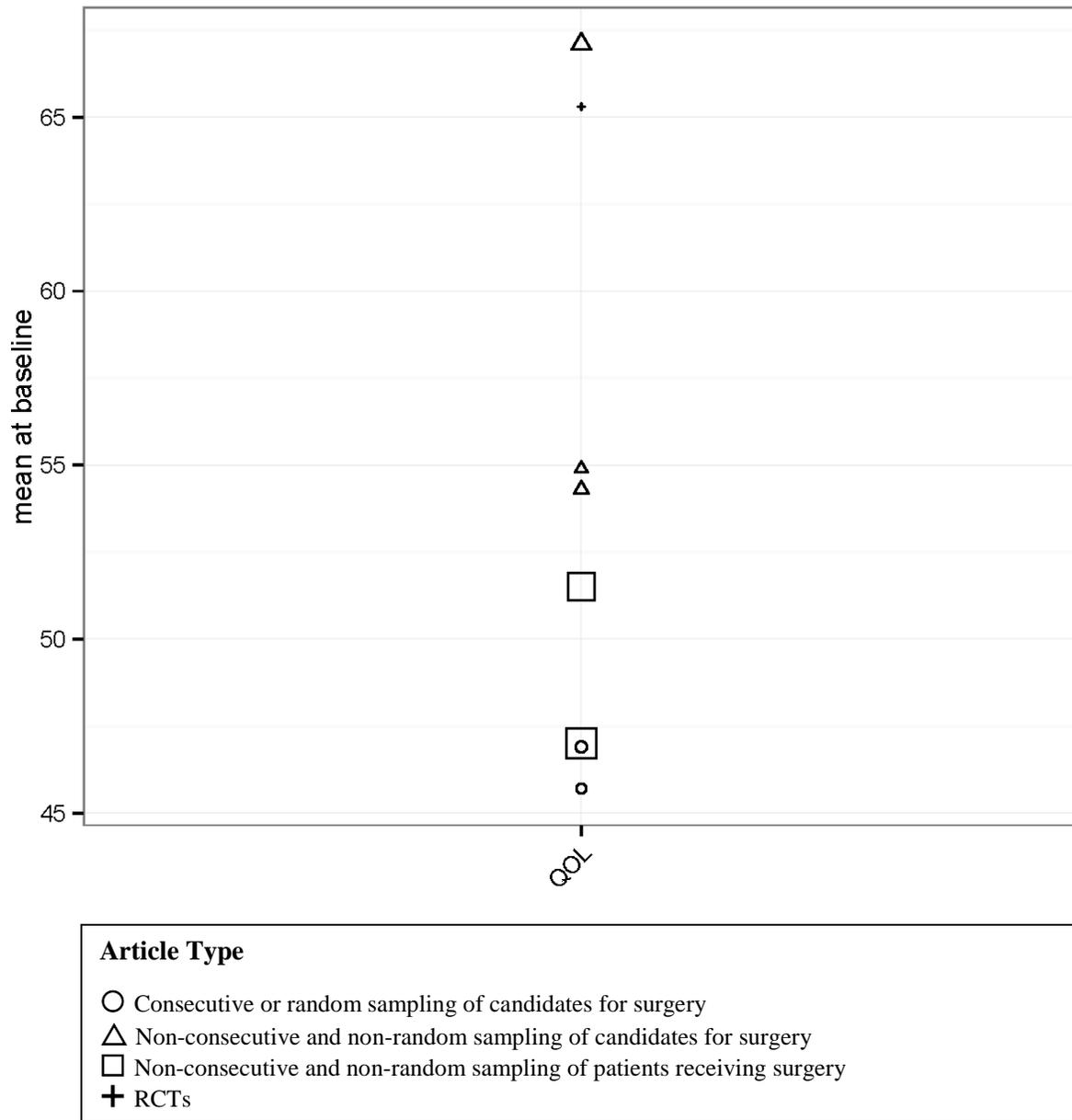
Nijamkin, 2013 ⁷⁰ USA	All received surgery	Patients enrolled in an RCT assessing an intervention to improve depressive symptoms (dates not stated)	N=144 83% female Mean BMI=36 Mean age=44	All procedures performed by one surgeon 100% RYGB	Depressive symptoms	BDI-II <i>Not stated</i>
Peterli, 2013 ⁷¹ Switzerland	All received surgery	Participants in an RCT comparing gastric bypass to sleeve gastrectomy; 4 sites, recruitment not described (Jan 2007 to Nov 2011)	N=217 72% female Mean BMI=44 Mean age=42.5	50.7% received RYGB 49.3% received sleeve gastrectomy	Depression, QOL	Not stated for depression Gastrointestinal Quality of Life Index <i>Not stated</i>
Shah, 2011 ⁷² USA	All received surgery	Patients enrolled in an RCT to test a post-surgical exercise program Patients with major neuropsychiatric illness impeding competence or compliance were excluded	N=33 91% female Mean BMI=42 Mean age=50	Gastric bypass RYGB	Quality of Life	IWQOL-Lite SF-36 <i>Not stated</i>

Figure 2. Prevalence of Pre-operative Mental Health Conditions in Bariatric Surgery Candidates or Patients



(Note: size of symbol is proportional to the sample size)

Figure 3. Quality of Life Assessment in Bariatric Surgery Candidates or Patients



(Note: size of symbol is proportional to the sample size)

Key Question 2: What is the association between pre-operative mental health conditions and bariatric outcomes, including weight loss, quality of life, adherence to behavioral guidelines, risk of suicide, prevalence of mental health conditions, and peri-operative complications?

We identified 24 studies reporting data on the association between pre-operative mental health conditions and post-operative outcomes.^{27,36,38,39,42,43,49,59,60,62-65,70-80} Three articles specifically addressed outcomes in Veteran populations.⁶³⁻⁶⁵ Details of each included study are presented in Table 3.

We present a synthesis of these data across 2 dimensions. First, we discuss the evidence by condition. Second, we discuss the collective evidence on the association of bariatric surgery and mental health outcomes and the association of mental health conditions and bariatric surgery outcomes.

Evidence for associations by condition

In total, 11 articles addressed depression among bariatric surgery patients.^{27,36,38,42,43,60,65,70,71,73,78} The method of assessing depression in each study is listed in Table 2. Seven focused on depression alone,^{36,38,60,70,71,73,78} while 2 also evaluated anxiety,^{43,65} one also evaluated eating disorders,⁴² and one evaluated mood, anxiety, and eating disorders as well as schizophrenia and substance abuse.²⁷ Sample sizes ranged from 55 to 11,115, and 5 studies included multiple clinical sites.^{36,42,43,60,71} The types of operations performed included RYGB alone^{70,78,79}; gastric banding alone^{27,38,43,73}; RYGB, banding, vertical banded gastroplasty, and “other”³⁶; RYGB and sleeve gastrectomy⁷¹; RYGB, LAGB and other⁶⁰; or not stated.⁴²

Depression improved following bariatric surgery in all 8 studies measuring changes in mental health outcomes. Three studies examined trends in the rate of patients reporting depression over time. In the first study, 5% of patients undergoing a variety of surgical procedures were diagnosed with depression prior to surgery compared to 2.5% at 1-4 months and 2.8% at 3 years post-operatively.³⁶ In the second study, patients were divided into 2 groups after surgery: an intervention arm providing comprehensive behavioral and nutritional support, and standard care. In the comprehensive care group, 54.2% were depressed pre-operatively compared to 41.7% at 6 months and 14.9% at one year post-operatively. Rates of depression also decreased in the standard care group from 58.3% pre-operatively to 37.5% at 6 months and 31.8% at one year after surgery.⁷⁰ A third study of LAGB patients found decreased rates of any mood disorder, major depressive disorder, and bipolar disorder at 2 years post-operatively; the largest change was found in the rate of major depressive disorder, which decreased from 18.1% to 6.0%.²⁷

Five studies examined trends in symptoms or treatment for depression: 3 studies compared Beck Depression Inventory (BDI) scores pre- and post-operatively,^{38,60,73} one study tracked patient-reported symptoms of depression over time,⁷¹ and the final study followed rates of antidepressant and psychotherapy use.⁶⁵ A study of LAGB patients found decreased BDI scores post-operatively among both a random sample of patients and a group of patients with elevated pre-operative depression scores (BDI>23).⁷³ Significant reductions were found in all BDI subscales for both groups, with the largest impact on negative self-attitudes. No formal comparison was made between changes in outcomes between the random and elevated-depression score groups. Another study of LAGB patients found that average BDI scores decreased from 17.7 pre-

operatively to 7.8 one year post-operatively; the trend stabilized, however, and started to regress with average scores of 8.0 at 2 years, 9.0 at 3 years and 9.6 at 4 years post-op.³⁸ A similar study of the Longitudinal Assessment of Bariatric Surgery (LABS) cohort also found decreased mean BDI scores from baseline (7.7) to 6 months (4.3) and one year post-op (4.1), but increasing scores thereafter: 4.7 at 2 years and 5.3 at 3 years.⁶⁰ In the study using self-reported symptoms of depression, 20% of sleeve gastrectomy patients and 11% of RYGB patients had diagnoses of depression at baseline. At one year after surgery, 93% of sleeve gastrectomy patients and 87% of RYGB patients reported improvement in their depression with 17% and 5%, respectively, reporting complete resolution of symptoms.^{60,71} In a final study involving 55 Veterans undergoing bariatric surgery, the use of antidepressant medications and psychotherapy for depression decreased from 56% to 34% over the 5-year follow-up period.⁶⁵ This study also evaluated the impact of surgery on the treatment of anxiety, finding only non-significant increases in the rates of anxiolytic use and psychotherapy post-operatively. Changes in metabolic outcomes, including weight loss, were not associated with observed changes in the use of psychiatric therapies for their disorder.

Three studies evaluated post-operative weight loss in patients with depression, but did not report on changes in mental health outcomes. In the first study, patients with depression or anxiety at baseline experienced a 7.9 kg/m² decrease in their BMI on average at 4 years after surgery compared to 12.5 kg/m² in patients without these mental health comorbidities. Based on their analysis, pre-operative depression and anxiety explained 4% of the variance in weight loss among bariatric surgery patients.⁴³ In another study, patients with depression had no difference in weight loss at one year after bariatric surgery, but did have less sustained weight loss at 4 years compared to non-depressed patients.⁴² This pattern was found for both patients with depression at the time of surgery as well as for patients with a history of depression at any time during their life, although the impact was larger among patients reporting active depression at the time of operation. Unfortunately, the study did not quantify differences in weight outcome between the 2 groups. A final study found no association between BDI scores and weight maintenance after RYGB, but did find that higher BDI scores pre-operatively (indicative of more severe depression) appeared to reduce the risk of significant weight regain at a mean follow-up of 28.1 months.⁷⁸ Each additional unit on the BDI scale was associated with a 6% reduction in the risk of experiencing significant weight regain, defined as $\geq 15\%$ of total post-operative weight loss.

Four studies reported on alcohol or substance abuse disorders: 3 related to changes in these disorders after bariatric surgery and one regarding their impact on post-operative weight loss. The first study found no change in the proportion of patients reporting symptoms of alcohol abuse from baseline to one year after surgery (7.6 vs 7.3%, $p=0.98$). Rates did increase, however, in the second post-operative year (7.6 vs 9.6%, $p=0.01$), especially among young men undergoing RYGB. There were no differences, however, in the rate of either inpatient or outpatient treatment for substance abuse between pre-operative and post-operative assessments.⁵⁹ A second study also reporting on depression found a decrease in the rate of patients reporting alcohol abuse from 1% pre-operatively to 0% at 2 years post-operatively, but only included patients undergoing LAGB.²⁷ The largest study on the topic from the Swedish Obese Subjects (SOS) trial compared 2,010 surgical patients to 2,037 matched controls. In this study, bariatric surgery was associated with increased rates of alcohol abuse, medium-risk alcohol consumption, and self-reported alcohol problems, especially for patients undergoing RYGB. In line with previous studies, however, patients who underwent LAGB did not experience increased rates of

alcohol abuse when compared to non-surgical controls.⁶² A final study evaluated the impact of alcohol and substance use disorders on weight loss among 66 Veterans undergoing bariatric surgery. Neither alcohol nor substance use was predictive of weight loss at 6 months or the rate of obesity at 12 months post-operatively; however, patients without these disorders lost more weight at 12 and 24 months and had lower rates of obesity at 24 months after their operation.⁶³

Two studies specifically reported on suicide. The first used mortality data from nearly 17,000 patients undergoing bariatric surgery in Pennsylvania over a 10-year period, and compared post-operative suicide rates to rates for an age- and sex-matched US population. At 13.7 per 10,000 among men and 5.2 per 10,000 among women, both rates were significantly higher than standardized rates of 2.4 per 10,000 for men and 0.4 per 10,000 for women.⁷⁴ This study did not have the data to control for mental health comorbidities. The second involved a comparison of severely obese individuals undergoing RYGB with 2 control groups: individuals who sought but did not undergo bariatric surgery at the same hospital, and a population-based sample of severely obese adults.⁸⁰ Over the 6-year follow-up period, all 4 suicides and 2 of the 3 poisonings of undetermined intention occurred in the surgery sub-group. While the cumulative incidence of suicide was higher in the surgical group than in the combined control groups, the rate was not significantly different from either control group alone.

