REVIEW
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Bariatric surgery outcomes in obese adults with cognitive impairments: A systematic review

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ABSTRACT

Obesity is highly prevalent among individuals with cognitive impairments, yet bariatric surgery is often underutilized in this population due to concerns regarding adherence and safety. The aim of this review is to evaluate the outcomes of bariatric surgery in obese adults with cognitive impairments, focusing on weight loss, cognitive function, general health, and postoperative risks. A systematic review of 11 studies was conducted, including case reports, cohort studies, and pilot trials that investigated bariatric surgery outcomes in adults with intellectual disabilities, neurodevelopmental disorders, or acquired cognitive dysfunction. Outcomes included excess weight loss (EWL), cognitive changes, comorbidity resolution, and postoperative complications. Most studies reported significant weight loss, although slightly lower than in neurotypical populations (EWL ranging from 31.1% to 90%). Cognitive improvements were observed in domains such as memory and executive function within weeks after surgery. Bariatric surgery also led to notable improvements in comorbidities such as diabetes and hypertension. However, risks included nutritional deficiencies and poor adherence, particularly in patients with low preoperative cognitive function. Strong caregiver support and structured follow-up programs were key predictors of long-term success. Bariatric surgery can be a safe and effective intervention for adults with cognitive impairments when tailored support systems are implemented. Cognitive screening and personalized postoperative care are essential to optimize outcomes.

Keywords: Bariatric and metabolic surgery, gastrointestinal surgery, minimal invasive surgery

INTRODUCTION

Bariatric surgery is a well-established intervention for severe obesity, providing significant and sustained weight loss while improving metabolic health and reducing obesity-related comorbidities such as type 2 diabetes, hypertension, and obstructive sleep apnea (1). Beyond these physical health benefits, emerging evidence suggests that bariatric surgery may also influence cognitive function, as obesity is increasingly recognized as a risk factor for neurocognitive decline (2). Obesity is notably prevalent among individuals with non-acquired cognitive impairments, such as intellectual disabilities, neurodevelopmental disorders, and neurodegenerative conditions (3). Despite the known benefits of bariatric surgery in the general population, its effectiveness and safety in cognitively impaired patients remain a subject of debate (4). Individuals with pre-existing cognitive impairments, such as those with intellectual disabilities or psychiatric conditions, may experience additional challenges in weight management, adherence to dietary recommendations, and long-term lifestyle changes following surgery (5). While some studies indicate that bariatric surgery can lead to improvements in cognitive function through mechanisms such as reduced systemic inflammation and enhanced cerebral oxygenation, concerns remain regarding postoperative adherence and the risk of nutritional deficiencies that could negatively impact cognition (5). Understanding the complex relationship between bariatric surgery and cognitive function is essential for optimizing patient outcomes, particularly for those with cognitive impairments.

Clinical and Research Consequences

A comprehensive literature search was conducted using Scopus, Web of Science, and Medline to identify studies on bariatric surgery outcomes in obese adults with cognitive impairments that were published over the last 15 years. Keywords such as "bariatric surgery", "cognitive impairment", "intellectual disability", and "weight loss" were used to ensure a broad yet relevant selection of studies. Boolean operators

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(AND, OR) were applied to refine the search. The initial search yielded 241 studies. After applying the inclusion and exclusion criteria, 11 studies remained for final analysis, all of which were published in English (Table 1).

Studies were included if they were published in the last 15 years, focused on adults aged 18 years or older, and were written in English. Eligible studies examined bariatric surgery outcomes in patients with cognitive impairments, including intellectual disabilities (e.g., Down syndrome), neurodegenerative disorders (e.g., Alzheimer's, Parkinson's), or acquired cognitive dysfunction (e.g., traumatic brain injury, stroke). Studies had to report at least one of the following: Weight loss outcomes, metabolic improvements, cognitive function changes, postoperative adherence, or psychological effects.

