Long-Term Follow-Up After Bariatric Surgery With a Focus on General Practitioners: A Scoping Review

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Abstract

Introduction

Obesity is a growing public health concern, with lifestyle interventions and pharmacotherapy playing a crucial role in weight management. However, for patients with severe obesity, bariatric surgery remains the most effective long-term treatment, leading to significant weight loss and metabolic improvements. Despite these benefits, bariatric surgery is associated with various early and late postoperative complications, highlighting the need for structured long-term follow-up.

Objectives

This scoping review aims to explore postoperative complications and interventions that minimize these complications within a holistic perspective, with a primary focus on the role of general practitioners in multidisciplinary long-term follow-up in Belgium.

Methods

A scoping review was conducted according to the PRISMA-ScR guidelines. A systematic search of PubMed and Embase was performed to identify studies published in the last 10 years related to bariatric surgery, postoperative follow-up, and adverse effects. Studies were screened based on predefined inclusion and exclusion criteria. Data extraction included study characteristics, patient population, intervention details and reported outcomes.

Results

A total of 30 studies were included, categorized into key themes: long-term follow-up and nutritional deficiencies, osteoporosis, gallstone disease, iron deficiency, hypoglycemia, gastroesophageal reflux disease and psychological outcomes. The findings emphasized the importance of structured follow-up, with regular monitoring of nutritional status, physical activity and psychological health. Pharmacological interventions, such as ursodeoxycholic acid for gallstone prevention and GLP-1 receptor agonists for post bariatric hypoglycemia, showed potential benefits. However, adherence to follow-up protocols remains a challenge.

Conclusion

Long-term follow-up after bariatric surgery is essential for preventing and managing complications. A multidisciplinary approach, with general practitioners playing a central role, along with dietitians and psychologists, is necessary to optimize patient outcomes. Given the rising number of bariatric procedures, Belgium requires standardized national guidelines and improved reimbursement policies to enhance long-term patient care.

Abstract

Inleiding

Obesitas is een toenemend probleem van de volksgezondheid, waarbij levensstijlinterventies en farmacotherapie een cruciale rol spelen in de behandeling van overgewicht en obesitas. Voor patiënten met ernstige obesitas blijft bariatrische chirurgie echter de meest effectieve langetermijnbehandeling omwille van significant gewichtsverlies en vermindering van co-morbiditeiten. Ondanks deze voordelen gaat bariatrische chirurgie gepaard met verschillende vroege en late postoperatieve complicaties, wat het belang van een gestructureerde lange termijn opvolging benadrukt.

Doelstellingen

Deze scoping review heeft als doel postoperatieve complicaties na bariatrische chirurgie te onderzoeken en de interventies te identificeren die deze complicaties kunnen minimaliseren binnen een holistisch perspectief, met een specifieke focus op de rol van huisartsen in multidisciplinaire lange termijn opvolging in België.

Methodologie

Een scoping review werd uitgevoerd volgens de PRISMA-ScR richtlijnen. Een systematische zoekopdracht in PubMed en Embase identificeerde studies van de afgelopen 10 jaar over bariatrische chirurgie, postoperatieve opvolging en bijwerkingen. Studies werden geselecteerd op basis van vooraf bepaalde inclusie- en exclusiecriteria. Data extractie omvatte studie kenmerken, patiëntenpopulatie, interventie en gerapporteerde uitkomsten.

Resultaten

In totaal werden 30 studies opgenomen, onderverdeeld in de volgende thema's: lange termijn opvolging en nutritionele tekorten, osteoporose, galsteenlijden, ijzertekort, hypoglycemie, gastro-oesofageale refluxziekte en psychologische uitkomsten. De bevindingen benadrukken het belang van gestructureerde opvolging met regelmatige monitoring van nutritionele status, fysieke activiteit en psychologische gezondheid. Farmacologische interventies, zoals ursodeoxycholzuur voor de preventie van galstenen en GLP-1-receptoragonisten voor postbariatrische hypoglycemie, toonden mogelijke voordelen. Echter, opvolging van follow-up protocols blijft een uitdaging.

Conclusie

Lange termijn opvolging na bariatrische chirurgie is essentieel voor het voorkomen en minimaliseren van complicaties. Een multidisciplinaire aanpak, waarbij huisartsen een centrale rol spelen, samen met diëtisten en psychologen, is noodzakelijk om patiëntuitkomsten te optimaliseren. Gezien het stijgend aantal bariatrische ingrepen, zijn gestandaardiseerde nationale richtlijnen en aangepaste terugbetalingsregelingen in België nodig om de langetermijnzorg voor patiënten te kunnen garanderen.

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Introduction

The prevalence of overweight and obesity is increasing worldwide(1). The WHO reported that overweight and obesity have become widespread and concerning in the European region. According to WHO, 59% of adults in the European region are living with overweight or obesity. Overweight and obesity contribute to many diseases affecting multiple body systems such as the cardiovascular system, increasing morbidity and mortality(1).

Treatment options for obesity include lifestyle modification, pharmacotherapy and surgical treatment. Lifestyle modification typically involves a multicomponent approach consisting of a hypocaloric diet, increased aerobic training, and cognitive behavioral therapy(2). Lifestyle changes can improve health outcomes, although a substantial proportion of people do not adhere to weight loss interventions, limiting their effectiveness(3).

In recent years, bariatric surgery has increasingly emerged as the most effective treatment for individuals suffering from severe obesity in the long term(4). This includes long-term weight loss, improvement of comorbidities and decrease of overall mortality(4). As a result, the demand for bariatric surgery has increased significantly in recent years(5). Recent data show that by 2017, one in every 100 Belgians had undergone bariatric surgery. Moreover, an 80% increase in procedures was recorded over a seven-year period(6). Indications for bariatric surgery include patients from 18 to 60 years old who have failed non-surgical treatments over a period of time and if BMI ≥40 kg/m², or with BMI of 35-40 kg/m² with associated comorbidities, such as cardiovascular disease, where weight loss is expected to improve the disorder. Additionally, bariatric surgery may be considered for patients with a BMI > 30kg/ m² who have type 2 diabetes on an individual basis(2)(7)(8).

However, bariatric surgery is not without risks, with complication rates ranging from 10% to 17% and reoperation rates affecting approximately 7% of patients(5). Although mortality rates are low, these risks highlight the critical need for regular long-term follow-up to help identify and manage both early and late complications(5). Consistent monitoring allows general practitioners and other healthcare professionals to intervene quickly, supporting patient recovery and minimizing the likelihood of additional health complications and associated costs over time.

In Belgium, there is a growing concern regarding bariatric surgery being performed on patients who do not meet clear indications for the procedure. This raises the risk that the potential harm such as complications, reoperations, or psychosocial impacts may outweigh the benefits. The lack of standardized selection criteria and uniform postoperative care across hospitals exacerbates this issue. To address this, stricter multidisciplinary evaluations and follow-up care protocols are essential to minimize unnecessary surgeries and ensure a favorable balance between harm and benefit.

