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## Bariatric surgery barriers: a review using Andersen's Model of Health Services Use

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### Abstract

Severe obesity affects nearly 20 million adults in the United States and is associated with significant morbidity and mortality. Bariatric surgery is the most effective treatment for weight loss and resolution of obesity-related co-morbidities. Of adults with severe obesity, <1% undergo bariatric surgery annually. Both contextual (health system, clinicians, and community) and individual factors contribute to the underutilization of bariatric surgery. In this review, we summarize potential barriers to undergoing bariatric surgery within the framework of Andersen's Behavioral Model of Health Services Use.

### Keywords

*Bariatric surgery, Access to care, Barriers, Bariatric referral, Andersen's Behavioral Model of Healthcare Use*

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Over 18 million U.S. adults have severe obesity (body mass index [BMI] of  $\geq 35$  kg/m<sup>2</sup>) [1]. Severe obesity increases the risk of chronic diseases such as diabetes and heart disease [2] and decreases lifespan by nearly a decade [3]. Medical care for individuals with severe obesity costs the U.S. healthcare system \$70 billion annually [4]. Severe obesity also accounts for a significant amount of absenteeism in the workplace; with these individuals missing 40% more work than healthy-weight individuals [5].

Bariatric surgery is the most effective treatment for severe obesity, leading to substantial and sustained weight loss, co-morbidity resolution, and improvement in quality of life [6]. Despite the effectiveness of bariatric surgery, < 1% of patients who meet the National Institute of Health BMI criteria for bariatric surgery undergo it [7]. This low utilization of bariatric surgery suggests the need for an improved understanding of the barriers to bariatric surgery access and utilization.

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The process of obtaining a bariatric surgery referral and subsequently undergoing surgery is complex, often including multiple visits with different providers in different health systems over a period of several months. This article provides a review of the factors that facilitate or impede this process, organized within the framework of Andersen et al.'s [8] widely cited Behavioral Model of Health Services Use. Use of the Andersen conceptual model facilitates identification of barriers, facilitators, and interactions deserving of further study and may help direct interventions to improve access to bariatric surgery.

## Andersen's Behavioral Model of Health Services Use

Initially published in the 1960s, Andersen's model suggests that an individual's use of a health service is a function of 3 elements: (1) one's predisposition to use a service; (2) factors that enable or impede use of a service; and (3) the need for a service. The model has been applied and adapted to several areas of healthcare, including investigation of barriers to routine health examinations and mental health services utilization [9]. The most recent iterations of the model incorporate both contextual and individual determinants. Contextual determinants represent the circumstances and environment of healthcare access, including the health system, healthcare providers, and community. In our application of the model, individual determinants relate to patients with severe obesity, including health behaviors and patient-physician interactions.

Tables 1 and 2 describe relevant components of the conceptual framework and include corresponding barriers and facilitators of bariatric surgery. Contextual need factors (environmental factors, population health indices) and patient outcome factors represented in the Andersen model were not relevant to our study and were excluded.

## Contextual factors

### Predisposing factors

**Provider demographic characteristics.**—Evidence regarding differences in clinician characteristics is limited and conflicting. A survey of U.S. primary care physicians (PCPs), obstetrics/gynecology physicians, and nurse practitioners in 2015 found that female providers were less likely to recommend bariatric surgery as a treatment option [10]. However, Balduf et al. [11] surveyed U.S. PCPs and reported no difference in referral practices between PCPs by sex or race. Referring providers were younger and had higher BMIs.

**Social.**—Contextual social characteristics reflect how supportive or detrimental the community around an individual is to accessing health services [8]. In qualitative interviews conducted in New Zealand, PCPs reported that they had an important role in the care of patients with obesity and that it was socially acceptable for them to address patients' weight [12]. Physicians felt that the societal normalization of obesity and the stigma of obesity treatment contributed to low bariatric surgery utilization [12].

Woodruff et al. [13] explored U.S. community health center clinicians' perceptions of their patients' ability to maintain a healthy weight. Perceived community-level barriers included

limited availability of healthy foods and various obesity-promoting social norms: aspects of Southern food culture (e.g., fried foods, sugar sweetened beverages), positive associations with larger body sizes, and beliefs about hereditary or generational body types.