Studies were excluded if they focused only on cognitively normal patients, were review articles or editorials, or lacked primary data. Data extraction focused on study design, sample characteristics, type of bariatric procedure, weight loss outcomes, metabolic improvements, cognitive function assessments, postoperative adherence, and complications (Figure 1).

A qualitative synthesis was conducted to summarize findings, and all included studies were published in high-quality, peer-reviewed journals. This systematic approach ensured a focused and high-quality evaluation of bariatric surgery outcomes in obese adults with cognitive impairments.

Several studies demonstrated that bariatric surgery results in clinically significant weight loss in obese individuals with cognitive impairments, though outcomes may vary based on cognitive capacity and surgical approach.

In Cazzo et al. (6), two patients, one with Prader-Willi syndrome and another with Down syndrome, achieved 55% and 90% excess weight loss (EWL), respectively, one year after surgery. Daigle et al. (7) reported a mean 31.1% EWL at an average follow-up of 33.7 months in a cohort of six patients with lifelong cognitive impairment, although individual results ranged widely.

Heinberg and Schauer (8) described a patient with borderline intellectual functioning who maintained 74% EWL over 4.5 years. This was attributed to structured pre- and post-operative support. Similarly, Vermeer et al. (9) showed that patients with cognitive or psychiatric comorbidities achieved an average of 27.4% total weight loss over four years, slightly less than the general population but still clinically successful.

Short-term outcomes also reflected consistent weight reduction. Spitznagel et al. (5) reported 6.6% to 16.2% total weight loss within 4-6 weeks postoperatively. Another longitudinal study found that patients' body mass index decreased from 45.11 to 31.69 kg/m^2 over 36 months, with early cognitive performance (e.g., memory, working memory, and generativity) predicting long-term success (10).

Across these studies, better preoperative or early postoperative cognitive function was consistently associated with superior weight loss outcomes and long-term weight maintenance (10).

Studies have demonstrated significant improvements in metabolic health following bariatric surgery, including diabetes remission, improved cardiovascular markers, and reduced inflammation. This is reinforced by the Cazzo et al. (6) study, which showed significant improvements in obesity-related conditions for the two reported cases. The Prader-Willi syndrome patient, who previously had impaired glucose tolerance and a walking disability, experienced complete resolution of impaired glucose tolerance and improved mobility. The patient with Down syndrome, diagnosed with hypertension, saw resolution of his high blood pressure post-surgery. Both individuals also exhibited improvements in lipid profiles, such as reduced low-density lipoprotein and triglyceride levels and increased HDL cholesterol, suggesting that bariatric surgery can provide broad health benefits beyond weight loss even in cognitively impaired individuals (6).

However, cognitive impairments may influence the management of these health improvements. Individuals with poorer executive function and memory may struggle with medication adherence, dietary compliance, and medical follow-ups, potentially affecting long-term outcomes (7). Spitznagel et al. (5) further supports this, finding that while bariatric surgery is associated with improvements in type 2 diabetes, hypertension, and dyslipidemia, low adherence rates post-surgery such as poor dietary habits, inadequate physical activity, and insufficient protein intake can hinder success, particularly among those with cognitive dysfunction.

Bianciardi et al. (10) also confirmed improvements in obesity-related comorbidities, including hypertension, diabetes, and sleep apnea. However, patients with preoperative binge eating disorder exhibited a greater risk for long-term weight regain, highlighting the need for ongoing behavioral interventions beyond the first year following surgery (10).

Another study emphasized that patients with lower cognitive function may struggle to maintain lifestyle changes, which could lead to suboptimal outcomes. Approximately 16.2% of participants experienced some weight regain between 12 weeks and 36 months, reinforcing the importance of cognitive capacity in sustaining health benefits (11).

Daigle et al. (7) reported that patients with cognitive impairment often present with multiple obesity-related comorbidities, and those with greater weight loss were more likely to experience comorbidity resolution. Importantly, a strong social support system was found to enhance postoperative adherence, including dietary restrictions and follow-up attendance (7).

