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Patient and Referring Provider Characteristics Associated With the Likelihood of Undergoing Bariatric Surgery: A Systematic Review

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Abstract

Importance—Although bariatric surgery is the most cost-effective treatment for severe obesity, less than 1% of severely obese patients undergo it. Reasons for low utilization are unclear.

Objectives—To identify patient and referring provider characteristics associated with the likelihood of undergoing bariatric surgery.

Evidence Review—PubMed, PsycINFO, CINAHL, and the Cochrane databases were searched for reports published between January 1, 1998, and December 31, 2014. Reports were eligible if they presented descriptive data regarding facilitators or barriers to bariatric surgery or if they reported statistical associations between patient or provider characteristics and referral to or receipt of bariatric surgery. Frequency effect sizes were calculated as the proportion of studies reporting a finding.

Findings—Of the 7,212 reports identified in the initial search, 53 were included in full-text review. Nine reports met our inclusion criteria and were included in analyses. Of those, four included descriptive findings, six reported statistical associations, and one included both. One report included providers as study participants, whereas eight included patients. Four of nine studies identified an association between female gender and a greater willingness to undergo bariatric surgery. Lack of knowledge about bariatric surgery was a barrier in two studies. Five of nine cited patient concerns about the outcomes and safety of bariatric surgery as a barrier to undergoing it. Patients were more likely to pursue bariatric surgery when it was recommended by

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referring providers. Providers who believed that obesity treatment should be covered by insurance were more likely to recommend bariatric surgery.

Conclusions and Relevance—Limited patient and referring provider knowledge about the safety and effectiveness of bariatric surgery are important barriers to bariatric surgery utilization. Future efforts focused on improving knowledge and identification of the critical determinants of obesity treatment decision making from both the provider and patient perspectives would have an important public health impact.

Introduction

Bariatric surgery outcomes have been the focus of more than 30 randomized controlled trials and nearly 150 observational studies over the past decade.¹ Compared to medical treatment, bariatric surgery has achieved superior weight loss and comorbidity resolution and significantly improves quality of life.²⁻⁹ Most studies suggest that bariatric surgery is a cost-effective intervention.¹⁰ Although one concluded that bariatric surgery was not cost-saving after three years in a cohort of mostly male Veterans,¹¹ three others in non-Veterans have found that bariatric surgery may be cost-saving within a decade.¹²⁻¹⁴ A lead author of one of these economic analyses noted that, “the expectation for any surgical intervention to show a return on investment is unusual, and few effective interventions reach this threshold. Laparoscopic Roux-en-Y gastric bypass, however, may be one of them.”¹⁵

Given the strong evidence supporting bariatric surgery, one might expect that a significant percentage of severely obese patients (patients with a body mass index [BMI] ≥ 40 kg/m² or 35 – 40 kg/m² in addition to an obesity-related comorbidity) would choose to pursue it. However, of the estimated 18 million severely obese adults in the United States,¹⁶ only 125,000 (< 1%) undergo bariatric surgery annually.^{17,18}

Reasons for the low utilization of bariatric surgery are unclear. Lack of access to bariatric surgery due to socioeconomic factors and low education levels have been cited as possible barriers.¹⁹ Lack of insurance coverage has been also been reported as a barrier, although utilization rates are even lower in some settings where it is broadly covered (i.e., Veterans Affairs population).²⁰ A comprehensive understanding of facilitators and barriers among patients and referring providers is needed to promote appropriate referrals and provision of bariatric surgery. We performed a systematic review of literature published from 1998 through 2014. Our goal was to identify patient and referring provider characteristics related to demographics, knowledge, and attitudes toward bariatric surgery that are associated with either referral for or receipt of bariatric surgery.

Methods

Search Strategy

We searched Medline, PsycINFO, CINAHL, and the Cochrane Registry for Controlled Trials. Each database was searched from January 1, 1998 through December 1, 2014. 1998 was chosen as the starting point because it represents the beginning of the modern era of bariatric surgery, which incorporates laparoscopy.¹⁷ Search terms were used that identified bariatric surgery, including gastric bypass, sleeve gastrectomy, or adjustable gastric band.