**Beliefs.**—The value and perception of obesity care within the community, particularly among healthcare providers, may affect the accessibility of bariatric surgery. Despite an American Medical Association resolution characterizing obesity as a disease, a focus group study of PCPs found that they were still skeptical that obesity is a disease [14]. In a survey of U.S. physicians, Glauser et al. [15] found that half of PCPs, cardiologists, and endocrinologists believed that obesity resulted from a lack of self-control. In a 2011 survey, Salinas et al. [16] found that PCPs perceived lifestyle changes to be the most effective available method for patients to lose weight and “lack of patient motivation” to be the biggest barrier to the management of adults with obesity.

A focus group study among PCPs identified 4 different treatment prioritization approaches for patients with severe obesity: (1) treat the disease that is easiest to address, (2) treat the disease that is perceived as the most dangerous, (3) let the patient set the agenda, and (4) address obesity first because it is the common denominator for other co-morbidities [17]. Provider knowledge and beliefs about obesity treatment appear to be an important barrier to bariatric counseling and referral. A survey of PCPs in 2008 found that, compared with nonreferring providers, referring providers reported more familiarity with National Institutes of Health guidelines for bariatric surgery, had completed more bariatric continuing medical education, and had greater knowledge of outcomes for bariatric surgery [11]. In a study evaluating obesity training, surveyed physicians with obesity training were more likely to refer patients for bariatric surgery and consider bariatric surgery safe [18].

Variation in bariatric referral practices between healthcare provider specialties has also been reported. Petrin et al. [10] found that one third of NPs would not recommend bariatric surgery, but only 5% of PCPs reported that they would not. Yet, multiple studies have found that PCPs are reluctant to refer for bariatric surgery due to concerns about management of postoperative medical and surgical complications and discomfort with long-term, postbariatric medical care [11,16,17,19–22].

There is also variability in PCP confidence in managing severe obesity and perceived effectiveness of bariatric surgery [16,17,22,23]. In a survey by Avidor et al. [23], 478 physicians from 6 specialties, physicians perceived bariatric surgery to be the most effective treatment option, yet recommended it less than exercise, diet, nutritional counseling, behavioral modification, and medications.

### Enabling resources

**Health policy.**—Numerous policy changes within the past decade have impacted the provision of bariatric surgery. In 2006, a Centers for Medicare & Medicaid Services coverage decision required that bariatric surgery be performed at approved facilities, which became known as “Centers of Excellence” [24]. In 2013, this stipulation was removed as evidence was published suggesting that Centers for Medicare & Medicaid Services Centers of Excellence designation was not associated with improvements in bariatric surgery

outcomes for Medicare patients [25]. Others have reported that bariatric surgery facility accreditation is associated with improved outcomes. A 2015 review of 6 studies supported the role of hospital accreditation with regard to improved bariatric surgery outcomes, including decreased complications, cost, and mortality [26]. The authors also described advantages of accreditation programs such as establishment of a uniform structure, process of care, and collection of prospective data.

**Financial.**—Amid a changing landscape of healthcare and payor regulations in the United States, the impact of health insurance coverage on obesity care and bariatric surgery is a critical issue. A meta-analysis of bariatric surgery utilization found that having private insurance (compared with government or public insurance) was associated with a higher likelihood of undergoing bariatric surgery [27]. However, a retrospective multistate study of patients undergoing bariatric surgery from 2002 to 2012 found that private insurance status was not associated with higher bariatric surgery provision when patient characteristics were adjusted for, including age, race, income, and education level [28]. A recently published study of bariatric surgery patients from West Virginia found that insurance status was the most significant barrier to care for rural residents; specifically, no Medicaid patients were approved for bariatric surgery within the study period, despite it being listed as a covered benefit [29].

Inadequate incentives for providers to offer obesity and bariatric surgery care may also pose a financial barrier. Although billing codes exist for obesity behavioral counseling in the primary care setting, a survey by Petrin et al. [10] found that few providers use them. A survey by Stanford et al. [18] found that some PCPs see inadequate reimbursement as a barrier to providing bariatric referral. In other studies, providers have indicated that ambiguity regarding whether insurance covered bariatric surgery hindered their decision to refer patients for bariatric surgery [16,17,20,21].