Long-term follow-up is crucial in ensuring successful patient outcomes after bariatric surgery. General practitioners play a key role in this process, as emphasized by the BOMSS guidelines, which recommend at least annual monitoring of nutritional status, given the high prevalence of iron, vitamin B12, and fat-soluble vitamin deficiencies(9). Additionally, GPs must manage metabolic and gastrointestinal complications and adjust medications due to altered drug absorption. With the rising number of bariatric surgeries, structured collaboration between primary care and bariatric specialists is essential to optimize long-term patient outcomes(6).

The purpose of this scoping review is to explore the short- and long-term complications associated with bariatric surgery and to define postoperative interventions aimed at reducing these complications. Additionally, this review will investigate how a multidisciplinary approach can support the implementation of these interventions by healthcare professionals. The ultimate goal is to enhance patient follow-up regarding bariatric surgery in order to optimize the harm-benefit balance.

Materials and method

Design

A scoping review was conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)(10).

Search strategy

We conducted a systematic search on PubMed and Embase to identify all papers published in the last 10 years related to bariatric surgery, follow-up and adverse effects. We did not search for grey literature or via google scholar. For PubMed we used a combination of keywords and MeSH terms. The specific terms can be found in appendix I. The filters we used are 'free full text', 'full text', 'clinical trial', 'clinical Trial, Phase III', 'clinical Trial, Phase IV', 'guideline', 'meta-analysis', 'practice guideline', 'pragmatic clinical trial', 'randomized controlled trial', 'systematic review', '10 years' and 'English'. For Embase we used the PICO search strategy. For the population we used the term bariatric surgery, for the intervention we used the term follow-up, the term comparison was left blank and we used the terms related to adverse effects for outcome. The filters we used can be found in appendix I.

Eligibility criteria

We decided on the following inclusion criteria: studies published in English; publication date in the last 10 years; all types of papers except those that we noted in the exclusion criteria; papers related to the long term follow-up of adverse effects from bariatric surgery and bariatric surgery in primary care medicine.

For the exclusion criteria we decided the following: RCT topic; meta-analysis topic; studies including children; adolescents or pregnant women; studies primarily focusing on acute postoperative complications; studies focusing specifically on patients with diabetes mellitus type 2; papers that focus on second-line medicine.

Screening

Articles were managed and screened using Mendeley as an organizing system. The first screening was based on title and then by abstract, followed by a second screening of the full text. Articles that did not meet the inclusion criteria or met any exclusion criteria were excluded. (see flow diagram in Figure 1) Both reviewers conducted this process, but given the amount of articles, the articles were divided. After the screening process the remaining papers were reviewed by both authors and a consensus was obtained.

Data extraction

Data from included articles were charted in a shared Google Drive sheet to facilitate collaboration. The extracted data were systematically recorded to ensure consistency and transparency in the data collection process.

Data were extracted to obtain the key characteristics of each study. Data extracted from the eligible articles included first author and year of publication, country, study type, type of surgery included in the study, type of intervention, sample size, outcome measures, the results and conclusions.

Quality appraisal

A formal quality appraisal was conducted using JBI Critical Appraisal Checklist. (see appendix III)

Synthesis of results

A descriptive synthesis was performed to summarize key findings from the included studies. Data were categorized according to themes related to follow-up care and adverse effects after bariatric surgery.

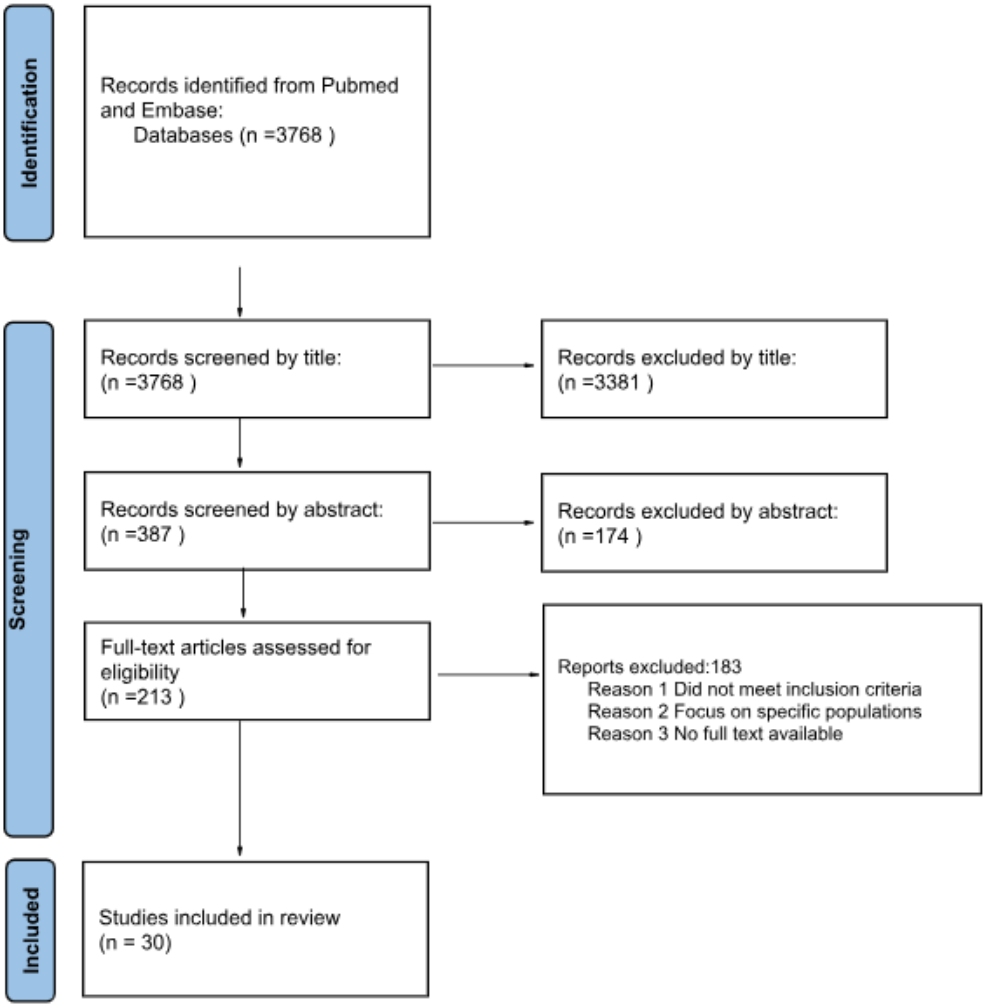


Figure 1 (11)

Results

We obtained a total of 3768 articles by literature searches on both PubMed and Embase. After screening by title and abstract, we conducted a full text review on 213 articles to determine if they met the inclusion criteria. Ultimately, 30 studies were included in this scoping review. Figure 1 shows the selection process in more detail. The included studies were categorized based on post-operative complications. Eight studies focused on general long-term follow-up and micronutrient deficiencies. Seven studies addressed osteoporosis. Another seven studies examined gallstone disease. Iron deficiency was investigated in three studies, while hypoglycemia was covered in two studies. Gastroesophageal reflux disease (GERD) was analyzed in two studies. Additionally, two studies explored psychological outcomes, including substance use and suicide risk. An overview of the possible complications and interventions is summarized in table 1. The extracted data from the included articles, including interventions and their outcomes, are summarized in the evidence table in Appendix II.