Table 1. Includes all studies

Study title	Number of patients	Type of bariatric surgery	Type of cognitive disorder	BMI before surgery	BMI after surgery	Weight reduction (%)	Post-op complications
Spitznagel et al. (5)	37	LRYGB	Cognitive impairment affecting adherence (attention, executive function, memory)	45.59	Not provided	11.24%	Nausea (5), Infection (2), Stricture (1), Anemia (1)
Cazzo et al. (6)	2 (case report)	Biliopancreatic diversion (1), RYGB (1)	Severe cognitive impairment (Prader-Willi syndrome, Down syndrome)	55 / 41.5	38.5/26.7	55%/90% EWL	No significant complications
Daigle et al.(7)	6	RYGB (2), Sleeve (3), Adjustable Band (1)	Nonacquired cognitive impairment (trisomy 21, unknown causes)	49.4	41	31.1% EWL	No significant complications, 1 readmission (fever)
Heinberg and Schauer (8)	1 (case study)	RYGB	Borderline intellectual disability	47.9	31.2 (4.5 years)	74% EWL (2 years)	No complications, improved sleep apnea, hyperlipidemia
Vermeer et al. (9)	2525 (163 psychiatric group)	Not specified (likely RYGB)	17.9% had cognitive impairment (also mood disorders, PTSD, ADHD)	Not provided	Not provided	Psychiatric group: 27.4% TWL (1 yr), 21.6% (4 yrs)	Psychiatric group had lower weight loss
Bianciardi et al. (10)	78	Mostly sleeve gastrectomy (82%)	Cognitive impairment (executive function, memory) & BED	43.15	Not explicitly mentioned	58.13% (1 year), 54.83% (4 years)	Patients with BED had poorer weight loss
Spitznagel et al. (11)	55	Mostly RYGB (1 gastric band)	Cognitive impairment affecting memory, executive function, and adherence	45.11	31.69	69% lost >25% weight at 36 months	Not explicitly detailed
Alosco et al. (12)	50	Mostly RYGB (1 gastric band)	Cognitive impairment (attention, executive function, memory)	46.61	32.35	Not explicitly mentioned	Weight regains (24-36 months), decline in attention
Manderino et al. (13)	116	Bariatric surgery candidates (type not specified)	Cognitive dysfunction (emotion recognition)	46.29	Not provided	Not provided	Not applicable (pre-surgery study)
Custers et al. (14)	133	RYGB	Obesity-related cognitive impairment	Not provided	Not provided	Not explicitly mentioned	42.9% cognitive improvement at 24 months, brain structure changes in temporal lobe
Tucker et al. (15)	6 bariatric patients, 10 normal-weight controls, 7 reference controls	Sleeve gastrectomy	Obesity-associated cognitive impairment	41.9±3.9	Not explicitly mentioned	Significant weight loss observed (exact % not stated)	17% cognitive improvement at 2 weeks, 21% at 14 weeks; improved macrovascular function but no CVR change

BMI: Body mass index, BED: Binge eating disorder: RYGB: Roux-en-Y gastric bypass, CVR: Cerebral vascular reactivity, LRYGB: Laparoscopic Roux-en-Y gastric bypass, PTSD: Post-traumatic stress disorder, ADHD: Attention deficit hyperactivity disorder, EWL: Excess weight loss.