The complete search-string used for our PubMed search is in the **Appendix**. Inclusion criteria were 1) observational or interventional study design; 2) descriptive or inferential findings; 3) patient or provider participants, 4) adult human subjects; and 5) English language. Case reports and series, studies examining clinical outcomes, editorials, guidelines, trials comparing surgical or medical therapies, and literature reviews were ineligible. Reports were excluded if they focused on medical or psychiatric comorbidities as predictors of undergoing bariatric surgery because they are part of the clinical decision-making process regarding eligibility. For example, one study included in our initial search found that approximately one in five surgical candidates did not pass initial psychiatric screening.²¹ Others focused binge eating among bariatric surgery candidates.^{22,23} We considered these as issues that factored into the bariatric team's decision-making process rather than a patient-level barrier to bariatric surgery.

Study Selection

Results of the searches were imported into EndNoteX7, and duplicates were eliminated. Two surgeon members of the study team (Funk, Fischer) manually reviewed record titles and abstracts and excluded reports based on the aforementioned criteria. Reports were subjected to full-text review by two surgeon reviewers (Funk, Fisher) if at least one reviewer marked it for inclusion. If consensus was not reached by both reviewers, a third reviewer (Voils) was included. All three reviewers discussed their reasons for initial inclusion or exclusion. Consensus was reached when all three reviewers subsequently agreed to include or exclude the report.

Data extraction and analysis

Study characteristics were extracted from each report and included dates of data collection, study population (patients or providers), research setting (outpatient, inpatient, ambulatory surgery, integrated health care system, and academic medical center), gender and race/ethnicity of study participants, study design and methodology, and data type (descriptive or inferential).

Relevant findings were extracted by two surgeon members of the research team (Funk, Jolles) and verified by the senior author (Voils). Descriptive and inferential findings were included in this synthesis because they addressed the same research question and were in a format that permits meta-synthesis.^{24,25} Descriptive findings were included if they were mentioned in a report, regardless of the number of participants mentioning them.²⁶ Descriptive findings were obtained both from qualitative data collection techniques (e.g. interviews, focus groups) and quantitative surveys in which authors reported the percentage of participants endorsing a barrier or facilitator of surgery. Statistical associations between patient or provider characteristics and referral to or receipt of bariatric surgery were included in analyses if $p < .05$. Following previous research published by the senior author, if only bivariate analyses were reported, then bivariate results were used.²⁴ If results from a multivariable regression analysis were available, then we used those findings rather than the bivariate results because the estimate is likely more accurate after adjusting for confounders. If results from several regression models were presented, results from the model with the largest number of predictors were included. The statistical associations and descriptive

findings were grouped by topical similarity, and concise summaries of each finding were created.

For each abstracted finding, a frequency effect size was calculated as the number of reports containing a finding divided by the total number of included reports. Frequency effect sizes reflect the extent to which a particular theme has been studied either because researchers thought the constructs were important to study (in the case of quantitatively-oriented studies in which investigators determine *a priori* what to measure) or because participants thought the issues were important enough to raise in the context of a discussion (in the case of qualitative data generated by focus groups, interviews, or open-ended survey questions). This strategy follows a data extraction technique that we have described previously for qualitative meta-summaries combining quantitative and qualitative findings.²⁴

Results

Study Selection and Characteristics

Our literature search identified 7,212 unique records. After removing 1,060 duplicates, 6,152 articles were reviewed at the title and abstract level. Of these, 53 reports were chosen for full-text review. Nine reports representing unique studies were selected for inclusion in the systematic review. The study selection process, as per Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines,²⁷ is shown in the **Figure**.

All included studies were published from 2007 through 2014. Eight studies included patients as study participants, while one focused on providers. In eight of the nine studies, most participants were female (**Table 1**). The percentage of non-white participants in the seven reports that included ethnicity/race ranged from 41% to 100%. All study designs were observational and cross-sectional. Study methodologies included surveys or questionnaires (n=7), retrospective chart review (n=1), and focus groups (n=1). Four of the nine studies provided descriptive data. Six reports included inferential statistics, of which four included multivariable analyses.²⁸⁻³¹ Three reports focused on receipt of bariatric surgery.^{30,32,33} The other six targeted referral for bariatric surgery.