Nutritional management and long term follow-up

Bariatric surgery leads to significant changes in anatomy, physiology, eating habits, and dietary intake, making long-term follow-up essential. Regular monitoring is required for weight loss, nutritional management, supplementation needs, and the early detection of postoperative complications. The following studies provide recommendations on long-term follow-up and management.

Martinez et al. (2020)(12) present evidence-based recommendations for the nutritional management of bariatric surgery patients, emphasizing the importance of preoperative screening for micronutrient deficiencies and corrective treatment before surgery. A Very Low-Calorie Diet (VLCD) for 4–8 weeks preoperatively is advised to optimize surgical outcomes. Postoperatively, patients should follow a liquid diet for the first month, transitioning to a semi-solid diet in the second month. Protein intake, set at 1–1.5 g/kg based on adjusted weight, is crucial for recovery and muscle preservation. Vitamin B12 and iron supplementation are necessary in cases of deficiency to prevent anemia and anemia related complications. Follow-up blood tests are recommended at one, three, six, and twelve months postoperatively, including measurements of albumin, CRP, iron/ferritin, calcium, phosphorus, magnesium, parathyroid hormone (PTH), folic acid, vitamin B12, and vitamins D, A, and E(12).

Similarly, Busetto et al. (2018)(13) provide practical recommendations for post-bariatric surgery management. Like Martinez et al. (2020)(12)**,** this study highlights the importance of a minimum protein intake of 1.5 g/kg and the role of liquid protein supplementation in early recovery. Regular follow-up with a registered dietitian is advised to ensure long-term dietary adherence. Physical activity is recommended, with at least 150 minutes per week and strength training twice weekly. While both studies stress the need for monitoring micronutrient deficiencies through blood tests, Busetto et al. (2018)(13) advocate for individualized supplementation based on detected deficiencies. Additionally, they advise against medications such as NSAIDs and corticosteroids, which may cause gastrointestinal damage, and suggest avoiding oral contraceptives(13).

The role of registered dietitian in postoperative follow-up was further examined in a retrospective cohort study by Garg et al. (2016)(14). This study compared patient outcomes between those who received follow-up care from a surgeon alone versus a combination of a surgeon and a registered dietitian. Patients in the latter group had significantly fewer readmissions due to dietary-related issues (9 vs. 0; p=0.004) and showed more favorable biochemical markers at three months, including improved serum thiamine levels (−30.5 vs. −4.04; p=0.002), HDL cholesterol (−3.42 vs. −1.67; p=0.053), and triglycerides (−17.5 vs. −31.5; p=0.03). Additionally, fewer minor complications were observed (16 vs. 6; p=0.08). While this study does not provide specific dietary guidelines, it underscores the importance of multidisciplinary follow-up care in optimizing patient outcomes(14).

A review by Fink et al. (2022)(15), based on German clinical practice guidelines, further examined key aspects of post-bariatric surgery follow-up. This study suggests an alternative set of blood tests, including vitamin A, B1, D, B12, E, K, calcium, iron, folic acid, zinc, and an annual copper assessment. Additionally, they recommend ulcer prophylaxis for one to six months post-gastric bypass using proton-pump inhibitors(15).

Mahawar et al. (2020)(16) conducted a narrative review to identify key areas requiring long-term follow-up after bariatric surgery. Dietary management was identified as a crucial component, with the most significant effects on hunger and satiety occurring within the first year. This period corresponds to the greatest weight loss, after which some patients experience weight regain. A high-protein diet is recommended, and patients should consistently monitor their weight and caloric intake. Poor dietary choices are strongly associated with weight regain, highlighting the necessity of ongoing dietary counseling. Regarding the micronutrient status, a significant number of deficiencies have been observed due to reduced intake and altered absorption capacities. As a result, lifelong supplementation

is essential, though two major challenges remain: limited guidelines on micronutrient supplementation and suboptimal patient adherence. To address these issues, regular post-surgical monitoring is recommended, including annual hematological assessments and evaluations for micronutrient deficiencies such as anemia, hair loss, or neurological symptoms. Routine tests should include hemoglobin and parathyroid hormone (PTH) levels. High-risk groups, including pregnant women, patients with malabsorptive procedures, and those with liver cirrhosis, require closer monitoring. In cases of anemia, ferritin, vitamin B12, folate, and copper should be assessed, while neurological symptoms necessitate evaluation of vitamin B1, B12, and copper. Zinc levels should be checked in patients experiencing hair loss. Additionally, post-bariatric surgery patients tend to have lower levels of physical activity compared to the general population, with higher activity levels correlating with better weight loss outcomes. Regular exercise is encouraged to enhance fat loss and preserve lean body mass(16).

Rao et al. (2023)(17) conducted a retrospective observational study evaluating the outcomes of single-anastomosis duodeno-ileal bypass with sleeve gastrectomy, focusing on nutritional status and supplementation. The study followed 196 patients, monitoring them at 2 weeks, 3 months, 6 months, 9 months, 12 months, 18 months, 24 months, and then annually. However, a significant dropout rate was observed over time. A decline in protein and albumin levels was noted at 12 months postoperatively, followed by stabilization. Similar trends were observed for vitamins A and E, while ferritin levels decreased but remained within normal limits. Vitamin D levels gradually declined but stayed within the normal range. Calcium levels improved after 36 months, stabilizing serum parathyroid hormone (PTH) levels. Zinc, copper, and selenium levels declined at 24 months but later stabilized. Mild to moderate deficiencies were observed in 14.2% of patients during the first 18 months. Notably, vitamin A deficiency was more frequent among those receiving an initial supplement formulation with 3000 IU of vitamin A, leading to adjustments in dosage. By 48 months, no patients exhibited postoperative deficiencies in vitamin D, calcium, folic acid, total protein, iron, vitamin B12, copper, or vitamin A. These findings highlight the importance of ongoing nutritional monitoring and tailored supplementation following SADI-S to ensure long-term stability. The study attributes high patient compliance to comprehensive education and structured reminder systems for prescription refills and scheduled blood tests. The American Society for Metabolic and Bariatric Surgery (ASMBS) guidelines recommend blood testing every three months during the first postoperative year, every six months in the second year, and annually thereafter.(17)

Sista et al. (2022)(18) conducted a retrospective cohort study to assess long-term outcomes following laparoscopic gastric sleeve surgery and the importance of follow-up. The study analyzed 285 patients, comparing those who adhered to follow-up schedules with those who failed to attend follow-up visits for over two years. Nutritional and dietary assessments were conducted every three months in the first year and annually thereafter. Psychological and physical activity assessments were included in the first year. The compliant group had an average weight loss of 33 kg (±16.6) compared to 30.9 kg (±15.3) in the non-compliant group ($p=0.4$), with significantly higher rates of insufficient weight loss in the non-compliant group (78 vs. 23; $p=0.001$). No significant differences were observed regarding the resolution of type 2 diabetes, hypertension or sleep apnea(18).