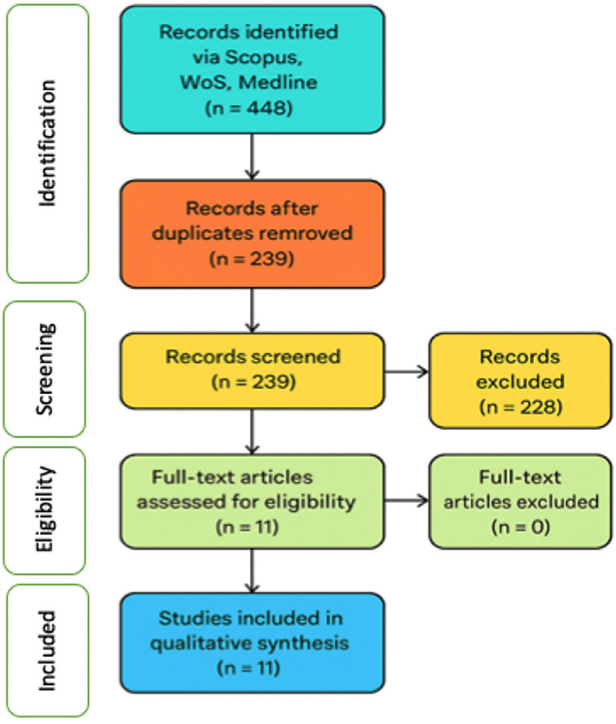

Figure 1. The process for selecting the included studies.

Similarly, Heinberg and Schauer (8) documented significant resolution or improvement in sleep apnea, hyperlipidemia, asthma, and acid reflux. Their case also showed reduced seizure frequency and emphasized the value of structured education and monitoring in supporting cognitively impaired individuals post-surgery.

Vermeer et al. (9) found that while the psychiatric cohort including those with cognitive impairment had slightly smaller improvements in physical health-related quality of life compared to the general population, outcomes were still clinically significant. Interdisciplinary support was critical in enhancing long-term health outcomes.

Finally, Alosco et al. (12) found improvements in comorbidities such as type 2 diabetes and hypertension, along with reduced use of antihypertensive medications. Neuroimaging results suggested structural brain changes, including increased cortical thickness and vascular efficiency, pointing to possible neuroprotective effects. However, reductions in gray matter and cerebral blood flow in some areas suggest that these changes may be due to metabolic shifts rather than direct cognitive benefits (13,14).

The study by Tucker et al. (15) examined the effects of bariatric surgery on cerebral vascular reactivity (CVR) and cognitive function in severely obese individuals. Obese patients demonstrated lower cognitive function than normal-weight controls prior to surgery, but cognitive performance improved by 17% at two weeks and 21% at 14 weeks post-surgery. Although these cognitive gains were not directly linked to changes in CVR or middle cerebral artery (MCA) vasodilation, the elimination of preoperative MCA vasoconstriction in 60% of patients suggests some macrovascular improvement. The findings imply that metabolic or hormonal changes may contribute to early cognitive recovery, though the exact mechanisms remain uncertain (15,16).

Manderino et al. (13) explored preexisting cognitive deficits among bariatric surgery candidates, identifying impairments in executive function, memory recall, and attention switching. These deficits were associated with poorer emotion recognition, potentially affecting psychological well-being and social interactions. The study raises questions about whether individuals with such impairments may experience cognitive improvement post-surgery or continue to struggle in these areas.

Similarly, Spitznagel et al. (11) found that 5.3% of bariatric candidates exhibited clinically significant cognitive impairments, and subclinical deficits were common in memory, attention, and executive function. These impairments were associated with lower adherence to postoperative guidelines. The study emphasizes that early postoperative success is more influenced by preoperative cognitive status than by potential post-surgical improvements (5).

Bianciardi et al. (10) also highlighted the importance of preoperative executive function in long-term weight management. Cognitive deficits in planning, problem-solving, and impulse control were linked to maladaptive eating behaviors and lower adherence to postoperative recommendations. However, the study did not measure postoperative cognitive change, leaving the question of surgery-induced cognitive improvement open.

Further evidence of cognitive enhancement is presented in a study showing significant improvements in memory and executive function at 12 weeks post-surgery, with continued benefits up to 36 months. Improvements in memory and executive function were observed up to 36 months post-surgery. Nonetheless, the study stresses that early postoperative cognitive performance is a strong predictor of long-term success, indicating a need for additional support for patients with lower baseline function (11).