Patient characteristics associated with the likelihood of discussing or considering bariatric surgery referral (Table 2)

Patient demographics—Two studies found that females were more likely to consider referral for bariatric surgery,^{20,34} while two also found that higher BMI was associated with a higher likelihood of considering referral.^{20,31} The presence of a higher number of obesity-related comorbidities²⁸ - specifically obstructive sleep apnea³¹ - was associated with a higher likelihood of bariatric surgery consideration while older age was associated with a lower likelihood of considering bariatric surgery.³⁵ White ethnicity was associated with a lower likelihood of considering bariatric surgery referral in one report,³⁵ while another found that patients who were in higher socioeconomic status groups were more likely to consider bariatric surgery.³¹

Patient level of knowledge—Afonso and colleagues assessed the association between patient knowledge and the likelihood of considering bariatric surgery.³⁵ Lack of knowledge

regarding bariatric surgery as a treatment option for severe obesity was associated with a lower likelihood that a severely obese patient would consider bariatric surgery. 13% of patients were not aware that they qualified as a candidate for bariatric surgery, and 8% had never heard of bariatric surgery.

Patient attitudes and behavior—Patient concerns about surgical complications or death were associated with a lower likelihood of considering bariatric surgery referral in three studies.³⁴⁻³⁶ Concerns regarding the financial burden of bariatric surgery were reported in one.³⁵ In their focus group study of obese African-American women, Lynch and colleagues reported that patients were concerned about the loss of control over the amount of weight loss, lifestyle restrictions, and possible weight re-gain after bariatric surgery.³⁶ Patients who felt their other treatment options had been exhausted were more likely to consider bariatric surgery.

Insurance coverage—Arterburn and colleagues concluded that having insurance coverage for bariatric surgery was associated with a higher likelihood that patients had discussed bariatric surgery with a primary care provider (PCP) but a lower likelihood that they would consider pursuing it.²⁸ In the aforementioned Afonso study, not having insurance coverage for bariatric surgery was associated with a lower likelihood that the patient would consider it.³⁵

Patient characteristics associated with the likelihood of receiving of bariatric surgery (Table 3)

Patient demographics—Two reports found that female gender was associated with a higher likelihood of considering receipt of bariatric surgery.^{30,32} In a telephone survey of 325 severely obese patients seen at four primary care practices in the Boston area, Wee and colleagues found that African American and Hispanic ethnicities were more likely to consider undergoing bariatric surgery if they received a physician recommendation for surgery but were less likely to consider it if they were older.³⁷

Patient attitudes and behavior—In multivariable analyses, Wee reported that patients who received a recommendation from a PCP to consider bariatric surgery were five times more likely to consider it. Physician recommendation was a stronger predictor than patient race, gender, age, BMI, or comorbidities.³⁰ In their chart review and subsequent telephone follow-up with 55 patients who were referred but did not undergo bariatric surgery in the U.K., Sivagnanam and colleagues reported that patients were concerned about bariatric surgery complications, its financial burden, and logistical challenges related to attending clinic visits, such as arranging for childcare.³³ Difficulty with participation in the bariatric surgery preoperative program was cited by Pitzul as a reason that patients did not undergo bariatric surgery despite referral.³²

Provider characteristics associated with the likelihood of referring a patient for bariatric surgery (Table 4)

One study investigated the association between provider characteristics bariatric surgery referral.²⁹ Family physicians with a self-reported greater knowledge about bariatric surgery

were more likely to recommend bariatric surgery in bivariate analysis. Having higher self-reported knowledge regarding the care of extremely obese patients was associated with a more positive attitude toward bariatric surgery in bivariate analyses. The relationship between physician attitude and actual discussion or referral for bariatric surgery was not assessed. In multivariable analyses, PCPs with a higher percentage of severely obese patients in their practice (>7%) were more likely to refer severely obese patients for bariatric surgery.