Thibault et al. (2016)(19) conducted a narrative review identifying twelve key nutritional issues in bariatric surgery. They emphasize preoperative screening and correction of deficiencies, the role of preoperative weight loss, and the importance of high-protein diets postoperatively. Nutritional follow-up should occur every three months in the first year, every six months in the second year, and annually thereafter. The review highlights the need for further research on body composition measurements, dietary counseling, and exercise's role in long-term success(19).

Osteoporosis

Bariatric surgery is associated with an increased risk of osteoporosis and fractures due to altered calcium and vitamin D metabolism, malabsorption, and changes in bone turnover. Several studies have evaluated the impact of bariatric surgery on bone health, assessing fracture risk, screening strategies, and supplementation to optimize long-term outcomes.

A nationwide cohort study by Lu et al. (2015)(20) investigated long-term fracture risk following bariatric surgery by comparing 2064 surgical patients to 5027 matched obese controls. The study found that bariatric surgery was associated with a 1.21-fold increased risk of fractures (95% CI: 1.02–1.44), with malabsorptive procedures showing the highest risk (1.47, 95% CI: 1.01–2.15). A trend towards an increased overall fracture risk was observed one to two years postoperatively. However, it did not reach statistical significance(20). A retrospective study by Robinson et al. (2021)(21) examined fracture rates over a five-year period following bariatric surgery. The study reported that the incidence of major fractures increased postoperatively, with an incidence rate ratio (IRR) of 2.70 (95% CI, 1.31-5.57). The relative incidence of any fractures also increased (IRR = 1.73; 95% CI, 1.09-2.77), while the rate of peripheral fractures remained stable. The study identified several risk factors associated with postoperative fractures, including female sex, age, use of specific medications, and geographic factors(21).

A retrospective cohort study by Courtalin et al. (2023)(22) applied the European Calcified Tissue Society (ECTS) 2022 guidelines for osteoporosis prevention in post-bariatric patients, evaluating bone mineral density (BMD) using dual-energy X-ray absorptiometry (DXA). The study assessed osteoporosis treatment indications based on predefined criteria, including recent fragility fractures, low BMD T-scores (≤ 2 for any measurement site), and FRAX® score ≥20% for major osteoporotic fractures and/or ≥ 3% for hip fractures. The study found that 19.6% of patients met the criteria for osteoporosis treatment based on these assessments(22). Robinson et al. (2021)(21) developed a predictive model for assessing fracture risk in post-bariatric patients, incorporating variables such as age, sex, and medication use. The model demonstrated a moderate predictive ability with an area under the curve (AUC) of 0.70 (95% CI, 0.63–0.76)(21).

Bariatric surgery also influences bone metabolism over time. A retrospective cohort study by Sperb et al. (2023)(23) followed 127 patients for five years after Roux-en-Y gastric bypass (RYGB), assessing changes in BMD, calcium, vitamin D, and parathyroid hormone (PTH) levels. The first DXA scan, conducted 2.5 years postoperatively, revealed a median BMD decrease of 3.9% in the lumbar spine, 7% in the femoral neck, and 5.5% in the proximal femur. The incidence of osteoporosis increased from 6.7% to 11.1%, while vitamin D deficiency was reported in 41.5% of patients after two years. Secondary hyperparathyroidism (SHPT) was observed in 83.7% of patients after six years(23). A meta-analysis by Tian et al. (2020)(24) examined postoperative changes in bone metabolism following sleeve gastrectomy (SG) and RYGB. The analysis, which included 13 studies, reported no significant differences in BMI reduction between the procedures. Vitamin D deficiency was found to be greater in the RYGB group (-1.85, 95% CI: -3.32 to -0.39, p=0.01), and calcium levels were also lower in this group (-0.15, 95% CI -0.24 to -0.07, p=0.0006). No significant differences were observed in bone mineral content (BMC) between the two surgical groups(24).

Several studies have assessed vitamin D and calcium supplementation following bariatric surgery. A systematic review and meta-analysis by Giustina et al. (2023)(25), which included 57 studies with 8165 patients, reported that 85% of patients had vitamin D insufficiency preoperatively (25(OH)D <30 ng/mL), with 57% classified as severely deficient (<20 ng/mL). The study found that high-dose vitamin D supplementation (≥2,000 IU/day) was associated with an improvement in 25(OH)D levels and a reduction in deficiency rates(25). A prospective study by Flores et al. (2014)(26) compared two supplementation strategies: individualized vitamin D3 dosing based on preoperative levels versus a fixed high dose of 2,000 IU/day. Both approaches effectively increased 25(OH)D levels to ≥75 nmol/L(26).

Anemia

We included three studies examining iron deficiency anemia (IDA), a common complication following bariatric surgery. A systematic review by Anvari et al. (2021)(27) evaluated various iron supplementation strategies and their effectiveness in preventing and treating iron deficiency (ID) and IDA. The review included 49 studies with a total of 12,880 patients. Oral iron supplementation, either as part of a multivitamin regimen or as a standalone treatment, was the most common approach, with elemental iron doses ranging from 5 to 98.35 mg. However, adherence was inconsistent due to gastrointestinal side effects such as nausea and constipation. Intravenous (IV) iron was used for refractory or severe cases and demonstrated superior efficacy, with all studies reporting significant improvement in iron levels. One study directly comparing oral and IV iron found IV therapy to be both more effective and better tolerated. Among the 38 studies investigating iron supplementation for prevention, those using ≥45 mg elemental iron had higher success rates (52%) compared to lower doses (40%). Six studies compared supplemented versus non-supplemented patients, with five demonstrating a protective effect against ID and IDA. For treatment, seven studies assessed iron supplementation in patients with existing ID, with 50% of oral strategies and 100% of IV strategies proving effective. Two studies focused on severe or refractory IDA, both showing significant improvement with IV iron. Despite the benefits of supplementation, challenges remain, including low adherence, variability in supplementation methods, and inconsistent monitoring. The review highlights that current iron supplementation regimens after bariatric surgery are often inadequate, with IV iron emerging as the most effective option for treating ID and refractory IDA(27).

A randomized controlled trial by Mischler et al. (2018)(28) further examined the effectiveness of different iron supplementation strategies following Roux-en-Y gastric bypass (RYGB), emphasizing the lack of evidence supporting current recommendations. The study compared heme and non-heme iron supplements in treating ID, a common postoperative complication that negatively impacts quality of life. Fourteen participants were enrolled in an 8-week trial, with six receiving ferrous sulfate and eight receiving heme iron polypeptide (HIP). Nutrient intake from food and supplements was monitored throughout the study. No significant differences were observed between the groups aside from the intervention itself. Blood markers, including hemoglobin, ferritin, soluble transferrin receptor (sTfR), and total iron-binding capacity (TIBC), were measured at 2, 4, and 8 weeks. The results showed significant improvements in all iron markers in the ferrous sulfate group ($p<0.0001$), while no significant changes were observed in the HIP group ($p>0.05$). Additionally, four out of six patients in the ferrous sulfate group achieved resolution of ID, compared to none in the HIP group ($p=0.0094$). Compliance rates were high (95% in the ferrous sulfate group and 94% in the HIP group), and no significant differences in side effects such as constipation, diarrhea, vomiting, or abdominal pain were observed. The study concluded that ferrous sulfate is significantly more effective than HIP in treating ID after RYGB(28).