Three studies explored associations between eating disorders and bariatric surgery: one reporting the impact of eating disorders on weight loss, one reporting the impact of surgery on eating disorders, and one reporting on both. In a study that also reported on depression, history of an eating disorder had a small but significant effect on post-operative weight loss at 4 years, with those reporting a history of eating disorder losing *more* weight after bariatric surgery.⁴² This study, however, did not quantify the difference between the 2 groups. In a second study also reporting on depression and substance abuse, 28 of 204 (14%) LAGB patients reported pre-operative binge eating disorder (BED) compared to only 7 (5%) after a 2-year follow-up period.²⁷ A final study found no differences in weight loss for BED compared to non-BED patients at 3 years after bariatric surgery.⁷⁵ One third of BED patients in this small sample (6 of 18) reported continued BED episodes following their operation.

Five studies examined changes in quality of life following bariatric surgery. One study showed a 26% increase in SF-36 physical component scores, and a 7% increase in mental component scores at 2 years after surgery.⁴⁹ Another study on quality of life using the SF-36 compared LAGB patients to community normal values (CN). Candidates' pre-operative mean scores were lower than CN values, with greater impairment in the physical component summary score (PCS) (36.8 vs 51.3, $p=0.001$) than in the mental component summary score (MCS) (45.7 vs 48.8, $p=0.001$). At one year after surgery, scores had improved in both domains, and were closer to CN benchmarks (PCS: 52.4 ± 8.2 and MCS: 48.4 ± 7.7); no subsequent reduction in quality of life was observed during the study's 4-year follow-up period.³⁹ A third study evaluating high volume exercise (HVE) in bariatric surgery patients utilized both IWQOL-L and SF-36 measures of quality of life.⁷² IWQOL-L among patients receiving HVE increased from 61 at baseline to 74 at 6 weeks and 75 at 12 weeks post-op; patients in the control group had similar increases (from 67 to 83). The SF-36 physical component score also increased from 49 at baseline to 51 at 6 weeks and 53 at 12 weeks post-op in the control group; no sustained change was found among patients in the HVE group (52, 50, and 52 at baseline, 6 weeks, and 12 weeks, respectively). The mental component score, on the other hand, increased in the HVE group from 46 to 55 but did not

change among patients in the control group (49 at both baseline and 12 weeks). Changes in the HVE group could be due to a combination of bariatric surgery and the HVE intervention. A fourth study used linear analog scale assessment (LASA) to measure changes in quality of life among 148 patients undergoing RYGB. Mean LASA scores increased from baseline by 138% (3.4 to 8.1) after a follow-up of 4.0 years; only 4 patients (2.7%) experienced worsened quality of life after surgery.⁷⁹ Finally, in a study also reporting on changes in depression after bariatric surgery, quality of life was measured at baseline and one year post-operative using the GIQLI score. Based on this metric, quality of life increased from 99 to 128 on average by one year post-operative – a level that exceeds the majority of healthy individuals who score 121 points on average.⁷¹

We identified 2 studies each addressing PTSD and bipolar disorder. In the first study on PTSD, which also addressed a range of mental health conditions, 2.9% of patients undergoing LAGB were diagnosed with PTSD at baseline compared to only 1.3% at 2 years after surgery.²⁷ Unfortunately, the study did not report if this trend reached statistical significance. In the second study, 24 (24%) of 102 Veterans undergoing bariatric surgery at a single VA center were being treated for PTSD at the time of their operation.⁶⁴ There was no difference in the rates of short-term complications between the PTSD and non-PTSD groups, and only a non-significant difference in percent excess weight loss between the 2 groups at one year post-op (66 vs 72%, respectively; $p=0.10$). PTSD symptoms appeared to wax and wane throughout the post-operative period without a definitive trend toward improvement or deterioration.

The same study reporting changes in the rate of PTSD found that 2.9% of patients undergoing LAGB had bipolar disorder during pre-operative evaluation compared to 2.7% of patients at 2 years post-operatively.²⁷ However, this trend did not reach statistical significance. A second matched-cohort study of almost 1,600 obese patients with bipolar disorder compared time to inpatient psychiatric hospitalization for obese patients undergoing and not undergoing bariatric surgery.⁷⁶ Approximately 9% of surgical patients were hospitalized during a mean follow-up period of 2.4 years compared to 10.6% of controls. After multivariate adjustment, there was no association between bariatric surgery and time to psychiatric hospitalization (HR 1.0, 95% CI 0.83-1.23), and no difference in risk-adjusted use of outpatient psychiatric services, including psychiatric, behavioral medicine, or substance abuse visits.

We found only one study addressing cognitive function following bariatric surgery among 50 patients in the LABS cohort.⁷⁷ Three cognitive domains were assessed at baseline as well as at 12, 24, and 36 months post-operatively: attention, executive function, and verbal memory. The study found sustained improvements in executive function throughout the follow-up period ($p<0.001$), while memory improved from baseline to 12 months then stabilized from 12 to 36 months after surgery ($p<0.001$). Observed trends in attention were more complex, with steady improvement from baseline to 24 months followed by dramatic decreases from 24 to 36 months, driven largely by the sub-group of patients who regained weight during the time period.

Association of Bariatric Surgery and Mental Health Outcomes

Bariatric surgery is associated with reductions in both the rates and symptoms of a variety of mental health conditions, most notably depression. One study on LAGB patients, in particular, presented the widest evidence for improvement in mental health outcomes after surgery. Among 204 consecutive LAGB patients treated at a large US hospital, the diagnosis of any Axis I

disorder dropped from 40% to 20% by 2 years post-op with commensurate reductions in mood disorders (27% to 15%), anxiety disorders (15% to 4%), and eating disorders (12% to 5%; $p < 0.001$ for mood and anxiety disorders, $p < 0.01$ for eating disorders).²⁷ This study also reported the only evidence on changes in the prevalence of schizophrenia, finding no difference between patients reporting symptoms at baseline and at 2 years post-operatively.

All 8 of the studies that measured changes in depression found significant improvements. This includes a reduction in the number of patients reporting depression,^{27,36,70} a reduction in the symptoms of depression,^{38,60,71,73} and a reduction in medication or psychotherapy treatment for depression.⁶⁵ Interestingly, one study found no change in the rates of hospitalization for depression between baseline, one year, and 2 years post-operatively, but did find increased rates in the third year: 0.9% vs 1.7% ($p = 0.03$).⁶⁰

The evidence for an association between bariatric surgery and rates of alcohol abuse was mixed, and appeared to depend on the type of surgery being performed. Two studies found increased rates of alcohol consumption, alcohol abuse, and treatment for alcohol dependence after bariatric surgery, but only for patients undergoing RYGB as opposed to LAGB. Rates of alcohol consumption and abuse were lower than baseline in the first year following RYGB, but significantly increased over baseline in the second year.⁵⁹ Results from the SOS trial found similar increases in consumption and self-reported alcohol abuse among VBG patients, but did not report longitudinal data to determine year-to-year changes.⁶² Neither study found a significant difference in alcohol consumption or abuse among LAGB patients, a result that was confirmed by a third study focusing only on patients having this procedure.²⁷

Two studies tracked suicide after bariatric surgery, one finding elevated incidences compared to population averages and the other suggesting elevated cumulative incidence compared to matched non-surgical controls.^{74,80} Findings of the latter study, however, did not reach statistical significance.

All 5 studies measuring quality of life showed improvements following bariatric surgery.^{39,49,71,72,79} In studies using a scale with multiple domains, such as the PCS and MCS of the SF-36, there was improvement across all components with larger and more sustainable changes being seen in physical status than in mental status.^{39,49,72} Quality of life continued to improve between baseline and one year post-operatively. However, the one study that followed patients beyond one year found a slight attenuation over time, but not to pre-operative levels.³⁹

There was no clear evidence on post-operative changes in PTSD or bipolar disorder. One study suggested a decreased rate of PTSD following bariatric surgery, but did not provide statistical tests²⁷; another found that symptoms fluctuated after surgery without a definite trend towards improvement or deterioration.⁶⁴ A study of LABG patients reported no change in the rate of patients reporting bipolar disorder,²⁷ while another found no association between bariatric surgery and time to psychiatric hospitalization or the risk-adjusted use of outpatient psychiatric services for patients with bipolar disorder.⁷⁶

Minimal evidence exists regarding changes in cognitive function, and results appear to vary by domain: memory improved from baseline to 12 months then stabilized, attention increased from baseline to 24 months then decreased from 24 to 36 months, and executive functioning increased throughout the follow-up period.⁷⁷

Association of Baseline Mental Health Conditions and Post-surgical Weight Change

There was conflicting evidence regarding the impact of pre-operative mental health conditions on post-operative weight loss. The majority of studies found no association between the presence of any Axis I disorder—including depression—and weight outcomes. The only study looking at patients with any pre-operative Axis I disorder found no difference in percent excess weight lost at 2 years post-operatively.²⁷

Minimal and contradictory evidence exists regarding pre-operative depression and post-operative weight loss. One study found less post-surgical weight loss in patients with a diagnosis of depression or anxiety.⁴³ Another found no difference in weight loss at one year for patients with depression, but less sustained weight loss at 4 years.⁴² Another study found no association between BDI scores and weight loss on average, but did report a reduced risk of significant weight regain ($\geq 15\%$ of total weight loss) in patients with higher pre-op BDI scores.⁷⁸

The one study reporting on substance abuse found no difference in short-term weight loss; however, patients without a diagnosis of substance abuse had lost more weight at 12 and 24 months, and had lower rates of obesity at 24 months after their operation.⁶³

Two studies provide mixed results on the effect of eating disorders on weight loss. One study found that those with an eating disorder lost more weight after surgery while the other found no difference.^{42,75} The first study looked at patients with the diagnosis of an eating disorder at any point in the patient's lifetime and followed patients for 4 years; the second study looked only at patients diagnosed with an eating disorder at the time of surgery and followed patients for 3 years post-operatively.

In the one study on PTSD, there was no difference in percent excess weight loss at one year post-op between patients with and without the disorder.⁶⁴

Summary of Findings

There are conflicting data regarding the impact of mental health conditions on post-operative outcomes, including weight loss, mental health symptoms, quality of life, and suicide. The most consistent evidence suggests lower rates of depression, fewer symptoms of depression, and decreased usage of anti-depressant therapies after bariatric surgery. A causal role of bariatric surgery cannot be established with the existing studies. Aside from depression, only quality of life demonstrated consistent improvement across multiple studies, although the use of different scales and timelines complicates the evaluation. There is insufficient evidence to determine the relationship between pre-operative mental health conditions and post-operative weight loss outcomes.

Quality of Evidence for Key Question 2

The quality of evidence is moderate that bariatric surgery is associated with lower rates and fewer symptoms of depression, compared to pre-operative status. The quality of evidence is low regarding the association between bariatric surgery and quality of life improvements following surgery. All other associations between mental health conditions and outcomes following bariatric surgery are judged very low-quality evidence.