Discussion

Our findings suggest that patient concerns regarding complications or death following bariatric surgery are a notable barrier to pursuing bariatric surgery. Only two studies in our literature review examined the association between patient or referring provider knowledge of bariatric surgery and the likelihood of patients undergoing or being referred for bariatric surgery. Primary care physicians who were more knowledgeable about bariatric surgery were more likely to refer patients for bariatric surgery. This is a critical observation because a recommendation from a PCP increases the likelihood that a patient will consider bariatric surgery more than any other patient characteristic that has been studied, including patient race, gender, socioeconomic status, weight, or comorbidity status.

Despite the concerns about complications or death that patients reported in several studies included in this review, the published literature suggests that bariatric surgery is very safe.^{38,39} In 2008, national registry data from the U.S. indicated that the 30-day mortality rate was 0.16% for bariatric surgery.³⁸ Subsequent analysis of over 400,000 bariatric operations from 2007 to 2012 found that 30-day mortality had declined to 0.1%.³⁹ By comparison, data from the National Surgical Quality Improvement Program (NSQIP) indicate that the 30-day mortality rate following cholecystectomy is 0.27%.⁴⁰ For laparoscopic anti-reflux surgery, typically considered an advanced laparoscopic procedure, NSQIP data indicated that the 30-day mortality rate was 0.19%.⁴¹ Yet, in contrast to bariatric surgery, patient and provider concerns about the risk of death following cholecystectomy or laparoscopic anti-reflux surgery are not described in the literature as a barrier to undergoing surgery.

Reasons for the discordance between the actual and perceived risks of bariatric surgery are unknown. This is especially confusing when one considers that severely obese patients in one study were willing to accept a 13% mortality rate – a more than a 10-fold increase in the actual risk – to achieve their desired health state.⁴² One possible explanation is that, as with other health risks, patients may rely on vivid examples, such as experiences of friends or cases in the lay press, rather than actual risks to guide their impressions.⁴³ Ongoing education is needed to assure that patients have an accurate understanding of the expected, often very favorable, outcomes following bariatric surgery.

Both studies in our review that investigated the relationship between knowledge and referral or receipt of bariatric surgery found that lower knowledge was associated with lower referral and receipt rates. Poor knowledge regarding the effectiveness of bariatric surgery has been reported by other investigators. Sikorski and colleagues found that the general public felt that dietary changes and psychological changes were both more effective treatments than

bariatric surgery.⁴⁴ While these are important components of any multi-disciplinary weight management program, there is no evidence that lifestyle change is more effective than bariatric surgery. Further, fewer than half of general practitioners consider themselves capable of managing obesity effectively.⁴⁵ This lack of confidence is a significant concern.

The impact of insurance coverage on bariatric surgery utilization remains unclear. In the hypothetical scenario posed by Arterburn and colleagues,²⁸ having bariatric surgery coverage was associated with an increase in the likelihood of having a discussion with the primary care physician, but a decrease in the likelihood of considering it. The authors stated that this finding was likely the result of unmeasured confounding. Yet, in an environment where less than one in three patients had coverage for bariatric surgery – a rate common for commercial insurers in the U.S. – they urged more research in this area. Other investigators have found that among patients referred for bariatric surgery, lack of insurance coverage was the most common reason that patients were rejected from participation in a bariatric surgery program.⁴⁶

Our findings point to an excellent opportunity for ongoing research and quality improvement efforts to have a major public health impact. More qualitative studies examining perspectives and attitudes toward obesity care and bariatric surgery would help us understand why 99% of patients do not pursue the most effective treatment.^{5,6,8} Studies addressing why females are much more likely to undergo bariatric surgery are also needed as it seems likely that males are being undertreated. A better understanding of referring provider practices is also needed given that referral is the first step in the path to bariatric surgery. In one study, nearly 90% of PCPs indicated that an educational program would increase the likelihood that appropriate patients would be referred for bariatric surgery; more than 80% wanted handouts to give to patients regarding obesity treatment options.⁴⁷

This study has several limitations. We did not assess the extent to which reports included data on methodological rigor, as is commonly done in systematic reviews. Our stance is that all data can inform the evidence base and that sensitivity analyses can be performed based on quality of reporting. Our small sample size precluded meaningful analyses by quality of reporting. Second, although our search strategy was comprehensive and generated more than 7,000 records to review, we may have missed relevant studies. We were not able to perform a meta-analysis to assess the effect size associated with predictors of bariatric surgery referral and uptake. We would have needed a larger, more homogeneous sample of studies that included a single outcome and inferential statistics. Our mixed synthesis approach, which included descriptive and inferential findings and allowed for a larger range of outcomes by patients and providers, meets the imperative of using more available types of data in meta-syntheses.