**Organization.**—In Andersen's [8] conceptual framework, "organization" refers to the infrastructure, personnel, and resources needed to enable providers and communities to provide a service, including organizational influences on institutional delivery of care. As Table 3 shows, there is heterogeneity in how professional societies view bariatric surgery [30–36]. The American Diabetes Association has explicitly supported bariatric surgery as a procedure that "should be recommended to treat type 2 diabetes in appropriate surgical candidates with BMI  $\geq 40$  kg/m<sup>2</sup>, regardless of the level of glycemic control or complexity of glucose-lowering regimens" [30]. For adults with BMI 35.0–39.9 kg/m<sup>2</sup>, they recommend bariatric surgery when hyperglycemia is inadequately controlled despite lifestyle and optimal medical therapy. The American College of Physicians clinical practice guideline is more conservative, stating "surgery should be considered as a treatment option for patients with a BMI  $\geq 40$  kg/m<sup>2</sup> who have instituted but failed an adequate exercise and diet program" [36]. This type of variation between statements of professional societies may lead to uncertainty regarding which patients should be referred for bariatric surgery.

Organizational barriers could also pose a challenge to bariatric care. The Veterans Health Administration (VA) convened a bariatric surgery workgroup to evaluate the utility of bariatric surgery within the system and identified the following barriers: low number of VA

facilities that perform bariatric surgery, limited surgical volume at those facilities, and coordination of care across multiple VA sites [37]. This group also proposed process mapping as a solution to standardize the process of identification and referral of VA bariatric candidates.

The structure of outpatient PCP office visits and availability of resources for patient care also affect the utilization of bariatric surgery. PCPs report that there is a lack of time [16,18], lack of equipment/ancillary resources [12,16,20], lack of effective tools and information to give to patients [18], and inefficient referral processes [18]. In a survey of 478 physicians in the United States, the most commonly reported reason for not referring for bariatric surgery was being “unacquainted with local bariatric surgeon” [23]. Another study investigating system-level factors within U. S. hospital referral regions found no association between bariatric surgery provision and the number of bariatric surgeons, number of accredited centers, or percent of patients with a recent PCP visit [38].

## Patient factors

### Predisposing

**Demographic characteristics.**—Multiple studies have reported an association between patient age and sex and the likelihood of undergoing bariatric surgery. Older adults and males have been found to be less likely to undergo bariatric surgery [28,39,40]. Both a systematic review and a meta-analysis of 8 retrospective studies support that women are significantly more likely to undergo bariatric surgery than men [27,41].

The association between race and bariatric surgery is unclear. A meta-analysis found that white patients are more likely to receive bariatric surgery compared with nonwhite patients [27]. However, another retrospective analysis from 2 academic centers in Boston found no association between race and the likelihood of undergoing bariatric surgery after adjusting for co-morbidities and socioeconomic factors such as income, education, and health insurance status [42].

**Social.**—Patient socioeconomic status, social support, and family influence are all associated with the likelihood that patients will undergo bariatric surgery. Fysekidis et al. [39] studied socioeconomic deprivation in France and found that bariatric surgery patients were less socioeconomically deprived than patients with severe obesity who did not receive surgery [39]. Patients undergoing surgery were also more likely to be able to identify someone who could provide shelter and monetary assistance if needed. The authors noted that cost was not a confounder as all eligible patients in France have fully covered access to bariatric surgery due to their publicly funded healthcare system. Lastly, a qualitative study found that patients considering bariatric surgery discussed family influence, such as a desire to “be there” for their children or grandchildren, as a motivator to choose surgery [43].

Patient residence, education level, and employment type also affect access. A meta-analysis by Bhogal et al. [27] found that having bariatric surgery was more likely for patients living in an urban area, and the retrospective analysis by Bergmann et al. [29] concluded that rural patients are less likely to complete a bariatric program [29]. A questionnaire administered to

U.S. patients found that significantly fewer patients in professional occupations had been referred for bariatric surgery by their PCP [40]. In addition, eligible patients with a higher education level more often opted for nonsurgical management [44].