A larger randomized controlled trial by Schijns et al. (2020)(29) compared oral versus intravenous iron supplementation in 120 women who developed ID after RYGB, defined by ferritin levels <20 µg/L. Participants were randomized into three groups: one received ferrous fumarate (FF) 200 mg three times daily, the second received ferrous gluconate (FG) 695 mg twice daily, and the third received a single IV dose of iron (III) carboxymaltose (FCM) 1000 mg. Oral treatments lasted 90 days, with evaluations at 6, 12, 26, and 52 weeks assessing hemoglobin, serum iron, ferritin, total iron-binding capacity, transferrin levels, transferrin saturation, and CRP. Patients with persistent ID underwent another 90-day treatment with a different oral supplement or IV therapy. Some patients were lost to follow-up or switched due to adverse effects. After three months, ferritin levels increased from 13 to 26 µg/L in the FF group, from 13 to 24 µg/L in the FG group, and from 11 to 115 µg/L in the FCM group ($p<0.001$ for all groups). ID persisted in 10 patients in the FF group and 14 in the FG group ($p=0.27$), while no patients in the FCM group had ID after three months ($p<0.001$). At six months, ID recurred in seven patients in the FF group, six in the FG group, and three in the FCM group,

with significantly lower recurrence in the IV-treated group (p=0.037). After 12 months, recurrence rates were 69.7% in the FF group, 74.2% in the FG group, and only 27.8% in the FCM group. These findings indicate that IV iron is significantly more effective in both correcting and preventing recurrent ID after RYGB compared to oral supplementation(29).

Hypoglycemia

Several studies have examined post bariatric hypoglycemia (PBH), distinguishing between its subtypes and exploring various management strategies. A review by Fink et al. (2022)(15) described the role of nutritional therapy in PBH treatment, recommending that patients consume multiple small meals that are low in carbohydrates rather than a single large portion(15).

A prospective pilot study by Ciudin et al. (2021)(30) investigated postprandial hyperinsulinemic hypoglycemia (PHH) following Roux-en-Y gastric bypass (RYGB) and evaluated the efficacy of canagliflozin (300 mg daily) as a potential treatment. PHH is characterized by excessive insulin secretion in response to food intake, leading to severe hypoglycemia. The study included 21 patients with PHH and 5 matched healthy controls. Canagliflozin was found to significantly reduce postprandial glucose absorption, leading to an 85.7% reduction in hypoglycemic episodes after an oral glucose tolerance test (OGTT)(30).

A retrospective multicenter study by de Heide et al. (2023)(31) examined PBH in 120 patients with documented glucose levels below 3.0 mmol/L post-bariatric surgery, with a median follow-up of 27 months. This study assessed multiple pharmacological interventions, including acarbose, diazoxide, octreotide, and GLP-1 receptor agonists. Treatment effectiveness ranged between 45% and 75%, with combination therapy providing additional benefits. Long-acting octreotide and GLP-1 receptor analogs were reported to be the most effective treatments in terms of balancing efficacy and side effects. In cases where pharmacological treatment was insufficient, 19% of patients required surgical intervention, which was successful in 79% of cases(31).

GERD

A multicenter cohort study by El Nakeeb et al. (2022)(32) investigated the prevalence, predictors, and management of gastroesophageal reflux disease (GERD) following laparoscopic sleeve gastrectomy (LSG) in 1,537 patients across four centers. The study included both patients with and without preoperative GERD, with a mean follow-up duration of 15.9 months. Preoperative assessment consisted of a barium swallow, upper endoscopy, and the GERD-Health-Related Quality of Life (GERD-HRQL) questionnaire. Postoperative follow-up included clinical evaluations, repeated GERD-HRQL assessments, and additional diagnostic tests when necessary. Patients were categorized into two groups: those with pre-existing GERD (n=221) and those without GERD preoperatively (n=1,316). Follow-up assessments at 1, 3, 6, 12, and 24 months post-surgery revealed that 24.7% (n=379) of patients developed GERD, with 21.3% (n=328) experiencing de novo GERD and 1.6% (n=25) reporting a worsening of pre-existing GERD. Protective factors against GERD included antral preservation and gastropexy. Most patients (79.2%) responded well to proton pump inhibitors (PPIs). However, in cases where GERD was linked to anatomical abnormalities such as hiatal hernia, gastric twisting, stenosis, or intrathoracic sleeve migration, surgical or endoscopic interventions were necessary. These included balloon dilation, stent placement, crural repair, and gastropexy. In severe or refractory cases, conversion to Roux-en-Y gastric bypass (RYGB) was required in 15.8% of GERD patients. GERD is a common complication after LSG, affecting nearly one-quarter of patients. While most cases respond to PPI therapy, surgical or endoscopic interventions are required when GERD is refractory or caused by anatomical abnormalities. Conversion to RYGB remains a viable solution for severe, persistent cases(32).

Another study by Sista et al. (2022)(18) also identified GERD as a postoperative complication in a retrospective cohort study on long-term outcomes and the importance of long term follow-

up after bariatric surgery. Their findings indicated a higher incidence of GERD in patients who are not compliant regarding follow-up (p=0.26), suggesting that long-term follow-up compliance plays a critical role in minimizing both insufficient weight loss and GERD occurrence(18).

A review by Fink et al. (2022)(15) confirmed that GERD is a common complication following bariatric surgery, particularly after LSG. The authors stated that while LSG is effective for weight loss and metabolic improvements, it significantly increases the risk of de novo GERD. In contrast, RYGB is recommended for patients with pre-existing GERD, as it can improve reflux symptoms by creating anatomical barriers against acid reflux. The study also highlighted the importance of long-term follow-up to ensure early detection and management of GERD(15).

Gallstone disease

A randomized controlled trial by Haal et al. (2021)(33) examined the effectiveness of UDCA in preventing gallstone disease in patients undergoing RYGB or LSG. Patients were randomly assigned to receive either 900 mg of UDCA daily or a placebo for six months. While the overall incidence of symptomatic gallstone disease was lower in the UDCA group (6.5%) compared to the placebo group (9.7%), this difference was not statistically significant (p=0.071). However, subgroup analyses indicated that UDCA was particularly effective in RYGB patients without pre-existing gallstones (p=0.0016). The study did not provide conclusive evidence regarding its efficacy in LSG patients due to the small sample size(33). In contrast, a retrospective study conducted by Hossain et al. (2023)(34) specifically examined LSG patients and found a significant reduction in gallstone-related interventions among those receiving UDCA. Patients at one center were routinely prescribed UDCA (250 mg twice daily for six months), whereas another center did not use prophylactic UDCA. The study reported a significantly lower ERCP rate in the UDCA group (0.3% vs. 2.5%, p=0.031) and a lower incidence of gallstone-related interventions (8.9% vs. 15.8%, p=0.022). Although there was a trend toward fewer cholecystectomies in the UDCA group (8.3% vs. 13.9%, p=0.056), this difference was not statistically significant. These findings support the 2019 ASMBS guidelines, which recommend UDCA prophylaxis after LSG(34).