In summary, limited patient and provider knowledge about the safety and effectiveness of bariatric surgery are barriers to bariatric surgery utilization. Advances are needed in this field, including improved design and availability of qualitative studies and rigorous investigation of the factors that impact decision-making for referring providers. An increase in the appropriate utilization of bariatric surgery may result from these efforts which would

be welcomed given that few of the nearly 20 million severely obese patients in the U.S. are pursuing the most effective treatment.

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Appendix

Search strategy

PubMed

Search (“Bariatric Surgery”[Mesh] OR (bariatric AND (care OR surgery)) OR “weight loss surgery” OR “gastric bypass” OR “sleeve gastrectomy” OR laparoscopic adjustable gastric banding) AND (Clinical Trial OR Comparative Study OR Controlled Clinical Trial OR Evaluation Studies OR Meta-Analysis OR Multicenter Study OR Observational Study OR Randomized Controlled Trial OR systematic[sb] OR Validation Studies OR prospective OR retrospective OR epidemiologic OR cohort OR case-control OR longitudinal OR cross-sectional) Filters: Publication date from 1998/01/01 to 2014/12/31; Humans; English; Adult: 19+ years

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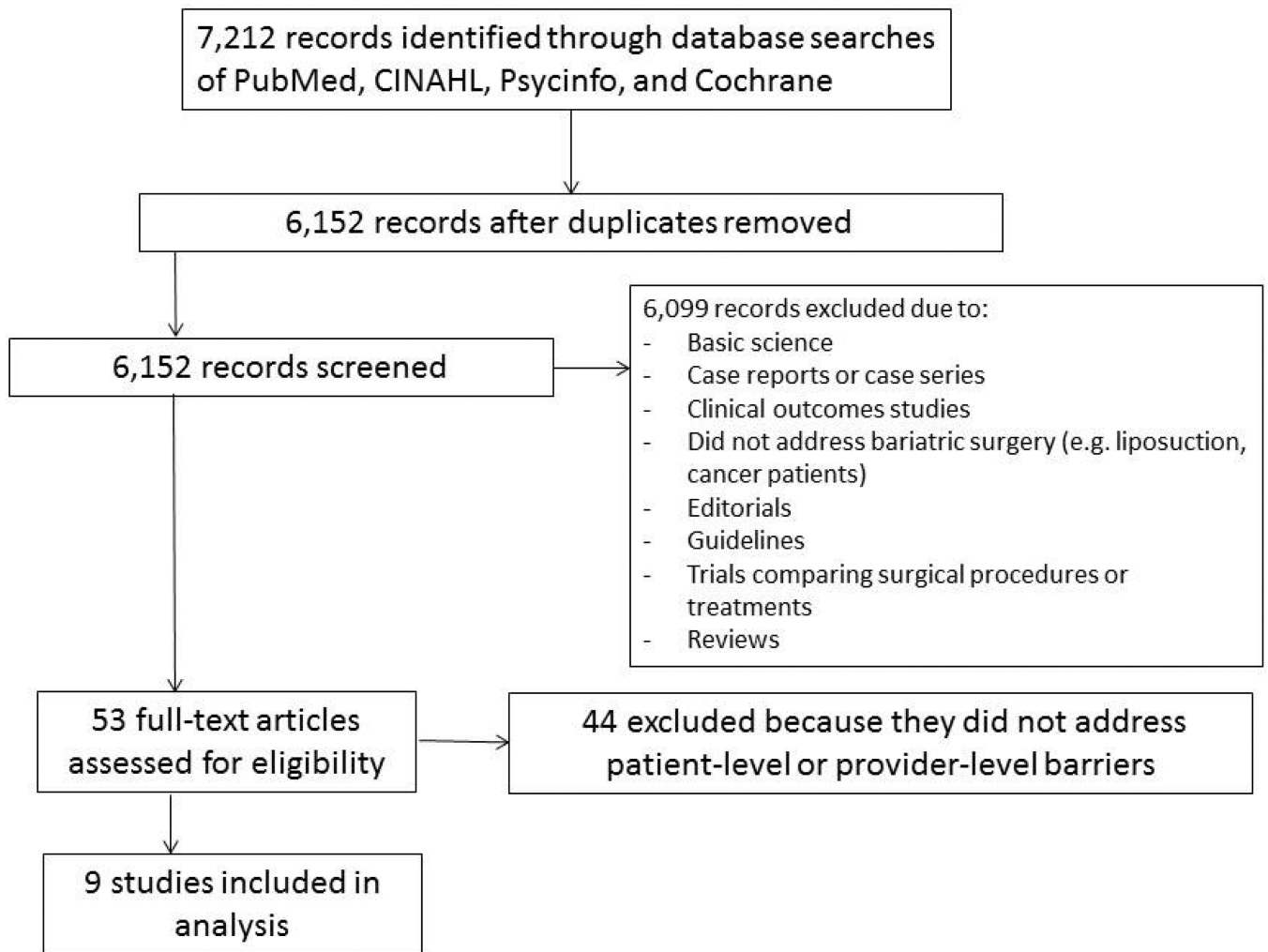