**Beliefs.**—Multiple studies have found that patients considering bariatric surgery are fearful of surgery itself or potential postoperative complications [41,44,45]. In a study of adults with severe obesity who chose not to undergo bariatric surgery, patients viewed surgery as extreme, expressed concern that surgery would not change their eating habits, and had concerns regarding postsurgical diet and physical restrictions [45]. Patients have also expressed concern regarding possible postsurgical weight regain and lack of control regarding postsurgical weight loss [41].

### Enabling

**Financial.**—Although costs vary depending on the bariatric procedure and complexity of care, the 2 most common bariatric operations (Roux-en-Y gastric bypass and sleeve gastrectomy) cost >\$10,000 to undergo [46]. Qualitative studies and a systematic review have demonstrated that surgery-eligible patients view the cost of surgery as a potential barrier [40,41,43,45].

**Organization.**—Organizational barriers or facilitators include travel time to care sites and other logistical factors that affect patient ability to participate in care [8]. Livingston and Burchell [47] found that median travel distance increased for Medicare patients from 25 to 46 miles after the Centers for Medicare & Medicaid Services Centers of Excellence requirement, but did not increase for patients with other insurance types. A systematic review identified patient characteristics “not favoring receipt of bariatric surgery,” including being “unable to complete participation in bariatric surgery preoperative program indicated by multiple missed appointments or dropping out of the program,” “unable to arrange child care for clinic appointments,” “physically incapable of commuting,” and having “lack of choice regarding surgeon, type of operation, and/or hospital” [41].

### Need

**Perceived.**—Because patients typically seek care in reaction to perceived illness or disease, awareness of severe obesity as a disease with significant associated morbidity is an important motivator for seeking surgery. Wharton et al. [45] found that patients with obesity from a community-based weight management clinic who were interested in bariatric surgery were more likely to consider themselves obese compared with patients with obesity not interested in surgery. In a questionnaire prospectively collected from a cohort of patients with severe obesity during nonsurgical internal medicine visits or hospitalizations in Florida, researchers found that two thirds of patients did not identify themselves as having severe obesity. Some patients had never heard of bariatric surgery [40].

Roberson et al. [43] describe a “tipping point” at which patients with severe obesity become motivated to explore surgical options. In their qualitative study of a cohort of bariatric surgery candidates considering surgery, the main factors that contributed to this “tipping point” were worsening health issues and low energy levels that limited activity. Another

motivating condition was when a patient knew someone else who had successful bariatric surgery. A U.S. 2015 systematic review on factors associated with the likelihood of undergoing bariatric surgery and a 2017 patient survey from Germany found that some patients perceive bariatric surgery as a “last resort” [41,44]. Both studies also found that patients with higher BMIs and worse overall health were more motivated to discuss and consider bariatric surgery.

**Evaluated.**—Irrespective of a patients’ perception of whether or not they “need” bariatric surgery, “evaluated need” refers to medical need based on objective measures [8]. Recent literature suggests that there is inconsistent adherence by clinicians to clinical guidelines for evaluating whether patients “need” bariatric surgery. Auspitz et al. [20] surveyed family practitioners and found that 70% referred <5% of their patients with severe obesity for bariatric surgery. Glauser et al. [15] found that PCPs reported low familiarity with clinical guidelines including the American Association of Clinical Endocrinologists/ The Obesity Society/American Society for Metabolic & Bariatric Surgery guidelines. A 2015 survey found that 35% of PCPs were either neutral or in agreement with the statement, “I am not familiar with the indications for bariatric surgery.” The majority agreed that “BMI 35 kg/m<sup>2</sup> and co-morbidities related to obesity are an indication” for referral [21]. Other surveys have found PCPs to be less familiar with BMI qualifications for referral [18,22].

## Health behavior factors

### Personal health practices

Consideration of positive and negative personal health practices during the evaluation of patients for bariatric surgery eligibility is crucial. Negative personal health practices, such as active alcohol, tobacco, and drug use are typically disqualifying factors for bariatric surgery. In a systematic review, participation in a bariatric surgery preoperative program was commonly discontinued due to an inability to stop smoking cigarettes or marijuana [41].