Additional evidence supporting UDCA use comes from a randomized controlled trial by Pizza et al. (2020)(35), which examined gallstone formation after one-anastomosis gastric bypass (OAGB). The study included 190 patients, randomly assigned to receive 300 mg of UDCA twice daily for six months or no prophylactic treatment. Follow-up ultrasound examinations revealed that, after six months, gallstones were detected in only three patients in the UDCA group compared to 21 in the control group ($p<0.05$). After 12 months, gallstones were identified in four UDCA-treated patients versus 24 in the control group ($p<0.05$). The study concluded that UDCA significantly reduced gallstone formation and should be considered as part of standard postoperative management following OAGB(35).

A randomized controlled trial by Sakran et al. (2020)(36) further examined UDCA efficacy in bariatric patients. The double-blinded trial included 209 patients, but only 92 completed the study due to difficulties with medication adherence. At the six-month follow-up, ultrasound revealed gallstone formation in 45.7% of the placebo group compared to 23.9% in the UDCA group (p=0.029). However, this effect was significant only in LSG patients, suggesting that UDCA may be particularly beneficial for this subgroup(36). Similarly, randomized controlled study by Salman et al. (2022)(37) investigated the use of UDCA (500 mg daily for 12 months) in 332 LSG patients. After one year, 8.5% of patients in the UDCA group developed gallstones, compared to 32% in the control group ($p<0.001$). The need for cholecystectomy was also lower in the UDCA group (2.3% vs. 7%, $p<0.05$), further supporting UDCA's role in gallstone prevention(37).

A retrospective cohort study by Sen et al. (2020)(38) analyzed the prophylactic effect of UDCA in LSG patients. All patients underwent preoperative ultrasound screening for gallstones and

were prescribed UDCA (500 mg daily for six months). Follow-up was conducted at 3, 6, and 12 months, with annual ultrasounds thereafter. The analysis included 280 patients, 152 of whom received UDCA treatment. Among UDCA-treated patients, gallstones developed in 10.5%, compared to 37.5% in the control group ($p<0.01$). However, as only patients who adhered to the medication regimen were included in the analysis, the study could not account for non-compliant patients(38).

A systematic review and meta-analysis by Sharma et al. (2023)(39) pooled data from 14 randomized controlled trials (n=3,619) to evaluate UDCA's effectiveness in gallstone prevention. The study found that the overall incidence of gallstones was 19.3%, with a significantly lower rate in the UDCA group (8.3%) compared to the control group (38.1%) (Risk Ratio [RR] 0.27, 95% CI 0.18-0.41, $p<0.001$). The absolute risk reduction was 29.8%, corresponding to a number needed to treat (NNT) of 3.4. Notably, no significant difference in efficacy was observed between 500-600 mg/day and higher UDCA doses, and extending treatment beyond six months did not provide additional benefit. These findings suggest that a 500-600 mg daily dose for six months is the optimal regimen for preventing gallstones in post-bariatric patients(39).

Psychological

A review by Li et al. (2016)(40) examined the prevalence of substance use changes after bariatric surgery and the associated health impacts. The study focused on different forms of substance use, including alcohol, smoking, and drug consumption. The review found that patients with a preoperative history of substance use, especially patients undergoing RYGB, were at increased risk of developing postoperative substance use disorders (SUD). Alcohol use disorder (AUD) prevalence significantly increased two years post-surgery, while smoking rates remained largely unchanged. Opioid use remained prevalent, with a proportion of patients continuing or initiating chronic opioid use after surgery. Psychological factors, including depression, stress, and poor coping mechanisms, were identified as contributors to increased postoperative substance use, emphasizing the need for preoperative screening, structured follow-up, and psychological support(40).

Findings from the German clinical practice guidelines, as reviewed by Fink et al. (2022)(15), align with these concerns. The review highlights an elevated suicide risk among bariatric surgery patients, with a suicide rate of 2.7 per 1000 patients postoperatively. Compared to the same population preoperatively, the suicide risk was nearly twice as high and was 3.8 times higher than in matched controls. Notably, men were at a higher risk than women. Risk factors for suicide after bariatric surgery included a history of psychological consultations, psychotropic drug use, and sleep disturbances. While some studies indicated improvements in depression, anxiety disorders, and binge eating in the first 6–24 months postoperatively, other findings suggested that these conditions might return to baseline levels beyond 24 months. Given these psychological risks, the guidelines recommend targeted psychological follow-up, especially for high-risk patients(15).

Neovius et al. (2018)(41) conducted a matched cohort study to examine the risk of suicide and self-harm following bariatric surgery compared with non-surgical obesity treatment. Concerns have been raised regarding the potential adverse effects of bariatric surgery on mental health, including increased substance misuse and a reported elevated suicide risk. The study included two matched cohorts. In the first cohort, patients who underwent bariatric surgery were matched with individuals who received non-surgical obesity treatment. Matching was performed using an algorithm based on 18 variables to ensure comparability between groups. In the second cohort, patients who underwent gastric bypass were matched with those who participated in an intensive lifestyle modification program. In the first cohort, 2,010 patients underwent bariatric surgery, while 2,037 opted for non-surgical treatment. Baseline characteristic comparisons revealed that patients who chose surgery had lower education levels, a higher prevalence of mental health history, more cardiovascular disease and diabetes, a younger age, and a higher BMI than the control group. The incidence of suicide

and non-fatal self-harm was significantly higher in the surgery group (n=87) compared with the control group (n=49) (p=0.0021). Specifically, there were nine suicides in the surgery group and three in the control group (p=0.11). An increased risk of suicide or non-fatal self-harm was observed in patients treated with gastric bypass, gastric banding, and vertical-banded gastroplasty compared with the control group. Additionally, substance misuse was more prevalent among surgery patients with non-fatal self-harm events (48%) than in the control group (28%) (p=0.023). In the second cohort, 20,256 patients underwent gastric bypass, while 16,162 participated in an intensive lifestyle treatment program. Patients in the surgery group had a higher BMI, lower income, higher unemployment rates, and greater use of sedatives and hypnotics. Similar to the first cohort, a higher risk of suicide and non-fatal self-harm was observed in the gastric bypass group (n=341) compared with the lifestyle group (n=84) (p<0.0001), with 33 and 5 suicides, respectively (p=0.0017). Furthermore, substance misuse was more common among surgery patients with non-fatal self-harm events (51%) compared to the lifestyle group (29%) (p=0.0003). Both cohorts demonstrated a higher risk of suicide and self-harm following bariatric surgery. Notably, despite psychiatric disorders being an exclusion criterion, the prevalence of self-harm history in the surgery group was nearly twice that of the control group. Importantly, even among patients without a prior history of self-harm, an increased risk was still observed. These findings underscore the importance of patient education regarding self-harm risks following surgery and the need for postoperative psychiatric surveillance(41).