Table 3. Evidence Table of Studies of Associations between Pre-Operative Mental Health Conditions and Bariatric Outcomes

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Articles with Consecutive or Random Sampling of Patients Receiving Surgery (n=12)						
Ahmed, 2013 ⁷⁶ USA	All received surgery	All patients with diagnosis of bipolar disorder who underwent bariatric surgery between 2006-2009	N=144 89% female Mean BMI=42 Mean age=44 Follow-up rate: N/A	86% lap RYGB, 7% LAGB, 4% open RYGB, 4% gastric sleeve	Time to psychiatric hospitalization, outpatient visits for psychiatric or behavioral health	Administrative records <i>Not applicable</i>
Alosco, 2013 ⁷⁷ USA	All received surgery	Consecutive patients enrolled in LABS study from 3 clinical sites	N=50 92% female Mean BMI=47 Mean age=44 Follow-up rate: 100%	98% RYGB, 2% gastric banding	Cognitive function	IntegNeuro test series <i>Not stated</i>
Batsis, 2009 ⁷⁹ United States	All received surgery	Consecutive patients referred for bariatric surgery to a single institution who also lived in the county, 1990-2005; response rate=38.0%	N=148 73% female Mean BMI=47 Mean age=46	100% RYGB	QOL	LASA <i>Not applicable</i>
Cremieux, 2010 ³⁶ USA	All received surgery	All patients in a proprietary database of 5,000,000 Americans who had received bariatric surgery and had continuous insurance coverage	N=5,502 83% female Mean BMI not stated Mean age=44 Follow-up rate: N/A	73% RYGB Mix of other procedures	Depressive Disorders	Claims data <i>Not applicable</i>
Dixon, 2003 ³⁸ Australia	All received surgery	Consecutive patients receiving bariatric surgery at a university program, 1999-2003; response rate not stated	N=487 85% female Mean BMI=44.1 Mean age=41.2	100% LAGB	Depression	BDI <i>Not stated</i>
Dixon, 2001 ³⁹ Australia	All received surgery	Consecutive patients receiving bariatric surgery at a single institution, 1998-2001; response rate not stated	N=459 85% female Mean BMI=45.0 Mean age=41	100% LAGB	QOL	SF-36 <i>Not applicable</i>

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Hayden, 2014 ²⁷	Candidates (98% received surgery)	Consecutive patients meeting eligibility criteria for bariatric surgery at one institution, 2007-2009; response rate = 75%	N=204 82% female Mean BMI=42.7 Mean age=45	100% LAGB	Any Axis I disorder Any mood disorder Major depressive disorder Dysthymia Bipolar disorder Any anxiety disorder Panic disorder OCD PTSD Generalized anxiety disorder Schizophrenia Alcohol abuse Binge eating disorder	SCID <i>Not stated</i>
Hayden, 2011 ⁷³ Australia	All received surgery	Random sample of patients who had undergone lap band surgery at a single bariatric center	N=191 84% female Mean BMI=43 Mean age=42 Follow-up rate: Not stated	Lap band	Depression	BDI <i>Not stated</i>
Lapidoth, 2011 ⁷⁵ Sweden	All received surgery	Consecutive patients receiving surgery at 4 Swedish bariatric clinics (96% agreed to participate)(dates not stated)	N=130 78% female Mean BMI=46 Mean age=41 Follow-up rate: 78%	76% gastric bypass, 14% gastric banding, 5% VBG, 4% BPD	BED Quality of life	EDO, EDE-Q, SF-36 <i>Not stated</i>
Legenbauer, 2011 ⁴² Germany	All received surgery	Consecutive patients receiving surgery in 6 German hospitals (99% of patients participated) (dates not stated)	N=151 67% female Mean BMI=51 Mean age=39 Follow-up rate: 64%- 80%	Mix of gastric banding and gastroplasty	Depressive Disorder Eating Disorders	Composite International Diagnostic Interview Structured Interview for Anorexia and Bulimia <i>Not stated</i>

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Odom, 2009 ⁷⁸ USA	All received surgery	Consecutive patients undergoing surgery at one institution; response rate=18.1%	N=203 85% female Mean BMI=29.6 Mean age=51	RYGB	Depression	BDI <i>Not stated</i>
Tindle, 2010 ⁷⁴ USA	All received surgery	All patients undergoing bariatric surgery between 1995-2004 in Pennsylvania Health Care Cost and Containment Council database	N=16,683 % female not stated Mean BMI= not stated Mean age= not stated Follow-up rate: N/A	Not stated	Suicide	Death certificates recorded by Pennsylvania State Department of Health <i>Not applicable</i>
Articles with Non-consecutive and Non-random Sampling of Patients Receiving Surgery (n=6)						
Adams, 2012 ⁸⁰ USA	All received surgery	Patients receiving surgery from 3 bariatric surgeons in Utah, 2000-2011; response rate=92.6%	N=418 84% female Mean BMI=47.3 Mean age=43	All RYGB	Suicide	National Death Index <i>Not stated</i>
Adams, 2010 ⁴⁹ USA	All received surgery	Patients seeking bariatric surgery from 3 bariatric surgeons in Utah; non- bariatric seeking patients from a large database	N=835 84% female Mean BMI=47 Mean age=44 Follow-up rate: 52%	Gastric bypass	Quality of Life	IWQOL-Lite, SF-36 <i>Not stated</i>
King, 2012 ⁵⁹ USA	All received surgery	From the LABS-2 observational study, participants in LABS-2 who underwent surgery and completed AUDIT Feb 2006-Feb 2009	N=1945 78.8% female Mean BMI=45.8 Mean age=47 Follow-up rate: 86%	69.9% RYGB 25.2% Adjustable gastric banding 0.8% Biliopancreatic diversion 1.5% Banded gastric bypass 2.6% Sleeve	QOL, depression, alcohol abuse, maladaptive eating, past year treatment psychotic or emotional problem	SF-36, BDI, AUDIT <i>Not stated</i>

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Legenbauer, 2009 ⁴³ Germany	All received surgery	Patients at 6 German hospitals were approached on the day of admission	N=151 68% female Mean BMI=51 Mean age=39 Follow-up rate: 64%-80%	Gastric bypass	Any Mental Disorder Depressive Disorders Anxiety Disorders Binge Eating Behaviors	Composite International Diagnostic Interview Structured Interview for Anorexia and Bulimia Nervosa <i>Not stated</i>
Mitchell, 2014 ⁶⁰ USA	All received surgery	From the LABS-2 observational study, Feb 2008 - Feb 2009	N=2,146 78.5% female Median BMI=45.9 Median age=46	Not stated (but in other LABS-2 reports the proportion receiving RYGB was approximately 70%)	Depression	BDI <i>Not stated</i>
Svensson, 2013 ⁶²	All received surgery	Patients participating in the surgical cohort portion of the Swedish Obese Subject (SOS) study, 1987-2001; response rate not stated	N=2,010 71% female Mean BMI=42.3 Mean age=47	68% VBG 19% gastric banding 13% RYGB	Self-reported alcohol problems	Self-reported alcohol consumption Answer to survey question: "Do you think you have alcohol problems?" <i>Not stated</i>
Articles with Samples of Veterans (n=3)						
Adams, 2012 ⁶³ USA	All received surgery	All patients receiving bariatric surgery at the Jackson, MS VA 2003-2008 No recent substance abuse or serious mental health problems	N=61 33% female Mean BMI=45.5 Mean age=48 Follow-up rate: N/A	41% had bypass procedures 59% had banding procedures	Tobacco use Substance abuse	Medical records, psychologist evaluation <i>Not stated</i>
Ikossi, 2010 ⁶⁴ USA	All received surgery	All patients undergoing laparoscopic RYGB at Palo Alto VA 2001-2007	N=102 20% female Mean BMI=48.5 Mean age=51 Follow-up rate: 95%	All received laparoscopic RYGB	PTSD	Medical record diagnosis

Author, Year Country	Sample (Candidates/All received surgery)	Method of Recruitment	Details of Sample	Details of Surgery	Mental Health Diagnoses Assessed	Methods of Assessment <i>Kept Confidential from Surgery Team</i>
Rutledge, 2012 ⁶⁵ USA	All received surgery	All patients receiving with loss surgery at the San Diego VA	N=55 31% female Mean BMI=44 Mean age=52 Patients with substance use, cognitive impairment, <i>etc</i> Follow-up rate: Not stated	82% received RYGB 18% received adjustable band	Use of antidepressants for moods, anxiety disorders, use of anxiolytics, history of substance abuse, history of PTSD, history of suicide attempt, history of bipolar disorder	Medical record, clinical psychologist interview <i>Not stated</i>
Articles from RCTs (n=3)						
Nijamkin, 2013 ⁷⁰ USA	All received surgery	Patients enrolled in an RCT assessing an intervention to improve depressive symptoms (dates not stated)	N=144 83% female Mean BMI=36 Mean age=44 Follow-up rate: 92%	All procedures performed by one surgeon 100% RYGB	Depressive symptoms	BDI-II
Peterli, 2013 ⁷¹ Switzerland	All received surgery	Participants in an RCT comparing gastric bypass to sleeve gastrectomy; 4 sites, recruitment not described (Jan 2007 to Nov 2011)	N=217 72% female Mean BMI=44 Mean age=42.5 Follow-up rate: 32%- 100%	50.7% received RYGB 49.3% received sleeve gastrectomy	Depression, QOL	Not stated for depression Gastrointestinal Quality of Life Index <i>Not stated</i>
Shah, 2011 ⁷² USA	All received surgery	Patients enrolled in an RCT to test a post-surgical exercise program Patients with major neuropsychiatric illness impeding competence or compliance were excluded	N=33 91% female Mean BMI=42 Mean age=50 Follow-up rate: 100%	Gastric bypass RYGB	Quality of Life	IWQOL-Lite SF-36 <i>Not stated</i>

Key Question 3: Is there evidence to support any pre-operative intervention to improve post-operative outcomes among patients with mental health conditions?

We identified no studies assessing the effect of a pre-operative intervention targeted at mental health conditions or eating disorders that assessed the impact on post-operative bariatric outcomes, specifically weight loss. We identified 5 studies of interventions aimed at improving pre-operative mental health disorders or eating disorders in bariatric surgery candidates. These studies measured changes in pre-operative status of these disorders. We describe these studies here as providing at least tangential evidence relevant to the study question.^{68,81-84} Details of each included study are presented in Table 4.

All 5 studies included only a single institution (and 2 of these were performed at the same institution). Three were conducted in the United States and 2 were from Europe. The patient characteristics were similar across studies with a mean age ranging from 41 to 48 years of age, the percent female ranging from 60 to 88%, and the baseline BMI ranging between 45 to 49 kg/m². The sample size varied from 10 to 243 patients. Overall the risk of bias for all 5 studies was high, in large part based on the inherent challenges with surgical studies, specifically the difficulty in blinding participants during the data collection phase. Also, adherence to the pre-operative interventions was low.

Kalarchian performed a behavioral lifestyle intervention for bariatric surgery candidates (N=121) and compared results to usual care (N=114), which included a physician-supervised diet.⁶⁸ Patients who decided not to pursue surgery were dropped from the study. The intervention occurred over 6 months; patients in both arms of the study underwent an insurance-company-mandated, physician-supervised pre-operative weight loss program. Usual care patients were expected to arrange for a physician-supervised weight loss program on their own. Patients were 83% white and 86% had education beyond high school.

The intervention focused on the health benefits of lifestyle change before and after bariatric surgery and on establishing realistic weight loss goals. The assessment of outcomes was only on bariatric surgery candidates. Patients were instructed to limit themselves to 1200 to 1400 calories per day, maintain a diet supportive of nutritional needs following surgery, and undertake at least 30 minutes of physical activity for 5 days weekly. A mix of individual (one hour), face-to-face (one hour), and phone (15-20 min) coaching was performed weekly over 6 months.

At 6 months, 187 participants (78%) were still candidates for surgery; included in the data analysis on this cohort were Beck Depression Inventory (BDI), Eating Disorder Examination (EDE) and Eating Behavior Inventory (EBI) scores. Lifestyle patients lost more weight than the usual care group (8.3 vs 3.3 kg, $p < 0.0001$). Both groups experienced improvement in depression: BDI decreased from 15.2 to 11.8 in the lifestyle group and 14.0 to 11.0 in the usual care group.

For the score on the EBI, there was a significant group effect ($p < 0.007$), a time effect ($p < 0.0001$), as well as a group by time interaction ($p < 0.0004$), indicating that lifestyle patients had larger improvements in eating behaviors than usual care patients. However, there was a significant effect for time only for EDE subjective bulimic episodes ($p < 0.02$), objective bulimic episodes ($p < 0.0001$), and BDI score ($p < 0.0001$), suggesting that both groups improved over time.

The second intervention study assessing changes in pre-operative psychosocial behavior was a Spanish study performed by Abiles and colleagues.⁸¹ The intervention used cognitive behavioral therapy (CBT) for bariatric surgery candidates and assessed differences between those with and without binge eating disorder (BED) at baseline. One hundred ten consecutive severely obese bariatric surgery candidates were enrolled in the CBT program, which consisted of 12 two-hour sessions over 3 months. Patients were categorized as having BED or not having BED at baseline. Outcomes assessed included mood (using the Abbreviated Scale of Anxiety and Depression [GHQ]), QOL (using the QLI-sp), and weight. These were measured before as well as at 3 months and 12 months after the intervention. A pre-post study design was used.

Patients with BED were more anxious and depressed, and had lower self-esteem and quality of life as compared to non-BED patients before the intervention ($p < 0.05$). Following the CBT intervention, differences in self-esteem, depression, and eating disorders were reduced in the patients with BED.

Multivariate regression showed that CBT was effective at treating psychological comorbidity regardless of whether BED was present at baseline. At one year post-CBT, weight loss of greater than 10% of body weight was noted in 61% of patients, with no differences between patients with or without BED at baseline.

In the third study by Aston and colleagues,⁸⁴ patients seeking bariatric surgery with a history of substance abuse/dependence or at risk for substance use ($n=86$) underwent a single-session 90-minute educational intervention about the health effects of alcohol/substances on bariatric surgery outcomes, alternative coping strategies, and providing treatment resources.

Patients completed a pre- and post-intervention questionnaire measuring knowledge of substance use health effects, the Alcohol Use Disorders Identification Test Consumption Items, and items on motivation for abstinence. Patients reported a significant increase in knowledge regarding the negative effects of substance abuse after surgery ($\chi^2 = 42.3$; $p < .001$). Patients also reported more healthy alternative coping strategies after the intervention ($\chi^2 = 18.9$; $p = .001$). More patients reported a lower intention of consuming alcohol after surgery ($\chi^2 = 16.2$; $p = .001$) and were more likely to report health reasons as motivation to abstain ($\chi^2 = 102.9$; $p < .001$).