The study by Cazzo et al. (6) reports that both cognitively impaired patients recovered without major postoperative complications. Neither the patients nor the control group experienced protein-calorie malnutrition, a common concern following procedures like biliopancreatic diversion or Roux-en-Y gastric bypass. Strong caregiver support was identified as essential in ensuring adherence to dietary guidelines and follow-up care, reinforcing

the importance of long-term monitoring to sustain health outcomes and prevent malnutrition-related issues.

While Manderino et al. (13) does not focus on physical complications, it highlights psychological risks associated with bariatric surgery, particularly in individuals with cognitive impairments. These patients may be more vulnerable to depression, anxiety, and social withdrawal, which may worsen after surgery due to changes in body image and impaired emotion recognition. This underscores the need for psychological screening and postoperative support.

Spitznagel et al. (5) link cognitive dysfunction with poor adherence to key postoperative guidelines, including protein intake, vitamin supplementation, and physical activity. Although most early physical complications (e.g., nausea, infections, anemia, and mild strictures) resolved by the time of follow-up, the study suggests that cognitive impairments increase the risk for nutritional deficiencies and weight regain. Tailored interventions, such as structured reminders and simplified plans, may help mitigate these risks.

Bianciardi et al. (10) also underline the need for ongoing mental health assessment post-surgery. Although psychopathology was not directly associated with weight loss outcomes, the risk of depression and self-harm remains elevated, particularly after the initial weight loss period. The study also notes that older patients tend to achieve less effective outcomes, possibly due to longstanding comorbidities and reduced metabolic responsiveness (10).

Additional findings confirm that cognitive impairments, especially in memory and executive function, can hinder adherence to dietary and exercise regimens, increasing the likelihood of nutritional complications and suboptimal long-term outcomes. These patients may require structured, individualized support to manage their postoperative care effectively (11).

Daigle et al. (7) reported no major complications or mortality in their cohort, though one patient was readmitted briefly for a postoperative fever. The study highlights that patients with lower independent functioning may be at higher risk for poor outcomes, emphasizing the importance of careful patient selection and comprehensive support systems (7).

Heinberg and Schauer (8) likewise observed no major surgical complications. However, their case required more frequent follow-ups, and they initially faced challenges with dietary compliance. Success was ultimately achieved through structured, ongoing support. The study also raises ethical considerations regarding informed consent and the suitability of bariatric surgery in patients with intellectual disabilities, a group often excluded from such interventions (8).

This review has examined the outcomes of bariatric surgery in cognitively impaired adults with obesity, focusing on studies published over the past 15 years, in light of advancements in surgical techniques during this period. In contrast to previous reviews, which have included both adult and pediatric populations and incorporated studies regardless of publication date, the present analysis provides a more focused and contemporarily relevant synthesis of the evidence (17,18).

Most studies report clinically significant reductions in excess weight in cognitively impaired patients after bariatric surgery. However, the degree of weight loss tends to vary based on the type and severity of cognitive impairment, the presence of structured support systems, and the patient's baseline executive functioning (6,9,10). Patients with higher levels of executive function particularly in areas such as impulse control, attention, and planning achieve greater weight loss and are more likely to maintain it over time (7,10,15).

In comparison to behavioral-only interventions, as highlighted in Spanos et al. (18), surgical interventions appear to offer greater and more sustained weight loss in patients with obesity and intellectual disabilities. While Spanos emphasized lifestyle-based strategies, our review demonstrates that when surgical interventions are delivered within a structured and supportive framework, they can yield favorable outcomes even in cognitively vulnerable populations. Thus, a multidisciplinary and individualized approach remains essential to success.