Positive personal health practices have been found to be associated with both decreased and increased bariatric surgery utilization. Fischer et al. [44] reported that patients who chose nonsurgical treatment were more likely to have completed well-structured supervised diets than those who chose bariatric surgery. Another study found that patients choosing bariatric surgery more frequently participated in physical activity compared with a reference group of patients with severe obesity [39].

### Process of medical care

The process of medical care refers to the behavior of providers in their interactions with patients, including the quality of provider-patient communication and the approach to patient counseling [8]. Uncertainty regarding whether the patient or provider should initiate the conversation of obesity care, and physician discomfort with discussing obesity and bariatric surgery, may be detrimental to bariatric surgery access. A survey of PCPs in Denmark found that PCPs were less likely to refer on their own initiative versus patient initiative [19]. Surveys from both the United States and Canada have found that approximately one third of PCPs do not proactively discuss bariatric surgery [20,40]. In another study of family

practitioners, those with no history of bariatric surgery referrals were found less likely to discuss bariatric surgery with patients [20].

Some PCPs prefer a treatment approach where they let the patient set the agenda [17], but some patients report not knowing that bariatric surgery is an available treatment option [40]. When patients do not receive bariatric surgery counseling from their PCP, they report obtaining information about surgery from the internet, other patients who have had surgery, and other healthcare providers, including nurse practitioners and dietitians [45]. A survey of PCPs within a hospital system in Cincinnati found that only two thirds of the PCPs felt comfortable discussing bariatric surgery as a treatment option [21], and a survey of all family practitioners in Connecticut found that only 57% were comfortable explaining the Roux-en-Y gastric bypass procedure to patients [22]. Other barriers to communication with patients with severe obesity cited by surveyed physicians included fear of offending the patient by raising the issue, concern that the patient would not be interested in discussing the issue, and lack of training regarding discussion of obesity [15].

## Conclusion

The chasm between potential bariatric surgery candidates and utilization of bariatric surgery is presently larger than expected. Closing this gap is an important component in addressing the obesity crisis. At the contextual level, efforts to improve PCP awareness of bariatric surgery guidelines, prioritization of obesity care in physician training curriculums, and efforts to strengthen referral networks between PCPs and bariatric surgeons may be high yield. From the patient perspective, efforts to educate patients on the health consequences of severe obesity, address misconceptions regarding bariatric surgery, and empower patients to seek out bariatric surgery referral may result in increased utilization of bariatric surgery. Investing in reliable internet resources to provide information on bariatric surgery may also be a solution to time constraints for in-office counseling and give patients confidence to initiate the conversation of bariatric surgery referral.

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**Table 1**

Contextual factors contributing to bariatric surgery referral and receipt (adopted from Andersen's Behavioral Model of Health Services Use)

Type of factor	Description	Barriers/facilitators and relevant citations
Predisposing		
Provider demographic characteristics	Characteristics of a community and/or providers involved in the care of a population	Barrier: female providers [10] Facilitator: younger providers [11], providers with higher BMI [11]
Social	Measures of how patients' communities might affect their access to health services; also may include socioeconomic composition of providers	Barrier: societal normalization of obesity and stigma of obesity treatment [12] Facilitator: PCP perception that they have an important role in obesity care [12]
Beliefs	Refers to the underlying attitudes, values, and knowledge of a community, organization, or provider regarding disease management and how health services should be organized and made accessible	Barrier: PCP beliefs: that obesity is not a disease [14], that obesity is due to poor self-control [15], that lifestyle change is the most effective weight loss method [16], that patients lack motivation [16], that obesity is not a priority to treat [17]; concerns about postoperative complications and long-term, postbariatric medical care [11,16,17,19–22], lack of confidence managing obesity [16], misperception regarding bariatric surgery effectiveness [16,17,22,23], preference to recommend nonsurgical treatments for obesity [23], NPs less likely to refer for bariatric surgery [10] Facilitator: obesity classification as a disease [14], PCP as obesity care provider [10], PCP familiarity with NIH guidelines and obesity care [11], completion of bariatric CME [11], physician obesity-related training [18]
Enabling		
Health policy	Authoritative decisions made pertaining to health or influencing the pursuit of health.	Barrier: CMS coverage mandate requiring surgery at COE [24,47] Facilitator: COE accreditation [26]
Financing	Measures that reflect the amount of financial resources potentially available (e.g., per capita community income) to pay for health services, incentives to provide services, and health insurance coverage rates/types	Barrier: Medicaid insurance [29], low usage of obesity-related billing codes [10], PCP perception of inadequate provider reimbursement [18], bariatric surgery cost and insurance coverage influence PCP referral decision [16,17,20,21] Facilitator: Private insurance [27]
Organization	The amount, distribution, and connectedness of hospitals, clinics, and healthcare personnel available for a given service (e.g., bariatric surgery), as well as how care is delivered at a given institution	Barrier: professional society statement heterogeneity [30–36], low number of bariatric surgery facilities [37], low bariatric surgical volume [37], difficult bariatric care coordination [37], inadequate time for patient encounters [16,18], lack of equipment and ancillary support for obesity care [12,16,20], lack of effective tools and information to give patients [18], inefficient referral process [18], PCPs being unacquainted with bariatric surgeons [23] Facilitator: higher overall surgical volume [38]