Figure.
The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA)
Flowchart Detailing the Selection of Studies for Systematic Review Diagram

Table 1

Study Characteristics

Study author (year)	Data collection dates	Design	Data type	Setting	Population	Female (%)	Non-white (%)
Afonso ³⁵ (2010)	Feb 2007-April 2008	Observational, cross-sectional	Descriptive and inferential	Outpatient and inpatient	Patients: 77 severely obese patients seen by internal medicine residents as inpatients or outpatients at the Cleveland Clinic Florida for medical problems not related to bariatric surgery	53	51
Arterburn ²⁸ (2013)	Not reported	Observational, cross-sectional	Inferential	Integrated health care System	Patients: 295 severely obese participants who were members of Group Health (Washington) who met NIH criteria for bariatric surgery but had not been referred to the Bariatric Surgery Program at Group Health	68	22
Ferrante ²⁹ (2009)	March-May 2008	Observational, cross-sectional	Inferential	Outpatient	Providers: 255 family physicians in New Jersey (members of the NJ Family Medicine Research network and randomly selected family physicians from a Blue Cross Blue Shield provider directory)	41	20
Khawali ³¹ (2014)	Jan 2006-Feb 2007	Observational, cross-sectional	Inferential	Outpatient	Patients: 65 Patients with a BMI ≥ 40 who were registered on the waiting list for bariatric surgery at the Obesity and Bariatric Surgery Outpatient Clinic of the Federal University of Sao Paulo (Brazil)	62	Not reported
Lynch ³⁶ (2007)	Not reported	Observational focus groups	Descriptive	Community	Patients: 41 African-American females with a BMI >30 living in the greater Pittsburgh area; recruited in	100	100

Study author (year)	Data collection dates	Design	Data type	Setting	Population	Female (%)	Non-white (%)
Pitzul ³² (2014)	Aug 2009-Feb 2011	Observational, cross-sectional	Descriptive	Outpatient	collaboration with the Black Women and Health Outreach for Longer Life and Empowerment group Patients: 1,237 patients referred to the Toronto Western Hospital Bariatric Program	71	Not reported
Sarwer ³⁴ (2013)	Not reported	Observational, cross-sectional	Inferential	Integrated health care system	Patients: 130 patients with type 2 diabetes and a BMI of 30-40, ages 18-65, identified from the Pennsylvania Integrated Clinical and Administrative Research Database	53	54
Sivagnanam ³³ (2008)	Mar 2006-Nov 2007	Observational, cross-sectional	Descriptive	Outpatient	Patients: 55 patients referred to the Norfolk and Norwich University Hospital (UK) for bariatric surgery	76	Not Reported
Wee ³⁰ (2014)	Not reported	Observational, cross-sectional	Inferential	Two academic medical centers	Patients: 337 patients, ages 18-65, with a BMI>35 who were seen at one of four primary care practices in Greater-Boston	69	65