The fourth study, also performed by Ashton, assessed the effectiveness of a brief 4-session group CBT intervention for binge eating in bariatric surgery candidates.⁸² In this study, 90% of participants had more than a high school education and 68% of participants were white. Again, a pre-post design was used.

The 4-session CBT group was designed specifically for bariatric surgery patients. The group met weekly for 1 ½ hours over a 4-week period. The number of participants at each session ranged from 2 to 12. A licensed psychologist or supervised postdoctoral fellow ran each session. The intervention included self-monitoring, stimulus control, regulation of eating patterns, cognitive restructuring, body image processing, stress management and relaxation training, social skills/assertiveness training, and group support. Two hundred forty-three patients participated in all 4 CBT sessions. The main reasons for missing sessions included medical disorders, transportation, and work. Patients were assessed for binge eating disorder and binge eating episodes (using the structured clinical interview and binge eating syndrome (BES) questionnaire) before and after the 4-week intervention (pre-surgery).

The CBT intervention was associated with a decrease in binge eating episodes from 2.84 before the intervention to 1.18 after the intervention. The change in BES and BEEs did not vary based on characteristics such as race or gender ($p>0.10$).

The last study by Wild and colleagues was conducted in a single university center in Germany.⁸³ Bariatric surgery candidates were given a thematic interventional group therapy of 12 sessions at 2-week intervals focusing on motivation and psychosocial state. The goal was to reduce depression in this population. Depression decreased following the treatment (12.8 to 8.6; 95% CI: 0.5, 7.8). Quality of life improved following the treatment (30.9 to 40.9; 95% CI: -13.3, -6.4). This study had a small sample size as only 10 of 16 patients completed the intervention, therefore the ability to reach conclusions are limited.

Summary of Findings

There were no studies that assessed the impact of a pre-operative intervention addressing mental health conditions on post-operative outcomes, such as surgical weight loss or the prevalence of the mental health disorders. Five low-quality studies reported pre-operative improvements in targeted mental health behaviors, as well as pre-operative physician-supervised weight loss before surgery and substance abuse, for bariatric surgery candidates.

Quality of Evidence for Key Question 3

There is no evidence specific to Key Question 3 and only low-quality evidence that interventions to change pre-operative psychosocial factors have clinically important effects on pre-operative status.

Table 4. Studies Presenting Pre-Operative Interventions Among Bariatric Surgery Candidates with Mental Health Conditions

Author, Year	Setting	Baseline Patient Characteristics	Intervention Description/ Comparators	Study Design	Outcomes Assessed (Instruments Used)/ Timing of Assessment	Findings	Risk of Bias Assessment
Kalarchian, 2013 ⁶⁸	large urban medical center, USA	Mean age: 45.2 Percent female: 86.7 Average BMI: 47.9 N=240	Behavioral lifestyle (on health benefits of decreasing calories and increasing physical activity) versus usual care (provided synopsis of same information) / pre-operative care as usual	RCT	Weight, Depression (BDI=Beck Depression Inventory score), Eating disorders (EDE=Eating Disorder Examination)/ 0 and 6 months	LIFESTYLE participants lost significantly more weight than those receiving USUAL CARE [8.3 +/- 7.8 kg vs 3.3 +/- 5.5 kg, F(1,183) = 23.6, P < 0.0001], with an effect size of 0.72 Lifestyle group- BDI- pre- 15.2(10.3), post- 11.8(8.8), Usual care group-pre-14.0(8.9), post- 11.0(8.7) there was a significant effect for time only for EDE subjective bulimic (P < 0.02), objective bulimic episodes (P < 0.0001), and BDI score (P < 0.0001), indicating that both groups improved over time.	Outcome: Low Allocation concealment: Unclear Blinding of participants and personnel: Unclear Blinding of outcome assessment: Unclear Incomplete outcome data: Low Selective reporting: Low Other bias: Low
Abiles, 2013 ⁸¹	one hospital in Spain	Mean age: 41 Percent female: 70 Average BMI: 49 N=110	3 month CBT program/ with or without binge-eating disorder	Pre-post intervention	Binge eating disorder (EDE-Q), Mood (Abbreviated Scale of Anxiety and Depression (GHQ)), QOL (QLI-sp), Weight/ before and after 3 month intervention and 12 months	Multivariate analysis demonstrated that CBT was effective to treat psychological comorbidity (depression, QOL, anxiety, self-esteem) regardless of the presence/ absence of BED or degree of obesity (P<.001 for all). At one yr post-CBT, weight loss versus baseline (before CTT) was > 10% in 61%, with no intergroup differences.	Outcome: Low Allocation concealment: Unclear Blinding of participants and personnel: Unclear Blinding of outcome assessment: Unclear Incomplete outcome data: Low Selective reporting: Low Other bias: Low

Ashton, 2013 ⁸⁴	academic medical center, USA, one site	Mean age: 46 Percent female: 67 Average BMI: 48, N=87	90-minute psycho-education and discussion about effects of substances and addictions after surgery	Pre-post intervention	knowledge of health effects of substances, Alcohol Use Disorders Identification Test-Consumption Items (AUDIT-C)	increased knowledge of negative effects of substance abuse after surgery ($X^2=42.3$; $P<.001$). Patients reported a lower intention of consuming alcohol after surgery ($X^2=16.2$; $P<.001$)	Outcome: Low Allocation concealment: High Blinding of participants and personnel: High Blinding of outcome assessment: High Incomplete outcome data: Low Selective reporting: Low Other bias: Low
Ashton, 2009 ⁸²	academic medical center, USA, one site	Mean age: 47 Percent female: 82 Average BMI: 34-129, median 49 N=243	brief 4-session cognitive behavioral group psychotherapy for binge eating/ pre-post design	Pre-post intervention	Binge eating disorder and binge eating episodes (structured clinical interview BES, questionnaire)/ after 4 week intervention (pre-surgery)	binge eating episodes decreased from 2.84 +/- 2.03 before intervention to 1.18 +/- 1.34 after intervention	Outcome: Low Allocation concealment: High Blinding of participants and personnel: High Blinding of outcome assessment: High Incomplete outcome data: Low Selective reporting: Low Other bias: Low
Wild 2011 ⁸³	Single, university center, Germany	Mean age: 48 Percent female: 70 Average BMI: 45.4 N=10	Thematic interventional group therapy 12 sessions at 2 week intervals focusing on motivation and psychosocial state. Goal to reduce depression	Pre-post intervention	QOL Anxiety Eating disorder (binge eating) Depression (SF-36, SF-12 PHQ-D)	Depression decreased pre to post treatment [12.8 (3.4) to 8.6 (5.8), difference CI (.5, 7.8)]. QOL improved [30.9 (10) to 40.7 (10.7) difference CI (-13.3, -6.4)] (only 10/16 completed the study)	Outcome: Low Allocation concealment: Low Blinding of participants and personnel: High Blinding of outcome assessment: High Incomplete outcome data: Low Selective reporting: Low Other bias: High

SUMMARY AND DISCUSSION

SUMMARY OF EVIDENCE BY KEY QUESTION

Key Question 1

Bariatric surgery candidates and those receiving surgery have depression, anxiety, and certain eating disorders (*eg*, binge eating) at rates equal to or exceeding 15%. Other mental health disorders, such as psychoses, are less frequent. Published prevalence estimates vary, particularly for depression and binge eating disorder. The few assessments done in Veteran populations found higher proportions of comorbidities than are present in other populations, particularly PTSD.

Key Question 2

There are conflicting data regarding the impact of mental health conditions on post-operative outcomes, including weight loss, mental health symptoms, quality of life, and suicide. The most consistent evidence suggests lower rates of depression, fewer symptoms of depression, and decreased usage of anti-depressant therapies after bariatric surgery. A causal role of bariatric surgery cannot be established with the existing studies. Aside from depression, only quality of life demonstrated consistent improvement across multiple studies, although the use of different scales and timelines complicates the evaluation. There is insufficient evidence to determine the relationship between pre-operative mental health conditions and post-operative weight loss outcomes.

Key Question 3

There were no studies that assessed the impact of a pre-operative intervention addressing mental health conditions on post-operative outcomes, such as surgical weight loss or the prevalence of the mental health disorders. Five low-quality studies reported pre-operative improvements in targeted mental health behaviors, as well as pre-operative physician-supervised weight loss before surgery and substance abuse, for bariatric surgery candidates.

LIMITATIONS

Publication Bias

We were not able to do a formal test of publication bias since we did not perform a quantitative analyses. However, publication bias is always likely to exist for subjects such as this, where prevalence data and association data are presumably present on a majority of patients receiving the procedure.

Study Quality

Most studies had limitations in their methods. These include an unclear method of enrolling participants, poor or unstated follow-up rate, and use of a pre-post design for studies of interventions. There are some notable exceptions, of course, such as the LABS-2 study, which probably provides the most rigorous evidence on variables included in that study, albeit in a selected sample. LABS-2 is a multi-site study with clear enrollment criteria, provides very detailed follow-up rate at multiple time points, and uses standardized measures to collect all data,

including comorbidities, quality of life, and mental health conditions, both pre-operatively and at regular time points following surgery.

Heterogeneity

The estimates for prevalence of mental health conditions and eating disorders vary, and most of this variation is unexplained. Hence, heterogeneity is a concern and lowers the confidence in conclusions.

Applicability of Findings to the VA Population

There are striking differences in the gender of patients assessed in VA compared to non-VA populations. From the limited VA studies that have been done, the prevalence of mental health conditions and eating disorders is higher than in non-VA populations. Therefore, generalizing results from the non-VA population to the VA population needs to be done with caution.

Other

We limited the scope of our evaluation to particular mental health conditions. However, other factors, such as cognitive functioning, temperament, socioeconomic status, and personality traits may also play a role in patient safety and success with bariatric surgery.

Binge eating disorder has undergone change in how it is defined, not existing formally as a psychiatric disorder until DSM-5, which appeared in 2013/2014. If the diagnosis was made by a scale, that was listed. However, if the diagnosis was made by interview, it is not always clear what criteria were used.

Mental health conditions were defined by the authors of the original studies and it was not always clear what types of disorders were included under diagnostic terms such as anxiety, depression and others. We were only able to specify according to the information given.

RESEARCH GAPS/FUTURE RESEARCH

In order to generate VA-relevant data, a more broadly-based data collection effort is needed among Veterans seeking bariatric surgery. This should include a sufficient number of sites to be representative of the diversity within the VA system, have clear eligibility criteria, use the same standardized instruments for classifying disorders, measure outcomes at regular intervals following surgery (*eg*, 3 months, 6 months, 12 months, 2 years, *etc*), and report the follow-up rate at each time point. For studies of associations, the addition of a control group would improve the ability to make causal inferences. The Swedish Obese Subjects study has shown that causal inferences are possible using non-randomized patients. Very careful attention to the selection of controls, as in the Swedish Obese Subjects study, is required. To assess the effectiveness of pre-operative interventions, randomized clinical trials are ideal.

One difficulty in comparing studies was the use of different measures, at separate sites, to diagnose mental health conditions. Future research should focus on determining the best methods of diagnosing these conditions and the VA should meet and decide which measures will be used across all VA sites.

More research into the severity or chronicity of mental health conditions is needed, as these were not usually reported but may contribute to the effect of mental health conditions on bariatric

outcomes. Specifically, more research is needed in both the VA and non-VA patients who may be seeking bariatric surgery. Long-term studies, beyond 2 years, on sustainability of the changes in response to interventions should be studied as well.

CONCLUSIONS

Mental health conditions and eating disorders are seen in rates exceeding 15% in bariatric surgery candidates and patients, in particular depression, anxiety, and binge eating disorders. Moderate quality evidence supports an association between bariatric surgery and lower rates of depression post-operatively. There is inconsistent evidence about the association of other mental health conditions and eating disorders on subsequent post-operative outcomes. There are no studies assessing the effect of pre-operative interventions aimed at mental health conditions or eating disorders. There is insufficient evidence to recommend for or against routine specialized pre-operative mental health screening in bariatric surgery candidates in addition to the existing general evaluation by the surgical and/or medical bariatric team. More research is needed to determine the optimal screening process and helpful interventions to address mental health and eating disorders in bariatric surgery candidates. Likewise, research is needed to better define the optimal mental health evaluations needed for clearance for bariatric surgery.