BMI = body mass index; PCP = primary care physician; NP = nurse practitioner; NIH = National Institute of Health; CME = continuing medical education; CMS = Centers for Medicare & Medicaid Services; COE = Centers of Excellence.

**Table 2**

Individual factors contributing to bariatric surgery referral and receipt (adopted from Andersen's Behavioral Model of Health Services Use)

Type of factor	Description	Barriers/facilitators and relevant citations
Predisposing		
Demographic	Patient demographic characteristics and characteristics that affect the likelihood a person will need health services	Barrier: older age [41] Facilitator: younger age [39], female sex [27,39,41], white race [27]
Social	Measures of a persons' status in the community and/or ability to cope with problems and use resources	Barrier: socioeconomic deprivation [39], rural residence [29], higher education level [44], professional occupation employment [40] Facilitator: urban residence [27], community social support [39], family influence [43]
Beliefs	Patient attitudes, values, and knowledge about health and health services (i.e., severe obesity, bariatric care) that can subsequently influence their perception of need and use of a health service	Barrier: fear of surgery [44] and postoperative complications [41,44,45], perception of surgery as "extreme" [45], concerns regarding postoperative restrictions [45], weight regain [41], and lack of control over amount of weight loss [41]
Enabling		
Financing	Wealth available to a patient for health services, including the effective price of healthcare as determined by insurance status	Barrier: cost of bariatric surgery [40,41,45], patient uninsured status [40,43]
Organization	Encompasses whether a person has a regular source of care, location/type of care, their geographic distance from facilities, means of transportation, and wait times for consultations, referrals, etc.	Barrier: longer travel time to bariatric care facilities [47], unable to participate in preoperative program as indicated by missed appointments [41], lack of child care support for clinic appointments [41], physically incapable of commute [41], lack of choice regarding hospital, operation type, or surgeon for treatment [41]
Need		
Perceived	Refers to how patients view their state of health (e.g., BMI, comorbidities), how much it causes them to worry, and how often they experience symptoms/ill-effects. This perception contributes to patient motivation to seek care or not	Barrier: not perceiving self as having severe obesity [13,40], unaware of bariatric surgery treatment [40], perception that bariatric surgery is a last resort [41,44] Facilitator: perceiving self as obese [45], worsening health status [43], low energy levels limiting activity [43], knowing someone who had successful bariatric surgery [43], higher BMI [41,44], higher number of co-morbidities [41,44]
Evaluated	Represents the necessity/indication for medical care/an intervention; dependent on objective measurement of a patients' health and professional judgment based on clinical standards	Barrier: appropriateness for referral miscalculated due to inconsistent PCP adherence to evidence-based guidelines [20], PCP unfamiliarity with bariatric surgery indications and guidelines [15,18,21,22]
Health behaviors		
Personal health practices	Patient practices that can affect health status	Barrier: inability to complete preoperative program after referral due to tobacco and marijuana use [41], preference for supervised diets as treatment [44] Facilitator: physical activity participation [39]
Process of medical care	Characterized as the behavior of physicians interacting with patients during the delivery of care, or interactions between physicians	Barrier: PCP deferring to patient to set treatment agenda [17] or initiate referral [19,20,40,45], inexperience providing bariatric referrals [20], discomfort counseling on obesity management [21] and explaining bariatric surgery procedures [22], fear of offending patients [15], perception that patients will be uninterested in discussing bariatric surgery [15], lack of communication training for obesity discussion [15]

BMI = body mass index; PCP = primary care physician.