Emerging evidence suggests that bariatric surgery may lead to improvements in cognitive function, even among individuals with pre-existing cognitive impairments. Several studies included in this review observed enhancements in domains such as memory, executive function, and attention, beginning as early as two weeks post-surgery and extending up to three years in some cases (10,11,13,15). These improvements are particularly relevant given the strong association between obesity, systemic inflammation, insulin resistance, and cerebral perfusion, all of which are known contributors to cognitive decline (2,12).

The mechanisms underlying postoperative cognitive improvements are not yet fully understood, but several hypotheses have been proposed. These include increased cerebral oxygenation, improved vascular reactivity, reduced levels of pro-inflammatory cytokines, and better metabolic regulation following significant weight loss (12,15,16). In some neuroimaging studies, structural brain changes such as increased cortical thickness and improved white matter integrity were documented, further supporting the possibility of neuroplastic recovery (16).

Importantly, the degree of cognitive improvement appears to be modulated by baseline cognitive status. Patients with milder impairments or borderline intellectual functioning

may experience more pronounced cognitive gains, likely because they are better able to engage with postoperative recommendations and benefit from enhanced metabolic health (5,11). Conversely, patients with more severe intellectual disabilities may experience stabilization rather than dramatic improvement, which is still a valuable outcome in preventing further decline.

However, the literature also highlights significant variability in cognitive outcomes. Some studies reported minimal or no improvement in certain subgroups, while others warned of possible neuropsychiatric risks such as mood instability or poor adjustment to body image changes postoperatively (7,8). These mixed findings underscore the importance of individualized cognitive screening both before and after surgery, along with continuous psychosocial support throughout the recovery process.

While Thiara et al. (17) demonstrated consistent cognitive improvements across psychiatric populations after bariatric surgery, their findings also emphasized the need to distinguish between neurodevelopmental conditions and acquired cognitive dysfunctions, as the trajectories of recovery may differ. Our review supports similar conclusions, showing that surgery-related cognitive benefits are most pronounced when paired with structured postoperative care and close follow-up.

Overall, the evidence supports the notion that cognitive improvement is possible, and in some cases likely, following bariatric surgery in cognitively impaired individuals. Nevertheless, more research, particularly longitudinal studies with standardized neuropsychological assessments, is needed to fully characterize the nature, timeline, and sustainability of these cognitive changes.

While bariatric surgery is generally considered safe, cognitively impaired patients face unique risks that can affect both surgical outcomes and long-term health. The most frequently reported complications in this population include nutritional deficiencies, psychological distress, poor adherence to postoperative guidelines, and a higher likelihood of weight regain (7,8,11).

Patients with intellectual or neurocognitive impairments may struggle to fully understand and comply with complex dietary instructions, supplement regimens, and physical activity recommendations required after surgery. Cognitive deficits in memory, planning, and attention can make it difficult to maintain consistent protein intake, vitamin supplementation, or hydration, putting patients at increased risk for complications such as anemia, vitamin B12 deficiency, and dehydration (5,7).

In addition to physical complications, several studies reported elevated rates of emotional and behavioral disturbances postoperatively. These include mood swings, depressive symptoms, anxiety, and difficulty adjusting to rapid body image changes (7,8). Emotion regulation can be particularly challenging for patients with pre-existing psychiatric comorbidities or impaired emotion recognition, which are common in this population.

While most studies in this review reported low rates of major surgical complications, such as infections or anastomotic leaks, the risk of long-term non-adherence remains one of the most significant concerns. This is especially critical because postoperative success in bariatric patients is highly dependent on sustained lifestyle changes, which require cognitive engagement and behavioral consistency (5,8,11).

Caregiver involvement emerged as a protective factor across multiple studies. Patients who received daily support such as meal preparation, medication reminders, and transportation to follow-up visits had fewer complications and better adherence to care protocols (7,11). These findings are consistent with previous literature on neurodevelopmental and psychiatric populations, where structured support systems have repeatedly been shown to mitigate adverse outcomes and enhance treatment adherence (14,19). In contrast, patients lacking consistent supervision or structure were more vulnerable to both physical and psychological setbacks.