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APPENDIX A. SEARCH STRATEGIES

BARIATRIC SURGERY – MALADAPTIVE EATING (From Livhits and colleagues)

SEARCH METHODOLOGY

SEARCH #1:

DATABASE SEARCHED & TIME PERIOD COVERED:

PubMed -10/1/2009-12/6/2013

LANGUAGE:

English

SEARCH STRATEGY:

[bariatric OR obesity/su OR (obesity AND (surgery OR surgical OR operation OR pre-operation)) OR (obese OR (weight AND reduce) OR (weight AND reducing) OR (weight AND reduction) OR weight-reducing OR (decreas* AND weight) OR "weight loss" OR (weight AND lost) OR overweight) AND (surgery OR surgical OR operation OR pre-operation)) OR gastric band* OR gastric bypass OR stomach bypass OR (laparoscop* AND band) OR (laparoscop* AND bands) OR (laparoscop* AND banding) OR lapband* OR "lap band" OR "lap bands" OR "lap banding" OR gastrectom* sleeve* OR sleeve gastrectom* OR biliopancreatic bypass OR duodenal switch* OR duodenum switch* OR biliopancreatic diver* OR gastroplasty OR gastric restrict*

AND

"adaptation, psychological" OR psychology OR psychological OR psychiatry OR psychiatric OR mental illness OR mentally ill OR binge eating" OR bulimia OR bulimic OR eating disorder* OR feeding behavio* OR eating behavio* OR maladaptive eating OR "portion size" OR "sweet eater" OR "volume eater"

NUMBER OF RESULTS: 1127

TOTAL AFTER FILTERING IN ENDNOTE TO REMOVE ANIMAL-ONLY STUDIES AND NON-RELEVANT MATERIAL (ARTICLES NOT RELATING TO BARIATRIC SURGERY OR OBESITY): 462

Search updated on 8/13/2014, number of results: 230

SEARCH #2:

DATABASE SEARCHED & TIME PERIOD COVERED:

PubMed -10/1/2009-12/6/2013

LANGUAGE:

English

SEARCH STRATEGY:

[bariatric OR obesity/su OR (obesity AND (surgery OR surgical OR operation OR pre-operation))

OR

gastric band* OR gastric bypass OR stomach bypass OR (laparoscop* AND band) OR (laparoscop* AND bands) OR (laparoscop* AND banding) OR lapband* OR "lap band" OR "lap bands" OR "lap banding" OR gastrectom* sleeve* OR sleeve gastrectom* OR biliopancreatic bypass OR duodenal switch* OR duodenum switch* OR biliopancreatic diver* OR gastroplasty OR gastric restrict*]

AND

"adaptation, psychological" OR psychology OR psychological OR psychiatry OR psychiatric OR mental illness OR mentally ill OR binge eating" OR bulimia OR bulimic OR eating disorder* OR feeding behavio* OR eating behavio* OR maladaptive eating OR "portion size" OR "sweet eater" OR "volume eater"

AND

predict* or pre-surgical or pre-surgery or presurgery or presurgical or candidate*

NUMBER OF RESULTS: 217

**TOTAL AFTER FILTERING IN ENDNOTE TO REMOVE ANIMAL-ONLY STUDIES:
172**

Search updated on 8/13/2014, number of results: 53

SEARCH #3:

DATABASE SEARCHED & TIME PERIOD COVERED:

MEDLINE ON OVID -1/1/2009-2014

LANGUAGE:

English

SEARCH STRATEGY:

obese or obesity or (weight adj3 reduce) or (weight adj3 reducing) or (weight adj3 reduction) or weight-reducing or (decreas* adj3 weight) or "weight loss" or (weight adj3 lost) or overweight)
IN ALL FIELDS

AND

surgery or surgical or operation or pre-operation or pre-operative or presurgery or presurgical or pre-surgery or pre-surgical (((obese or obesity) adj3 surgery) or surgical) IN ALL FIELDS

OR

gastric band* or "gastric bypass" or "stomach bypass" or laparoscop*) adj3 band) or laparoscop*) adj3 bands) or laparoscop*) adj3 banding) or lapband* or "lap band" or "lap bands" or "lap banding") OR

(gastrectom* adj3 sleeve*) or (sleeve adj3 gastrectom*) or (biliopancreatic adj3 bypass) or (duodenal adj3 switch*) or (duodenum adj3 switch*) or (biliopancreatic adj3 diver*) or gastroplasty or (gastric adj3 restrict*) OR bariatric OR ((obese or obesity) adj3 surgery or surgical) IN ALL FIELDS

AND

"adaptation, psychological" or psychology or psychological or psychiatry or psychiatric or mental illness or mentally ill OR (binge adj3 eating) or bulimia or bulimic or (eating adj3 disorder*) or (feeding adj3 behavio*) or (eating adj3 behavio*) or (maladaptive adj3 eating) or "portion size" or "sweet eater" or "volume eater" IN ALL FIELDS

AND

(predict* or pre-surgical or pre-surgery or presurgery or presurgical or candidate*).mp.
[mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier]

NUMBER OF RESULTS: 1030

NUMBER AFTER INTERNAL DUPLICATE REMOVAL: 911

TOTAL AFTER REMOVAL OF DUPLICATES WITH PUBMED SEARCHES, ALONG WITH ANIMAL-ONLY STUDIES AND NON-RELEVANT MATERIAL: 40

Search updated on 8/14/2014, number of results: 92

SEARCH #4:

DATABASE SEARCHED & TIME PERIOD COVERED:

PsycINFO - 10/1/2009-12/10/2013

LANGUAGE:

English

SEARCH STRATEGY:

bariatric OR obese OR obesity OR (weight AND reduce) OR (weight AND reducing) OR (weight AND reduction) OR weight-reducing OR (decreas* AND weight) OR "weight loss" OR

(weight AND lost) OR overweight) AND (surgery OR surgical OR operation OR pre-operation OR pre-surgical or pre-surgery or presurgery or presurgical)) OR (gastric band* OR gastric bypass OR stomach bypass OR (laparoscop* AND band) OR (laparoscop* AND bands) OR (laparoscop* AND banding) OR lapband* OR "lap band" OR "lap bands" OR "lap banding" OR gastrectom* sleeve* OR sleeve gastrectom* OR biliopancreatic bypass OR duodenal switch* OR duodenum switch* OR biliopancreatic diver* OR gastroplasty OR gastric restrict*

AND

predict* OR candidate*

NUMBER OF RESULTS: 178

**NUMBER AFTER REMOVAL OF DUPLICATES, ANIMAL-ONLY STUDIES AND
NON-RELEVANT MATERIAL: 78**

Search updated on 8/14/2014, number of results: 21

BARIATRIC SURGERY – PSYCHIATRIC DISORDERS (From Livhits and colleagues)

SEARCH METHODOLOGY

DATABASE SEARCHED & TIME PERIOD COVERED:

PubMed – 10/1/2009-12/11/2013

LANGUAGE:

English

SEARCH STRATEGY:

gastric band* OR gastric bypass OR stomach bypass OR (laparoscop* AND band) OR (laparoscop* AND bands) OR (laparoscop* AND banding) OR lapband* OR "lap band" OR "lap bands" OR "lap banding" OR gastrectom* sleeve* OR sleeve gastrectom* OR biliopancreatic bypass OR duodenal switch* OR duodenum switch* OR biliopancreatic diver* OR gastroplasty OR gastric restrict*

OR

bariatric OR obesity/su OR (obesity[ti] AND (surgery OR surgical OR operation OR pre-operation OR pre-operative OR pre-surgical or pre-surgery or presurgery or presurgical))

OR

(obese[ti] OR (weight AND reduce) OR (weight AND reducing) OR (weight AND reduction) OR weight-reducing OR (decreas* AND weight) OR "weight loss" OR (weight AND lost) OR overweight) AND (surgery OR surgical OR operation OR pre-operation)

AND

“Adjustment Disorders” [Mesh] OR adjustment[tiab] OR “Affective Disorders, Psychotic” [Mesh] OR affective disorder*[tiab] OR psychotic[tiab] OR psychosis[tiab] OR “Bipolar

Disorder" [Mesh] OR bipolar[tiab] OR counsel*[tiab] OR "Depression" [Mesh] OR depression[tiab] OR depressive[tiab] OR "Depression, Chemical" [Mesh] OR "Depressive Disorder" [Mesh] OR "Depressive Disorder, Major" [Mesh] OR "Dysthymic Disorder" [Mesh] OR dysthymic OR "Psychiatric Counseling" OR "Psychiatric evaluation" OR "Seasonal Affective Disorder" [Mesh] OR "seasonal affective disorder" OR psychopatholog*

NUMBER OF RESULTS: 680

NUMBER AFTER REMOVAL OF DUPLICATES WITH MALADAPTIVE EATING SEARCHES: 473

NUMBER AFTER MANUAL FILTERING IN ENDNOTE TO REMOVE ANIMAL-ONLY STUDIES & NON-RELEVANT MATERIAL: 108

Search updated 8/15/2014, number of results: 174

TARGETED PSYCHOLOGICAL LITERATURE DATABASE SEARCH

SEARCH METHODOLOGY

DATABASE SEARCHED & TIME PERIOD COVERED:

PsycINFO – 1/1/2009-12/12/2013

LANGUAGE:

English

SEARCH STRATEGY:

gastric band* OR gastric bypass OR stomach bypass OR (laparoscop* AND band) OR (laparoscop* AND bands) OR (laparoscop* AND banding) OR lapband* OR "lap band" OR "lap bands" OR "lap banding" OR gastrectom* sleeve* OR sleeve gastrectom* OR biliopancreatic bypass OR duodenal switch* OR duodenum switch* OR biliopancreatic diver* OR gastroplasty OR gastric restrict*

OR

(bariatric OR obese OR obesity OR (weight AND reduce) OR (weight AND reducing) OR (weight AND reduction) OR weight-reducing OR (decreas* AND weight) OR "weight loss" OR (weight AND lost) OR overweight) AND (surgery OR surgical OR operation OR pre-operation OR pre-surgical or pre-surgery or presurgery or presurgical)

AND

psychopatholog* OR adjustment OR affective OR psychotic OR psychosis OR bipolar OR counsel* OR depression OR depressive OR dysthymic OR "Psychiatric Counseling" OR "Psychiatric evaluation" OR "seasonal affective disorder"

Search modes - Find all search terms

NUMBER OF RESULTS: 205

**NUMBER OF RESULTS AFTER MANUAL FILTERING IN ENDNOTE TO REMOVE
DUPLICATES, ANIMAL-ONLY STUDIES AND NON-RELEVANT MATERIAL: 55**

Search updated 8/15/2014, number of results: 23

RELATED ARTICLE SEARCH FOR MALIK AND COLLEAGUES' KEY ARTICLE

DATABASE SEARCHED & TIME PERIOD COVERED:

PubMed– 1/1/1990-12/12/2013

LANGUAGE:

English

SEARCH STRATEGY:

“RELATED ARTICLES” SEARCH ON THE FOLLOWING REFERENCE:

S. Malik, J. E. Mitchell, S. Engel, R. Crosby and S. Wonderlich (2013). "Psychopathology in bariatric surgery candidates: A review of studies using structured diagnostic interviews." *Compr Psychiatry*. Oct 24

Search updated 8/15/2014, number of results: 3

APPENDIX B. STUDY SELECTION

Question	Answer
Study Design	Randomized clinical trial
	Controlled clinical trial
	Case series ≥ 10 subjects
	Other (specify)
	<i>Case series < 10 subjects (STOP)</i>
	<i>Other kind of review (commentary, editorial non-systematic review, etc) (STOP)</i>
	<i>Systematic review/Meta-analysis (STOP)</i>
Does article study bariatric surgery? (check all that apply)	Bariatric surgery candidates
	Gastric bypass
	Adjustable banding
	Biliopancreatic diversion
	Vertical banded gastroplasty
	Banded gastric bypass
	Sleeve gastrectomy
	Mix of common bariatric surgeries
	Other bariatric surgery, NOS
	<i>Other bariatric surgeries (STOP)</i>
	<i>Not bariatric surgery (STOP)</i>
Are data presented on patients with BMI ≥ 35 ?	Yes
	<i>No (STOP)</i>
What is the number of sites included in the study?	1
	2
	3
	4
	Other (specify)
What is the (approximate) sample size?	10-50
	51-150
	151-500

	>500
	Not reported
Does the sample specifically include Veterans?	Yes
	No
Is the purpose of the study to: (check all that apply)	Report prevalence of psychological or other conditions
	Report associations between pre- Operative characteristics and post- operative outcomes
	Report results of an intervention to improve pre-operative status
	Test instrument for psychiatric Screening of bariatric candidates
	<i>Other (STOP)</i>
If the study is about prevalence, what percentage of subjects received surgery?	100%
	Other % (specify)
	Not stated
What domains of pre-operative comorbidities or conditions are measured? (Check all that apply)	Mood disorders (depression, bipolar, <i>etc</i>)
	Anxiety disorders (anxiety, OCD, PTSD)
	Personality disorders (Axis 2 disorders, borderline, schizotypal, narcissistic, histrionic, <i>etc</i>)
	Sexual abuse
	Substance abuse
	Psychotic disorders
	ADHD
	MMPI or subscales
	Other psychiatric disorders (specify)
	Maladaptive eating
	Self-esteem
	Cognitive dysfunction (dementia, developmental delay/ mental retardation, unspecified memory issues)
	Other mental health traits (specify)
	Non-psychiatric comorbidities (diabetes, <i>etc</i>)
	Quality of life
Mandatory pre-operative weight loss	