**Table 3**

Summary of bariatric surgery and obesity care related statements from professional organizations and National Institute of Health

Professional organization	Yr	Body mass index criteria	Statements regarding bariatric surgery and obesity care
American Diabetes Association (ADA) [30]	2017	40 kg/m <sup>2</sup>	“Metabolic surgery should be recommended to treat type 2 diabetes in appropriate surgical candidates regardless of the level of glycemic control or complexity of glucose-lowering regimens.”
		35–40 kg/m <sup>2</sup>	“Metabolic surgery should be recommended to treat type 2 diabetes in appropriate surgical candidates when hyperglycemia is inadequately controlled despite lifestyle and optimal medical therapy.”
		30–35 kg/m <sup>2</sup>	“Metabolic surgery should be considered for adults with type 2 diabetes if hyperglycemia is inadequately controlled despite optimal medical control by either oral or injectable medications.”
American Academy of Family Physicians (AAFP) [31]	2016	-	“Bariatric surgery results in greater weight loss than nonsurgical weight loss interventions. “ “Bariatric surgery is highly effective in treating obesity-related co-morbidities, particularly diabetes mellitus.” “Bariatric surgery reduces obesity-related mortality.”  “Advise adults who are motivated to lose weight and who have not responded to behavioral treatment with or without pharmacotherapy with sufficient weight loss to achieve targeted health outcome goals that bariatric surgery may be an appropriate option to improve health and offer referral to an experienced bariatric surgeon for consultation and evaluation.”
American Heart Association (AHA)/American College of Cardiology (ACC)/The Obesity Society (TOS) [32]	2013	40 kg/m <sup>2</sup> 35–40 kg/m <sup>2</sup> with obesity-related co-morbid conditions	“Insufficient evidence to recommend for or against undergoing bariatric surgical procedures”
		<35 kg/m <sup>2</sup>	“Patients for whom bariatric surgery would not be associated with excessive risk should be offered bariatric surgery.”
American Association of Clinical Endocrinologists(AACE)/TOS/ American Society for Metabolic & Bariatric Surgery (ASMBS) [33]	2013	0 kg/m <sup>2</sup> without coexisting medical problems	“...may also be offered a bariatric procedure”
		35–40 kg/m <sup>2</sup> and one or more severe obesity-related co-morbidity	“...may also be offered a bariatric procedure”
		30–35 kg/m <sup>2</sup> with diabetes or metabolic syndrome	“...may also be offered a bariatric procedure”
U.S. Preventative Services Task Force (USPSTF) [34]	2012	-	“Screen all adults for obesity”  “Patients should be offered or referred to intensive, multicomponent behavioral interventions. “
American College of Physicians (ACP) [36]	2005	—	“Patients should be referred to high volume centers with surgeons experienced in bariatric surgery.”
		40 kg/m <sup>2</sup> with obesity-related co-morbid conditions	“Surgery should be considered as a treatment option for patients who instituted but failed an adequate exercise and diet program (with or without adjunctive drug therapy). A doctor-patient discussion of surgical options should include the long-term side effects, such as possible need for reoperation, gall bladder disease, and malabsorption.”
		-	“Patients judged by experienced clinicians to have a low probability of success with nonsurgical measures may be considered for surgery. A gastric restrictive or bypass procedure should be considered only for well-informed and motivated patients in whom the operative risks are acceptable.”
National Institute of Health (NIH) [35]	1991	>40 kg/m <sup>2</sup> 35–40 kg/m <sup>2</sup> with high risk co-morbid conditions or obesity-induced physical	“Patients are potential candidates for surgery if they strongly desire substantial weight loss, because obesity severely impairs the quality of their lives.” “. may also be considered for surgery”

Professional organization	Yr	Body mass index criteria	Statements regarding bariatric surgery and obesity care
		problems that interfere with lifestyle	

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