Complication Type	Recommendation	References
Nutritional Management & Long-Term Follow-Up	- High protein diet (1-1,5g/kg) - Follow-up by dietitian - Regular blood testing for deficiencies (different recommendations regarding frequency and specific testing) and even preoperative screening for deficiencies. - Lifelong supplementation - Importance of physical activity	Martinez et al. (2020), Busetto et al. (2018), Garg et al. (2016), Fink et al. (2022), Mahawar et al. (2020), Rao et al. (2023), Sista et al. (2022), Thibault et al. (2016)
Osteoporosis	- Importance of screening for osteoporosis - Treatment indications: recent fragility fractures, low BMD T-scores (≤ 2 for any measurement site), and FRAX® score ≥20% for major osteoporotic fractures and/or ≥ 3% for hip fractures - Vitamin D supplementation of ≥2000 IU/day.	Lu et al. (2015), Courtalin et al. (2023), Robinson et al. (2021), Giustina et al. (2023), Flores et al. (2014), Sperb et al. (2023), Tian et al. (2020)
Anemia	- Standard supplementation with iron, elemental iron ≥45 mg/day - In patient with therapy resistant iron deficiency IV supplementation should be used	Anvari et al. (2021), Mischler et al. (2018), Schijns et al. (2020)
Hypoglycemia	- Diet: small portions, more frequently. Low in carbs. - Pharmacological therapies: canagliflozin, GLP-1 receptor analogs, octreotide. - Refer to a bariatric surgeon for evaluation for revisional surgery if initial therapies are unsuccessful.	Fink et al. (2022), Ciudin et al. (2021), de Heide et al. (2023)

Gastroesophageal Reflux Disease (GERD)	- Importance of long-term follow-up for early detection and treatment - PPI is the first choice treatment - When GERD has an underlying anatomical cause, surgical or endoscopic intervention may be required.	El Nakeeb et al. (2022), Sista et al. (2022), Fink et al. (2022)
Gallstone Disease	- Prophylactic use of UDCA in a dose of 500-600 mg/day for 6 months	Haal et al. (2021), Pizza et al. (2020), Sakran et al. (2020), Salman et al. (2022), Sen et al. (2020), Sharma et al. (2023)
Psychological Outcomes	- Preoperative psychological screening - Psychological follow-up, certainly in patients with risk factors (previous psychological problems, stress, poor coping mechanisms, sleep disturbances, substance abuse) - Preoperative counseling of patients regarding possible psychological problems	Li et al. (2016), Fink et al. (2022), Neovius et al. (2018)

Table 1

Discussion

Bariatric surgery is an effective treatment for obesity, but it requires structured postoperative care to minimize complications and optimize long-term outcomes. Our scoping review focused on the importance of long-term follow- up and complication prevention. However, the current landscape of post-bariatric care varies significantly across different healthcare systems, and there is a need for standardized guidelines, particularly in Belgium.

One of the most critical aspects of post-bariatric care is structured follow-up. Studies included in our review showed the importance of regular nutritional assessments, physical activity recommendations, and psychological support. The findings by Martinez et al. (2020)(12) and Busetto et al. (2018)(13) showed that frequent monitoring of micronutrient deficiencies and dietary modifications are essential to prevent long-term complications such as osteoporosis, anemia, and hypoglycemia. This is reinforced by Garg et al. (2016)(14), who demonstrated improved patient outcomes when follow-up care was provided by a multidisciplinary team, including dietitians. In Belgium, postoperative follow-up is currently hospital-centered, but with an increasing number of patients undergoing bariatric surgery, a shift towards primary care

integration is necessary. Collaboration between hospitals, general practitioners (GPs), dietitians, and psychologists should be enhanced to provide comprehensive long-term support.

Another important finding of our review is the high prevalence of micronutrient deficiencies after bariatric surgery. Fink et al. (2022)(15) recommend different sets of blood tests to monitor vitamin and mineral levels, yet there is no universally accepted protocol. In Belgium, reimbursement policies for postoperative laboratory tests and nutritional supplements are inconsistent, potentially limiting patient adherence to recommended follow-ups. A national reimbursement framework for essential postoperative blood tests and supplementation would improve long-term management.

Osteoporosis and fracture risk were another area of concern. Studies by Lu et al. (2015)(20) and Robinson et al. (2021)(21) indicate a significantly increased risk of fractures post-surgery, especially among patients undergoing malabsorptive procedures. The study by Courtalin et al. (2023)(22) underscores the importance of early BMD monitoring and the need for pharmacological interventions in high-risk patients. In Belgium, routine DXA scanning is not systematically integrated into post-bariatric care. Implementing standardized osteoporosis screening and vitamin D supplementation strategies in Belgium, adapted to different surgical procedures, would be beneficial.

Gallstone disease prevention is another area where postoperative care could be improved. Studies by Haal et al. (2021)(33) and others show that prophylactic UDCA use can reduce gallstone formation, yet its application is inconsistent. Current Belgian guidelines do not provide clear recommendations regarding UDCA prophylaxis after bariatric surgery. Given the high incidence of gallstone-related complications, further research is necessary regarding implication of this in Belgium.

Post-bariatric hypoglycemia (PBH) represents a growing concern, with studies by Ciudin et al. (2021)(30) and de Heide et al. (2023)(31) highlighting pharmacological interventions as potential treatments. While PBH management primarily focuses on dietary adaptations, medical interventions such as acarbose and GLP-1 receptor agonists may be necessary in severe cases. In Belgium, PBH is not yet systematically addressed in bariatric follow-up care, and further research is needed to determine effective treatment strategies.

From a healthcare policy perspective, the increasing prevalence of obesity and rising demand for bariatric surgery call for a revision of follow-up care models. The KCE report on obesity care in Belgium suggests a shift towards multidisciplinary, primary care-based follow-up(6). Current Belgian reimbursement policies do not sufficiently cover long-term postoperative care, leaving gaps especially in nutritional and psychological follow-up. A clear national guideline, adapted to the Belgian healthcare context should improve patient outcomes and reduce healthcare costs related to post-bariatric complications.

When discussing primary care follow-up, it is essential to clarify the role of general practitioners (GPs) in the preoperative phase. If the long-term follow-up is to be managed in primary care, it is only logical that GPs, who will be responsible for ongoing postoperative care, are actively involved from the start. Expecting GPs to take on the long-term consequences of bariatric surgery without including them in the decision-making process is neither practical nor justifiable. Without this involvement, collaboration becomes strained, and alternative care models may need to be considered.