What post-operative outcomes are reported?	N/A this is not a study that includes post-operative outcomes
	Weight, BMI
	Psychiatric conditions
	Suicide
	Substance abuse
	Quality of life
	Eating patterns
	Other (specify)

APPENDIX C. PEER REVIEW COMMENTS/AUTHOR RESPONSES

Page # Section	Comment	Response
Executive Summary		
Page 1 Executive Summary	In the executive summary on page 1, it would be helpful to include a brief definition of bariatric surgeries.	We have included brief descriptions.
Page 2 Executive Summary	On p. 2, line 14, it would be helpful to add a brief explanation of the Cochrane Risk of Bias Tool.	We have added a brief explanation.
Page 1 Executive Summary	On page 1 under Methods, state the years (Oct 2009-Dec 2013) for which you did the updated search. That will provide readers a clear sense upfront.	We have added dates for the updated search.
Page 3 Executive Summary	On page 3, the 7% rate of substance abuse disorders is for any disorder? Might want to state that SUD is broad in this consideration.	We have added a sentence to clarify this.
Page 3 Executive Summary	(summary of KQ2 results): It would be useful to state weight loss at X months to reinforce the point that there is very little evidence and all of it is on short-term outcomes	We have clarified that measurements took place at one year and 4 years.
Page 4 Executive Summary	(discussion): It would be worth stating the specific number of veterans examined in the single-site VA studies in sentence: "all estimates for Veterans are judged low due to the small number of patients that have been assessed."	Changed as suggested.
Page 4 Executive Summary	(discussion): The statement "Concurrent depression at the time of surgery may negatively impact weight loss outcomes, especially in the long term." Should drop the "long term" statement since there are no studies of long-term weight change from US	Corrected.
Introduction		
Page 6 Intro	Evidence Report Introduction; Page 6. Suggest updating references regarding recommendations for Bariatric Surgery to include the newly released VA/DoD Clinical Practice Guideline (CPG) for Screening and Management of Overweight and Obesity (http://www.healthquality.va.gov/guidelines/CD/obesity/), as well as the recently published AHA/ACC/TOC Guideline (Jensen MD, Ryan DH, Apovian CM, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: A report of the American College of Cardiology/American Heart Association task force on practice guidelines and the Obesity Society. J Am Coll Cardiol. Nov 7 2013), both of which include recommendations for considering bariatric surgery that are similar to the NHLBI Guideline cited in the report.	We have added references to these guidelines.
Intro	The report states that the reason for screening for psychiatric disorders in the preoperative assessment is "to select patients with the highest likelihood of success." However, no robust predictors of success following bariatric surgery have been identified. Most teams requiring psychological clearance for bariatric surgery do so for reasons relating to patient safety rather than gatekeeping. For example, the preoperative psychiatric evaluation can be used to screen for	We have revised this sentence to clarify the potential reasons for pre-operative screening, including issues with compliance and patient safety.

	current severe or uncontrolled psychopathology, inability to provide informed consent, or history of noncompliance that could interfere with the postoperative regimen. Additionally, screening for a history of substance abuse or dependence may be important in light of a growing body of evidence that alcohol problems may worsen for patients with a history of problems, especially after gastric bypass. I recommend consulting the literature on preoperative screening in bariatric surgery and presenting a more detailed and complete description of why preoperative psychiatric evaluations are utilized.	
Page 6 Intro	In the introduction, on page 6, line 13-14, there is a notable gap on information on the BMI range of 30-40 kg/m2. Behavioral modification is routinely used in this range, corresponding to class I and II obesity.	We have added a sentence on the treatment of class I and II obesity.
Page 6 Intro	(intro, end of 2nd paragraph): Might be worth stating that “concerns remain about the durability of the improvements and the risks of surgery” because outcomes beyond 5 years are largely unknown for US-based samples. The lack of long-term outcomes is problematic and the basis for a new RFA from NIDDK & NIDA.	Changed as suggested.
Intro	May help to clarify the definition of a bariatric candidate in the introduction (<i>eg</i> , patients evaluated for surgery versus receiving surgery or both), as this may vary across studies.	We added a clarification of the term “candidates.”
Methods		
Page 23 Methods	The selection criteria are not sufficiently justified and some studies included do not appear to meet the criteria. For example, Kalarchian et al. (2013) is included in Table 1, page 23, yet this study reports mean BDI scores, but not actual prevalence data (p. 2, line 2).	We included studies using a scale to measure mental health conditions only when a specific cut-off value was stated in the text (<i>ie</i> , depression was defined as patients with a BDI>10). This has been clarified in the methods section.
Methods	Criterion 2, a threshold of 500 patients, seems to be particularly high for the bariatric surgery literature. This cutoff may miss several studies recognized for high quality psychiatric assessments in this patient population [Rosenberger et al. (2006) n = 174; Kalarchian et al. (2007) n = 288; Mauri et al. (2008) n= 282; and Mühlhans et al. (2009) n = 146].	Based on this suggestion we expanded our threshold to include studies with data from 200 or more patients. This generated an additional 8 studies for KQ1 and 4 studies for KQ2. The median estimates of the prevalence of mental health conditions were unchanged by the inclusion of the additional studies, and therefore we are confident that any additional relaxation of the sample size threshold would not change the results.
Page 13 Methods	Criterion 3 initially specifies data from “clinical trials,” but p. 13 refers to “RCTs”, which is a related, but different concept. For example, on page 20, the Longitudinal Assessment of Bariatric Surgery (LABS) study is included. LABS is a clinical trial, but not an RCT.	We added language to clarify that clinical trials could include studies with random or non-random patient assignment.
Page 1 Methods	The report body states PsycINFO was searched on p. 1 line 31, but later specifies MEDLINE, OVID, <i>etc</i>	Corrected
Page 2 Methods	Some of the language describing the methods is awkward. For example, p. 2, “...study had to report post-operative assessments of an included outcome.”	Corrected
Page 8	And on page 8, “Studies had to report actual prevalence data and not simply scores on a sale.”	We added language to the methods to clarify

Methods	Also on p. 8, reference to “the Structured Clinical Interview” is unclear whether this means any structured clinical interview or the Structured Clinical Interview for DSM (SCID).	when scores were used in calculating the prevalence of mental health conditions. We also separated studies using the “SCID” from those using other types of “clinical interview.”
Page 7 Methods	(end of topic development): “out” should be “our”, I think.	Corrected
Page 7 Methods	(end of topic dev): Is there value in defining what is included in the general category of SUD?	This was clarified as mentioned above.
Page 8 Methods	(data abstract): What study design abstracted? If so, please say so in detail.	Study design was abstracted and is included in Appendix B. We have added language to clarify this.
Page 9 Methods	(quality assessment): Not a problem that you can solve, but the Cochrane Risk of Bias tool deals largely with design criteria of RCTs, not with design criteria of non-randomized studies. So, can’t differentiate high quality observational studies from low quality observational studies. Might note that here.	We clarified the purpose and limitations of the Risk of Bias tool. While we understand its primary role in RCTs, we believe that a number of its criteria (eg, outcomes, confounders) may reasonably be applied to non-randomized interventions.
Page 7 Methods	Line 35- The description of the search result is somewhat odd. Too much emphasis is given to it being based on a publication by Livhits et al. This publication is in a journal known to have limited editorial quality (Obesity Surgery). The way the search methodology is presented, it seems like the search was subordinate to this rather minor publication. It would be better to present the search strategy as is done for most systematic reviews with a general description of the search strategy including naming all the databases searched and a brief description of the major search terms. If the search was somehow supplemented by references found in Livhits paper, this should be discussed after describing the overall search strategy. It is also unclear how the Livhits search differs from that of this review such that many more articles were found for this review than Livhits found.	We have clarified our search strategy in the methods section, including explicitly stating the role of other reviews (eg, Livhits et al.) and input from clinical experts.
Page 7 Methods	Line 37-The average reader will not know what ‘reference mined’ means.	Clarified.
Page 8 Methods	Line 2 – Specify what databases were searched. Only PsychInfo is named.	Clarified
Page 12 Methods	It is not clear from the search methodology section why the Livhits search results are different than the main search strategy. If the Livhits review yielded articles not found with the initial search and 3 papers were identified by experts that were missing, was the initial search strategy deficient? If so, should it be re-run such that it yields all these papers and more?	This has been clarified as mentioned above. We believe the Livhits search and selection criteria were sufficient. The three articles in questions were all suggested by one TEP member and all were more recent (published in 2014) than our original search (ended in December 2013). We identified and included these studies in our updated search (Dec

		2013-Aug 2014).
Page 7 Methods	It would make sense to exclude “grazing” and “cognitive restraint” (page 7, line 31-32) since these have not been adequately studied, but none-the-less may be important and I would state this.	We have clarified that, while important, other psychosocial predictors of bariatric surgery outcomes were outside our scope of analysis.
Results		
Page 2 KQ 1	On p. 2 and at other places in the report, it would be helpful to delineate the percentages of eating disorder by subtype (<i>eg</i> , anorexia nervosa, bulimia, etc).	Clarified
Page 17 KQ 1	On p. 17, Legenbauer (2011) is referenced but the term “anoxia” is used and this appears to have been “anorexia.”	Corrected.
KQ 2	On p. 29-31, KQ 2 references are not made to psychosis – were there any particular findings related to psychosis and relationship to bariatric surgery outcomes?	We have added all available information on psychosis to the results section as well as a statement regarding possible bias due to the frequent exclusion of these patients from bariatric surgery studies to our limitations section.
KQ 3	The 4 studies that were selected to address this question are not summarized concisely and are characterized as low quality, yet one of the studies is an NIH funded trial. Also may wish to consider Leahey et al. (2009), which includes a subset of preoperative and/or Brandenburg & Kotlowski (2005).	We have edited the text to better summarize our results. We reviewed both suggested articles, however, neither met criteria for inclusion as we only considered pre-operative interventions targeting a mental health condition.
Page 13 KQ 1	(KQ1): 1st and 3rd bullets outlining studies considered, want to consider adding “regardless of sample size” to the end of each description?	Corrected.
Page 15 KQ 1	(last study summarized): Need to add cite about study of 25 San Diego VA patients.	Added.
Page 29 KQ 2	Cites 50&51 in the 1st paragraph don’t seem like the right citations.	These have been checked and appear to be correct.
Page 29 KQ 2	Note specifically in each study whether depression was assessed via SCID, BDI, Dx or Rx. Be consistent.	We have specified the method used to assess mental health conditions, including depression, in Table 2. We have also included a reference to this in the text.
Page 29 KQ 2	For cite 56, change 93% and 87% to change in % with depression to be consistent with statement of depression rates after surgery as in cite 25 above.	Corrected.
Page 29 KQ 2	(KQ2 summary): I think this section would benefit from 3 subheadings of: 1) Impact of Bariatric Surgery on Psychiatric Disorders, 2) Impact of Baseline Psychiatric Disorders on Post-surgical Weight change, 3) Impact of Baseline Psychiatric Disorders on Other Post-surgical Outcomes (quality of life, suicide, <i>etc</i>). This would clearly differentiate the different types of studies reviewed into specific sub-questions and enable one to understand the main points of each subgroup of studies. As currently organized, a reader has to work very hard to understand these	Thank you for this suggestion. We have reorganized the results section using these headings.