Interestingly, a few studies reported lower-than-expected complication rates in some cognitively impaired patients, particularly when robust support systems were in place. For example, Vermeer et al. (9) noted that despite psychiatric comorbidities, patients achieved clinically meaningful weight loss with limited complications. Similarly, Heinberg and Schauer (8) documented successful long-term outcomes in a patient with borderline intellectual functioning, suggesting that individual and environmental factors may offset some of the risks typically associated with cognitive impairment.

Ethical and legal considerations also arise in this context, particularly regarding informed consent. Some patients may lack the cognitive capacity to fully understand the nature, risks, and long-term requirements of bariatric surgery. In these cases, a multidisciplinary team including psychologists, legal guardians, and ethics consultants should be involved to ensure that decisions align with the patient's best interests and respect their autonomy (8).

Despite these concerns, it is important to note that mortality rates in this population remain low and are generally unrelated to the surgical procedure itself (9). With the implementation of tailored education, structured postoperative plans, and ongoing monitoring, many of these risks can be successfully mitigated.

Study Limitations

This review has several limitations. First, there is a small number of eligible studies, because most are case reports or pilot studies, with limited statistical power, precluding a meta-analysis.

Additionally, the heterogeneity of cognitive impairments, including Prader-Willi syndrome, Down syndrome, and acquired impairments, limits the ability to make uniform comparisons. Most of these reports have short follow-up durations, and long-term cognitive and metabolic outcomes beyond 3-4 years remain unknown. Additionally, most of the data originate from Western countries, which may limit the generalizability of findings to other populations.

Recommendations

To optimize bariatric surgery outcomes in adults with cognitive impairment, several integrated strategies are recommended. All candidates with known or suspected cognitive deficits should undergo a comprehensive preoperative neuropsychological evaluation. This allows clinicians to identify impairments such as executive dysfunction or memory issues that may affect the patient's ability to adhere to postoperative instructions and sustain long-term lifestyle changes.

The surgical process should be guided by a multidisciplinary team composed of bariatric surgeons, psychologists, dietitians, primary care providers, and, when necessary, legal or ethical consultants. This collaborative approach ensures that the medical, cognitive, and psychosocial complexities of each patient are thoroughly addressed. Preoperative education must be tailored to the cognitive level of the patient, using simplified language, visual aids, repetition, and active caregiver involvement to enhance comprehension and retention.

Postoperative care should be highly structured, featuring regular follow-up appointments, clear and written instructions for medications, diet, and physical activity, and an emphasis on consistency. A responsible caregiver plays a crucial role in supporting the patient through this process. Caregivers should receive training and guidance on tasks such as managing medications, planning meals, and coordinating follow-up visits.

Ongoing psychological monitoring is essential, as individuals with cognitive impairments may be at increased risk for emotional distress, body image dissatisfaction, and social isolation following surgery. Access to mental health services should be integrated into postoperative care to support emotional well-being. For patients with limited decisional capacity, ethical safeguards must be in place. This may include legal guardianship, and consultation with ethics committees to ensure informed consent is valid and that the decision to proceed with surgery aligns with the patient's best interests.

Finally, future research should focus on conducting longitudinal studies and randomized controlled trials to investigate the long-term metabolic, psychological, and cognitive outcomes of bariatric surgery in this population. Such research is essential to inform clinical practice and enhance the safety and efficacy of surgical interventions for cognitively impaired individuals.

CONCLUSION

Bariatric surgery is an effective intervention for weight loss and metabolic health improvements, but its success is highly dependent on patient adherence and cognitive capacity. Patients with intellectual disabilities can benefit significantly from surgery, but they require additional support, structured lifestyle modifications, and long-term monitoring to optimize outcomes. Future research should focus on tailored interventions that enhance adherence and minimize cognitive and psychological barriers to success.

Footnotes

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