Table 2
Patient characteristics associated with the likelihood of discussing or considering bariatric surgery referral

Favoring discussion or consideration of bariatric surgery referral	Effect Size	NOT favoring discussion or consideration of bariatric surgery referral	Effect Size
Patient Demographics			
Female gender (Arterburn, Sarwer)	2/9	Older age (Afonso)	1/9
Higher body mass index (Arterburn, Khawali)	2/9	White ethnicity (Afonso)	1/9
Higher socioeconomic status (Khawali)	1/9	Employed in a professional occupation (Afonso)	1/9
Higher number of comorbidities (Arterburn)	1/9		
Obstructive sleep apnea as a comorbidity (Khawali)	1/9		
Patient level of knowledge			
		Not aware of being a candidate for bariatric surgery (Afonso)	1/9
		Not aware of bariatric surgery as a treatment option (Afonso)	1/9
Patient attitudes and behavior			
Feeling that other obesity treatment options have been exhausted (Lynch)	1/9	Concerns about surgical complications or death (Afonso, Lynch, Sarwer)	3/9
Higher role-emotional score on SF-36 (Khawali)	1/9	Concern about the financial burden of bariatric surgery (Afonso)	1/9
		Concerns about having no control over the amount of weight lost (Lynch)	1/9
		Not receiving a recommendation from primary care physician to consider undergoing bariatric surgery (Afonso)	1/9
		Physical and lifestyle restrictions after bariatric surgery (Lynch)	1/9
		Concerns about weight regain following surgery (Lynch)	1/9
		Perception that bariatric surgery is an option of last resort (Lynch)	1/9
		Not interested in surgery as a strategy to treat morbid obesity (Afonso)	1/9
Insurance Coverage			
Having insurance coverage for bariatric surgery (favored discussion with PCP but barrier to considering it) (Arterburn)	1/9	Not having insurance coverage for bariatric surgery (Afonso)	1/9

ES=effect size

Table 3
Patient characteristics associated with the likelihood of receiving of bariatric surgery

Favoring receipt of bariatric surgery	Effect Size	NOT favoring receipt of bariatric surgery	Effect Size
Patient Demographics			
Female gender (Pitzul, Wee)	2/9	Older age (Wee)	1/9
Higher body mass index (Sivagnanam)	1/9		
African Americans and Hispanics were more likely than Whites to consider bariatric surgery if their doctor advised it (Wee)	1/9		
Having some college education (Wee)	1/9		
Hypertension as a comorbidity (Wee)	1/9		
Patient attitudes and behavior			
Having a lower ideal body weight (Wee)	1/9	Concerns about surgical complications or death (Sivagnanam, Wee)	2/9
Receiving a recommendation from primary care physician to consider undergoing bariatric surgery (Wee)	1/9	Concern about the financial burden of bariatric surgery (Pitzul, Sivagnanam)	2/9
		Higher obesity-specific quality of life (Wee)	1/9
		Physically incapable of commuting (Sivagnanam)	1/9
		Unable to arrange childcare for clinic appointments (Sivagnanam)	1/9
		Concern about financial burden associated with commuting to clinic appointments (Sivagnanam)	1/9
		Lack of choice regarding surgeon, type of operation and/or hospital (Sivagnanam)	1/9
		Prefer to lose weight on their own (Pitzul)	1/9
		Unable to complete participation in bariatric surgery preoperative program indicated by multiple missing appointments or dropping out of the program (Pitzul)	1/9
		Unable to complete participation in bariatric surgery preoperative program due to inability to stop smoking cigarettes or marijuana, both preoperative requirements (Pitzul)	1/9
		Prefer to lose weight on their own (Pitzul)	1/9

ES=effect size

Provider characteristics associated with the likelihood of recommending bariatric surgery

Table 4

Favoring recommendation of bariatric surgery	Effect Size	Not favoring recommendation of bariatric surgery	Effect Size
<u>Provider level of knowledge</u>			
Greater knowledge about bariatric surgery (Ferrante)	1/9		
<u>Provider attitudes and behavior</u>			
N/A			
<u>Type of practice</u>			
		Higher percentage of severely obese patients in a primary care physician's practice (Ferrante)	1/9