	<p>different threads and might miss 2 important but distinct points:</p> <ol style="list-style-type: none"> 1) Bariatric surgery appears to improve post-surgical psychiatric disorders with most evidence on depression 2) Not clear how baseline psychiatric disorders impact post-surgical weight change and post-surgical outcomes of other sorts 	
Page 31 KQ 2	(KQ2 quality of evidence): can you state briefly what design improvements (particularly for non-randomized studies) would make the quality of studies better? For example, control groups, measurement via SCID as ideal but validated instruments as 2nd best	We added this information to the future research section.
Page 37 KQ 3	(KQ3): The intro 2 sentences are very confusing. As written, the interventions described in the 2nd sentence appear to map to the types of studies sought in the 1st sentence. I think the confusion arises in the vagueness in sentence 1 about which specific “post-operative outcomes” were of interest (I guessed from later reading that WEIGHT) is the relevant post-operative outcome that was of interest. If so, please say that here. Then, state in sentence 2 what post-operative outcomes these 4 studies actually assessed, which appears to be psychiatric disorders (NOT weight).	Corrected
Page 38 KQ 3	Should the study by Wild be included given that there were only 10 patients and no control group?	Due to the general lack of intervention studies meeting our criteria, we elected to be more inclusive of smaller studies for this section. We included this study in particular because of the intensity and length of the intervention.
Page 4 KQ 2 Summary	Line 28-What is meant by ‘concurrent’ depression?	Removed.
Page 13 KQ 1	Line 25 – The data are presented for individual diagnoses but some patients probably have many concurrent mental health disorders. It is important to know what fraction of patients undergoing bariatric surgery have any psych disorder. This would provide a better estimate for the magnitude of the problem. Even though this review is inconclusive, mental health disorders are common in bariatric surgery patients and this must be accounted for in policy planning. If the fraction is very high, it will suggest an urgent need to better understand the relationship between mental health disorders and bariatric surgery.	Thank you for this suggestion. We have now included estimates in Key Question 1 with any mood disorder and included “any” mental health condition in the Key Question synthesis.
KQ 2	A major question physicians have who take care of these patients is what the relationship is between preoperative MH disorders and post-operative weight loss. Apparently, the review did not find enough evidence about this question. To highlight this findings, a simple declarative statement such as ‘Our systematic review found insufficient evidence to determine the relationship between preoperative MH disorders and postoperative weight loss outcomes’ should be included. It is important to call this out. This reviewer practiced bariatric surgery in a region where the CMS carrier specifically barred bariatric surgery in patients with any evidence of prior MH treatments or disorders. The current review has the potential for countermanding such policies that have no evidence base to support them.	Changed as suggested. We also added a heading to summarize the evidence regarding the relationship between mental health conditions and weight loss in the results section of KQ2.
Page 31 KQ 2	Summary of findings- this is not well written. A great deal of passive language is used. Consequently, the results are difficult to grasp. It would be best to clearly state where there were	Corrected.

	positive associations, then negative associations and then what relationships were indeterminate. If there were no clear positive or negative associations, clearly state that.	
Page 29 KQ 2	Key Question 2, one of the studies (50) is discussed. My understanding is that the results of (50) indicated that psychiatric diagnoses did not predict 1 year WL totals, but number of psychiatric diagnoses predicted WL after 1 year. Patients with 2 or more psych conditions were 6 x more likely to either not lose weight or regain weight than those with no psychiatric diagnoses. However, on page 29, these findings are not mentioned, and yet they have a bearing on Key Question 2.	This article was re-reviewed, but no additional data were available for inclusion.
Page 3 KQ 2	Line 20 and later in the text you refer to the studies addressing suicide, and only reference the study from Pennsylvania. There are suicide data, however, in both the Ted Adams reports that you have referenced. You concentrated on other variables but you might wish to mine those studies for the suicide data as well.	Thank you for this suggestion. We were unable to find relevant data in Adams et al. 2010, but have added data from Adams et al. 2012 to our results.
Page 26 KQ 1 Fig 2	I found the graphic on page 26 a little hard to understand although I was able to figure it out. Also it isn't clear what you mean by "suicide"; successful suicide, attempt, successful attempt? Please clarify.	Clarified.
Page 30 KQ 2	Another issue that comes up on page 30 (line not shown) is the issue of "current and lifetime". This is the only place it was addressed as far as I can tell, and these are issues that need to be clarified. My assumption is that most of what you are interested in is "current", but this could be in error.	We have added language to clarify this issue. We used "current" data when both "current" and "lifetime" data were available, and made the assumption that data presented without description are "current" prevalence.
Conclusion		
Summary Discussion	Yes, it would be helpful to clearly delineate implications for surgeons and mental health providers in the conclusion. For example, while the findings currently do not support recommending for or against pre-surgical mental health evaluations for bariatric surgical candidates, it does confirm that mental health disorders are common in this population. Thus providing potential options for care to meet the mental health needs of these Veterans may be helpful. It would also be helpful to make suggestions for further VA research study related to the utilization of mental health evaluations for clearance for bariatric surgeries.	We have added language to the discussion to reflect the implications of our findings on clinical providers.
Summary Discussion	Though the updated VA/DOD CPG had not yet been released when this ESP was conducted, it will be valuable to refer to the CPG and, in the implications section, discuss if and how the findings of the ESP support the current CPG recommendations. The CPG includes the following recommendation for all patients who are overweight or obese, based on Expert Opinion, "Perform a targeted assessment on overweight and obese patients. In addition to the basic medical history and physical examination, assess for factors contributing to obesity." This recommendation also applies to candidates for Bariatric Surgery. The text accompanying this recommendation suggests including an assessment of current and past psychiatric history (including substance abuse and disordered eating), and assessment of medications, including psychiatric medications, that may be contributing to obesity. In addition, the VA/DoD CPG also recommends, in the section on Bariatric Surgery	Added as described above.

	<p>recommendations:</p> <ul style="list-style-type: none"> Engage all patients who are candidates for bariatric surgery in a general discussion of the benefits and potential risks. If more detailed information is requested by the patient to assist in the decision-making process, a consultation with a bariatric surgical team should occur. [EO] Provide lifelong follow-up after bariatric surgery to monitor adverse effects and complications, dietary restrictions, adherence to weight management behaviors, and psychological health. [EO] <p>Though these are EO recommendations, it would be useful to mention them and/or refer to them in the implementation section. Appendix K of the CPG Guideline offers more discussion on the risks and benefits of Bariatric Surgery (see pages 148 – 153), including risks associated with disordered eating, depression, risky alcohol use and suicide. The discussion in Appendix K notes, “although often required preoperatively, no evidence supports routine preoperative assessment by mental health providers. [267,268] As with all general surgical procedures, a complete history and physical is required and the preoperative evaluation should include a review of the assessment elements noted in the Screening and Assessment section of this CPG. This includes identification of problematic eating patterns that may require further assessment or management. “The section on suicide risk (pg. 152) concludes, “Nonetheless, because depression is not uncommon after bariatric surgery, increased vigilance for suicidal ideation and other risk factors for suicide (eg, alcohol and other substance use disorder) is warranted. [280,281]”</p> <p>In our opinion, the ESP findings support these EO recommendations and suggestions in the text. If the researchers agree, a statement to this effect in the implications section would be quite valuable.</p> <p>Note also, the VA/DoD CPG also made recommendations for future research, which included addressing the following questions:</p> <ul style="list-style-type: none"> Are there individual differences that predict response to comprehensive lifestyle intervention, a specific pharmacotherapy, or a specific bariatric procedure? How should a clinician prioritize choice of intervention based on presence of specific obesity-associated conditions? <p>Again, there is alignment with the ESP Report!</p>	
<p>Page 42 Summary Discussion</p>	<p>There are also some areas where more supporting information is needed. For example, bottom of page 42, LABS is cited as a study of exceptionally high quality without explanation as to why. If that information does not appear anywhere else in the report it should be added. Some conclusions would benefit from additional support or referencing, such as the statement that, “Concurrent depression at the time of surgery may negatively impact weight loss outcomes, especially in the long-term.” And the information on research gaps and future research is relatively underdeveloped.</p>	<p>We have added the characteristics of LABS-2 that separate it from many of the other studies, namely its multi-site nature, clear eligibility criteria, standardized assessments of mental health conditions, and clear follow-up rate. We have removed the statement regarding depression and long-term weight loss as we believe our updated evidence does not support this claim.</p>
<p>Page 43 Summary</p>	<p>The report notes that the demographics including gender of patients in the VA may differ from the samples of bariatric surgery patients. It would help to provide any VA demographic data that may</p>	<p>We have added language clarifying potential differences between VA and non-VA</p>

Discussion	be available. Consider adding increased emphasis that some psychiatric disorders vary significantly in prevalence by gender (<i>eg</i> , mood, substance).	samples. Unfortunately, there is insufficient demographic data to formally compare the populations or to estimate the impact on the prevalence of mental health conditions (<i>eg</i> , Veterans may have different rates of mental health conditions because they are predominantly male, however, the relationship between mental health and gender in the larger population may not hold among Veterans due to the influence of other demographic and experiential factors). Instead, we chose to include this as a limitation.
Page 42 Summary Discussion	(summary of KQ1): A 25% rate of depression is reasonably called “common”, but 1-16% rates of psychosis to eating disorders do not seem well described by the word “common”. Maybe refer to depression as common and the others as less common or something. Also, note that VA studies were small samples and single site studies. Same suggestion for Conclusions on page 43.	Corrected.
Page 42 Summary Discussion	(summary of KQ3): Want to state that there were no studies that assessed “post-operative WEIGHT CHANGE outcomes following bariatric surgery...”	Corrected
Page 42 Summary Discussion	(publication bias): First sentence was confusing.	Corrected
Page 42 Summary Discussion	‘publication bias – should this read ‘since we did NOT do A quantitative... ‘	Corrected.
Summary Discussion	Please generalize the conclusion to include the need to better understand these issues in all populations and not just veterans. I recognize that this report was commissioned by the VA but it relied mostly on non-VA data. This reflects that the vast majority of bariatric surgery occurs outside the VA. To be useful, the report should call for more research in both VA and non-VA populations.	Changed as suggested.
References to Check		
References to Check	Zimmerman M1, Francione-Witt C, Chelminski I, Young D, Boerescu D, Attiullah N, Pohl D, Roye GD, Harrington DT. Presurgical psychiatric evaluations of candidates for bariatric surgery, part 1: reliability and reasons for and frequency of exclusion. J Clin Psychiatry. 2007 Oct;68(10):1557-62.	This citation was excluded for its small sample size.
References to Check	de Zwaan M, Enderle J, Wagner S, et al. Anxiety and depression in bariatric surgery patients: a prospective, follow-up study using structured clinical interviews. Journal of affective disorders. Sep 2011;133(1-2):61-68	This citation was excluded for its small sample size.
References	Kalarchian MA, Marcus MD, Levine MD, Soulakova JN, Courcoulas AP, Wisinski MS.	This citation was excluded for its small

to Check	Relationship of psychiatric disorders to 6-month outcomes after gastric bypass. <i>Surg Obes Relat Dis.</i> Jul-Aug 2008;4(4):544-549	sample size.
References to Check	Odom J, Zalesin KC, Washington TL, et al. Behavioral predictors of weight regain after bariatric surgery. <i>Obes Surg.</i> Mar 2010;20(3):349-356	This article is now included in Key Question 2 after we reduced the sample size restriction on consecutive or random samples to 200.
References to Check	Legenbauer T, Petrak F, de Zwaan M, Herpertz S. Influence of depressive and eating disorders on short- and long-term course of weight after surgical and nonsurgical weight loss treatment. <i>Comprehensive psychiatry.</i> May-Jun 2011;52(3):301-311	This reference was included in the report.
References to Check	Dixon JB, Dixon ME, O'Brien PE. Depression in association with severe obesity: changes with weight loss. <i>Arch Intern Med.</i> Sep 22 2003;163(17):2058-2065	This article is now included in Key Questions 1 and 2 after we reduced the sample size restriction on consecutive or random samples to 200.
References to Check	Heinberg LJ, Ashton K. History of substance abuse relates to improved postbariatric body mass index outcomes. <i>Surg Obes Relat Dis.</i> Jul-Aug 2010;6(4):417-421	This citation was excluded for its small sample size.
References to Check	Consider the following as possible additional information concerning binge eating in bariatric population. I believe this review cites a number of additional studies beyond those cited in the current synthesis. Niego SH, Kofman MD, Weiss JJ, Geliebter A. Binge eating in the bariatric surgery population: a review of the literature. <i>Int J Eat Disord</i> 2007;40(4):349-59.	This article was mined for references, but because it is a review, it was not included.
References to Check	Larsen, F. (1990) Psychosocial function before and after gastric banding surgery for morbid obesity: a prospective psychiatric study. <i>Acta Psychiatr Scand Suppl</i> 359: 1-57.	This citation was excluded for its small sample size.
References to Check	Valley, V., Grace, D. M. (1987) Psychosocial risk factors in gastric surgery for obesity: identifying guidelines for screening. <i>Int J Obes</i> 11: 105-113.	This citation was excluded for its small sample size.
General		
General	While the objectives, scope and methods are clearly described, it would be quite helpful to differentiate in Key Question 3 mental health interventions prior to bariatric surgery from mental health presurgical clearance evaluations, if possible. An additional concern is whether or not these evaluations help with improving long term surgical outcomes.	We have reworded KQ3 to clarify this point. We have also added language regarding the lack of data on long-term outcomes in these intervention trials.
General	However, it may be helpful to reference the literature related to encouragement to complete psychological pre-clearance evaluations in the report.	We reviewed and considered this literature, but found it to be outside the scope of our review.
Page 1 General	On line 9 on page 1 and throughout the document, it would be beneficial to reference "mental health disorders" rather than "psychiatric disorders."	Changed as suggested. We have replaced "psychiatric disorders" with "mental health conditions" where appropriate throughout the report.
General	Consider change in the title to better reflect the actual scope of the ESP from "Psychiatric Clearance for Bariatric Surgery" to "Psychiatric Assessment and Psychosocial Interventions for Bariatric Surgery"	Changed as suggested.
General	Recommend changing "morbid obesity" references to "class III obesity" on line 6, 7, 15, 19 and paragraph 1 of page 42.	Changed as suggested from "morbid obesity" to "severely obese" or "severe obesity" throughout the report.
General	I am not sure whether PsycINFO would have been the best search engine to have used for this	The part about cutting out studies is true but

	<p>topic. I also found the other aspects of the search strategy to be a bit unusual. In addition, although the strict criteria that were used for inclusion of studies in the review are laudable, and the rationale for these criteria is understandable, the bariatric literature comprises mostly lower-quality studies, so the ones they examined are not really representative of the body of existing literature. Further, by leaving out the vast, vast majority of studies on this topic, the authors missed the opportunity to pick up on themes that are suggested over and over again, albeit in less-rigorous studies. They may be of poorer quality, but the consistency of some of the themes among the findings from those studies is convincing in its own right.</p>	<p>I think it makes sense that we cut out lower quality studies. Again we can address this with a mention in the limitations/ research gaps. Professional library selected these search strategies. Given the goal of</p>
<p>General</p>	<p>However, I think there is a very serious bigger-picture issue here. I am concerned that the “key questions” asked were not necessarily the most relevant ones. I am particularly concerned about the narrow focus on “psychiatric disorders” (and, to a lesser extent, eating pathology) in this review. As the authors found in their literature search, the existing literature does not contain strong evidence that any specific disorder affects WLS outcomes (in various domains). However, what the authors are not addressing in their lit review and report is that there are many, many psychosocial factors that may potentially affect various domains of WLS outcome, both directly and indirectly, and though I happen to know the research on these non-diagnosis factors is also pretty sparse, it’s actually a bit more convincing than studies looking at diagnosis alone. Just for some small concrete examples, there are papers looking at cognitive functioning (and other factors like various dimensions of temperament) and post-op adherence, papers looking at factors (including but not limited to psych Dx) that influence attendance at follow-up visits, <i>etc</i> I am concerned that this document, especially given its ‘authoritative’ role, will perpetuate what I see as a major problem in the way bariatric psychology gets practiced, which is to focus only on diagnoses, rather than a comprehensive look at all psychosocial factors that may affect the various domains of outcome. I am also concerned that the narrow focus on psych Dx in this document will have the effect of making it less likely that bariatric patients at the VA will receive any psych input – whether it is for evaluation, preparation, or follow-up. It is true that no studies have looked at the relationship between psych input/support and bariatric outcomes, but the fact that nearly every surgical program in the US includes these components suggests that it is widely thought (and anecdotally observed) that psych input/support is likely to enhance outcomes, at least for a subset of patients. The fact that we have not yet found a way to identify that subset a priori is a strong argument FOR providing such input/support as a standard part of the bariatric protocol. I understand that the remit of this report was to only examine the existing empirical literature, but I am concerned that this report will substitute for a broader discussion that takes more than just these few identified studies into account.</p>	<p>We added ‘Other’ section to limitations. Added sentences: We limited the scope of our evaluation to particular mental health conditions. However, other factors, such as cognitive functioning, temperament, socioeconomic status and personality traits may also play a role in patient safety and success with bariatric surgery.</p>
<p>General</p>	<p>Another point that seems small but is not: The title of the report mentions “Psychiatric Clearance”, which is a very problematic term. Firstly, it implies that only psychiatrists have a role here, while if anything, psychologists are much better-suited to this task since they are trained to base their practice on empirical knowledge and to examine factors other than diagnoses and symptoms. Second, the word “clearance” is very problematic. Given the state of the existing empirical literature, a dichotomous “clearance/no clearance” decision is probably the absolutely least useful aim of the pre-surgical psychosocial evaluation. Ideally the role of the evaluation is to identify</p>	<p>We have changed the title of the report and refocused the implications of our results.</p>

	factors (usually in a non-dichotomous fashion) that may affect the domains of WLS outcome and to formulate recommendations for interventions to ameliorate those that are identified.	
General	At the very least, the authors may consider looking at studies examining non-diagnostic psychosocial factors and various domains of WLS outcome, or considering relaxing their inclusion criteria so that themes that emerge repeatedly in lower-quality studies are included in the report. I would also really like to see the authors include some paragraphs that acknowledge that there are dimensions that fell outside of their specific brief (those dimensions I note above) that are still likely quite important in the evaluation and care of bariatric patients, to minimize the chances that this report will have an adverse impact on the standard of care in this arena for VA patients.	While potentially important, we believe that psychosocial factors and additional outcome domains are outside the scope of our report. We have added language to explicitly acknowledge this in the limitations section.
General	This report does not include a clear definition of psychiatric disorders and blends the concepts of disorders, diagnoses and symptoms. The definition presented on page 7 does not include sufficient rationale for the categorization and selection of these disorders: depression, anxiety, post-traumatic stress disorder (which is one type of anxiety disorder), personality disorders, substance abuse disorders, or suicidality (which is not a disorder per se)?	Clarified as noted above.
General	The report would also benefit from a clearer distinction between the predictors of interest (psychiatric disorders, focus of question 1) and the postoperative outcome domains of interest (not only psychiatric disorders, but also a range of other factors including quality of life, <i>etc</i> , focus of question 2). For example, p. 34, the table column labeled “Psychiatric Diagnoses Assessed” includes entries that are not psychiatric diagnoses (<i>eg</i> , Adams, quality of life).	Clarified as noted above.
General	I recommend checking all of the studies included in Tables 1-2. For example, references 54 and 59 do not appear to meet inclusion criteria, nor do they address report questions.	We have clarified our inclusion criteria in the methods section, and re-checked these references against our criteria.
General	As highlighted earlier, the tables seem to include a mix of pre- and postoperative psychiatric disorders, symptoms, and other factors. For example, on page 17, the Hood study includes “maladaptive eating.” However, bottom of page 7 states that “eating behaviors that are not classified as disorders are not included.” Therefore, I would think that a report on maladaptive eating would not fall in the scope of Question 1, which pertains to the prevalence of psychiatric disorders; possibly maladaptive eating would be a postoperative outcome of interest and could fall under Question 2. Additionally, throughout the tables, some cells seem to be filled with lengthy descriptions adapted from the publications or abstracts, whereas others include more concise summaries. Inconsistencies were also noted in the reference formatting.	We have clarified which pre-operative mental health conditions were included in the report, and the methods used to assess them. This information is included in Table 2.
General	I commend the VA and the investigators for conducting a systematic review to shed light on clearance procedures for bariatric surgery. It makes sense to be cautious about routinely requiring a potentially expensive and time consuming preoperative psychological evaluation that will not predict success. Although this report has culled a large amount of information, overall, it does not provide a balanced, clear picture of the evidence “for or against” routine preoperative mental health evaluations as posed on page 7. At a minimum, the inclusion of studies should be double checked, the text edited for clarity, and the tables organized for consistency and better alignment with the questions. Finally, because the initial question was broken into smaller questions due to lack of data (p. 7, line 13), it might be helpful to reference current clinical guidelines or expert consensus relevant to the initial question. Some suggestions:	We have edited and reorganized the text to more directly answer our key questions. We have also added references to updated clinical guidelines.

	<ul style="list-style-type: none"> • Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient (Mechanic et al., 2013) • Expert Panel on Weight Loss Surgery: Executive report update (Blackburn et al., 2009) • Behavioral and psychological care in weight loss surgery: best practice update (Greenberg, Sogg, & Perna, 2009) • Best practice updates for multidisciplinary care in weight loss surgery (Apovian et al., 2009) 	
General	The term morbid obesity is no longer preferred. Consider using clinically severe obesity.	Changed as mentioned above.
General	It would be useful to outline the types of non-randomized studies that might be useful to fill in important gaps here, because RCTs aren't going to be feasible for all questions for which there is limited evidence. For full disclosure, such detail would serve me well because I have developed (with HSR&D funding) matched cohorts of veterans undergoing surgery and non-surgical controls with which I intend to address some of these questions in a December 2014 IIR submission. I suggested several additional studies above to include in this review, because I recently (independently) reviewed much of this literature in preparation for this IIR and an Oct 2014 R01 in response to the NIDDK & NIDA RFA.	This information has been added to the future research section.
General	Binge eating as a psychiatric disorder did not exist formally until DSM-5 in 2013/2014. Therefore, prior papers on binge eating behavior likely defined this condition in somewhat different ways than in the DSM-5 (eg, perhaps just basing it on binge eating alone as in the San Diego VA study with the outlier eating disorder value [this study measured only self-reported binge eating] without the perceived loss of control element). Given the new disorder criteria, it is an area in need of future research incorporating the DSM-5 standards	We have added language to clarify how binge eating disorder was diagnosed and the potential limitations due to changes in criteria over time.
General	As the reports states in various places, one of the difficulties in answering the Key Questions resulted from the many different measurement tools utilized in studies to measure psychosocial factors. Although developing consensus guidelines for the use of certain measures for measuring psychosocial factors may be beyond the scope of this review but could be a recommendation for future research in order to facilitate greater reliability across new studies. For example, VA centers could develop and utilize a standardized psychological instrument battery for bariatric patients that would allow for a rapid increase in the state of knowledge about Veterans participating in bariatric procedures.	We have added language to the discussion regarding the need for consensus in the measurement of mental health conditions across sites.
General	Perhaps looking at the mere presence of psychiatric disorders in not predictive of bariatric outcomes, but it might be worthwhile to expand the review to determine whether severity and chronicity of psychiatric disorders are predictive of bariatric outcomes. If there are only a few, low quality studies on severity and chronicity of psychiatric disorders as predictors of outcome, this might be mentioned in the section on limitations.	We have added this as a potential avenue for future research.
General	I think that when we talked before we discussed that there were limits to the validity and reliability of psychosocial assessment for patients prior to bariatric surgery, given the fact that these patients wish to be perceived as healthy and well adjusted. I believe I sent you a couple of articles that address this directly. I can send them again if you wish. I think at some point this issue needs to be raised, since it addresses the quality of the data.	We added a sentence and the suggested reference reporting that confidential assessment of mental health conditions resulted in higher reported prevalence. We did assess each article whether or not it reported that the mental health assessment

		was confidential (included in Tables 1 and 2). Unfortunately, so few studies reported this that no sensitivity analysis was possible.
General	Terminology is not well defined. For example, is the anxiety diagnosis made using a structured system such as the DSM? Which anxiety diagnosis are included? What does depression include? It appears that you included bipolar disorder, which really is an affective disorder and not a form of depression. It isn't clear what systems you used for eating disorder diagnosis, which were primarily binge eating disorder (DSM-IV or some other variant of DSM?). Which system was used for personality disorders or was it just accepted what was written in the articles? Psychosis is a very broad term, I assume that most of this is schizophrenia; however, depression can be psychotic, as can be manic depressive illness. At some point it might be useful to define these terms and also to stipulate what is included. For example, if an article commented on "clinical depression" but didn't refer to any diagnostic nomenclature would that be considered a depressive diagnosis?	We have added language to clarify which mental health conditions were asses and included the individual metrics in Tables 1 and 2. Our discussion sections also notes that the use of different tools to measure and diagnose mental health conditions limited our ability to draw conclusions.
General	A major limitation of all this literature is the lack of long-term follow-up in most of these studies. Again I don't know how much you can be critical of this literature in your review but this seems to be a very key variable. Another key variable is the lack of consistency as to what constitutes the psychosocial evaluation. As far as I know there is no standardization employed, which is part of the problem, and again this should probably be cited as a difficulty in interpreting the literature.	Both limited follow-up and lack of consistency in measurement are included in our limitations section.
General	Question number 3 regarding the role of required pre-operative assessment with appropriate intervention prior to operation could not be answered by this review.	Based on our results, we agree with this statement, and have clarified our findings in the text.
General	The clinical questions are complex and not quite simple as the wording of the questions would suggest. In clinical practice, presumably including the VA, all bariatric surgery candidates are interviewed with variable degrees of psychological assessment. Selected formal or specialized psychological assessment and highly selective intervention may well be beneficial/crucial in certain cases. All bariatric surgery programs encounter patients whose psychopathology renders them unsuitable candidates for bariatric surgery. These candidates can be identified by the surgical and/or medical bariatric team without routine specialized psychological assessment having been required. It is unlikely that adequately powered trials of routine psychological assessment as well as intervention protocols will be conducted in the near future to guide clinical decision making and coverage policy. This reviewer understands that such disclaimers of statements of limitations of the methodology are not a standard part of these evidence based reviews. Nevertheless, a comment regarding the limitations of the evidence based program in formulating clinical decisions as well as policy should be considered.	We have added language regarding the many ways in which bariatric surgery patients are assessed prior to surgery, both formally and informally. As suggested by the comment and in our introduction, there is insufficient evidence to explicitly evaluate pre-operative psychiatric clearance for bariatric surgery. Instead we chose to focus on determining the prevalence and potential implications of mental health conditions prior to bariatric surgery, and have framed our results with these goals in mind rather than using them to comment on the process of psychological assessment.
General	This report will serve to call attention to the lack of evidence supporting mandatory preoperative formal psychological assessment among bariatric surgery candidates. As noted above this report should not be taken as indicating selective preoperative psychological screening and intervention should not be done.	We have clarified the implications of the report in its conclusion.