Another important note to make is the importance of a thorough multidisciplinary preoperative evaluation focusing on mental health problems and addiction issues. Our review highlights that bariatric surgery can be associated with an increased risk of substance use disorders, including alcohol use disorder and chronic opioid use, particularly in patients with a preoperative history of substance use (Li et al., 2016(40)). Furthermore, our findings indicate a concerning rise in suicide risk post-surgery, with suicide rates nearly doubling compared to the preoperative period and being 3.8 times higher than in matched controls (Fink et al., 2022(15)). Particularly alarming is the elevated risk among male patients and those with

preexisting psychological conditions. Additionally, our review identified an increased incidence of self-harm and suicide in patients undergoing bariatric procedures compared to those receiving non-surgical obesity treatment (Neovius et al., 2018(41)). Given these findings, it is crucial to implement comprehensive psychological assessments as part of the preoperative evaluation to identify high-risk patients. Including mental health professionals in the multidisciplinary team from the onset would ensure that individuals receive the right support and monitoring, reducing the risk of postoperative mental health deterioration. Furthermore, targeted patient education regarding the potential risks, especially related to substance misuse and self-harm, should be integrated into the preoperative counseling process.

This scoping review has several strengths that enhance the validity and relevance of its findings. First, by systematically mapping the existing literature on the long-term follow-up of bariatric surgery, we provide a comprehensive overview of both short- and long-term complications. This broad scope allows us to identify key gaps in knowledge and areas requiring further investigation. Additionally, our focus on multidisciplinary care emphasizes the importance of integrating perspectives from various healthcare professionals involved in bariatric surgery follow-up. This approach aligns with current recommendations and highlights the need for coordinated care pathways. Furthermore, our review specifically addresses the Belgian healthcare context, which is crucial given the rising number of bariatric surgeries performed in this country. By identifying challenges related to follow-up care and policy gaps, we offer practical insights that can support healthcare professionals and policymakers in optimizing patient management. Finally, our structured and transparent methodology, based on the PRISMA-ScR guidelines, ensures that our findings are robust and reproducible. By clearly outlining our inclusion and exclusion criteria, we reduce selection bias and enhance the reliability of our conclusions.

However, our scoping review also has several limitations. This study provides a broad overview of the literature but lacks the statistical depth of a systematic review or meta-analysis, which may limit the strength of conclusions. Additionally, the included studies show heterogeneity in methodology, quality, patient populations, follow-up durations, and interventions, making direct comparisons challenging. Many studies focus on short- to medium-term outcomes, while long-term data on complications such as osteoporosis remain scarce. Furthermore, most studies were conducted outside of Belgium, raising concerns about the applicability of findings within the Belgian healthcare system. Reimbursement policies, healthcare organization, and patient adherence to follow-up recommendations may differ significantly across countries, impacting real-world implementation. Another limitation is the issue of patient compliance; while studies suggest optimal follow-up strategies, adherence to supplement regimens, lifestyle changes, and medical follow-up remains a challenge. Factors such as cost, accessibility, and patient motivation influence long-term success and should be considered in future research. And lastly data extraction and study selection were divided between two researchers, with each screening and extracting data from half of the included records. As a result, the process was not performed in duplicate, which may introduce a risk of bias.

Moreover, there are gaps in current knowledge that require further investigation. Future research should focus on identifying patient subgroups that are at the highest risk for long-term complications and determining the most effective follow-up strategies adapted to different surgical techniques. Additionally, while some pharmacological interventions have shown promise in treating post-bariatric complications, more high-quality randomized controlled trials are needed to confirm their long-term efficacy and safety. Finally, the development of specific, evidence-based Belgian guidelines for post-bariatric care would help standardize management and ensure optimal patient outcomes.

Conclusion

In conclusion, while bariatric surgery is an effective intervention for obesity, its long-term success depends on structured follow-up and multidisciplinary collaboration. The findings from our scoping review highlight the need for standardized guidelines, improved reimbursement policies, and enhanced primary care involvement in Belgium. Future efforts should focus on integrating dietitians, GPs, and psychologists into postoperative care pathways, ensuring that all patients receive comprehensive, long-term support to prevent complications and maintain optimal health.

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APPENDIX I : search strategy

Research questions:

What are the post-operative interventions to minimize complications in various types of bariatric surgery in a holistic perspective?

- What are the postoperative complications?
- What are the specific interventions to prevent and reduce these complications?
- How best to implement the interventions ?
- What professional groups are eligible in that support?

PICO:

Population: Adult patients (≥ 18 years) with bariatric surgery.

Intervention: The **follow-up** of bariatric surgery in primary care medicine.

Comparison: /

Outcome: The **side effects** of bariatric surgery.

Embase search strategy:

Using PICO:
P : Bariatric surgery; add synonyms (16)
I: follow up, add synonyms (6)
C: /
O: side effect (add synonyms (2)), adverse event (add synonyms (5)), complications (add synonyms (5)), side effect assessment (add synonyms (1))

('bariatric surgery'/exp OR 'bariatric operation' OR 'bariatric operations' OR 'bariatric procedure' OR 'bariatric procedures' OR 'bariatric surgery' OR 'bariatric surgical procedure' OR 'bariatric surgical procedures' OR 'metabolic surgery' OR 'obesity operation' OR 'obesity surgery' OR 'obesity surgical treatment' OR 'surgery, bariatric' OR 'weight loss operation' OR 'weight loss surgery' OR 'weight reduction operation' OR 'weight reduction surgery') AND ('follow up'/exp OR 'follow up' OR 'follow up study' OR 'follow-up studies' OR 'followup' OR 'lost to follow up' OR 'lost to follow-up') AND ('side effect'/exp OR 'side effect' OR 'side reaction' OR 'adverse event'/exp OR 'adverse effect' OR 'adverse effects' OR 'adverse event' OR 'adverse events' OR 'adverse reaction' OR 'complication'/exp OR 'clinical sequelae' OR 'complication' OR 'complications'OR 'complicative disease' OR 'medical sequelae' OR 'side effect assessment'/exp OR 'side effect assessment')

Filters: AND (2015:py OR 2016:py OR 2017:py OR 2018:py OR 2019:py OR 2020:py OR 2021:py OR 2022:py OR 2023:py OR 2024:py) AND ('controlled clinical trial'/de OR 'controlled study'/de OR 'longitudinal study'/de OR 'meta analysis'/de OR 'multicenter study'/de OR 'practice guideline'/de OR 'prospective study'/de OR 'randomized controlled trial'/de OR 'systematic review'/de)

TOTAL RESULTS: 3677 results

PubMed search strategy

Concept 1	Concept 2	Concept 3
Bariatric surgery	Long term adverse effects, complications	Care management, follow-up.

MeSH terms

Concept 1

((((((bariatric surgeries[MeSH Terms]) OR (bariatric surgery[MeSH Terms])) OR (bariatric medicine[MeSH Terms])) OR (medicine, bariatric[MeSH Terms])) OR (gastric bypass[MeSH Terms])) OR (gastric bypass, roux en y[MeSH Terms])) OR (bypass, roux en y gastric[MeSH Terms])

Concept 2

"Long Term Adverse Effects"[Mesh] OR "Postoperative Complications"[Mesh]

Concept 3

((care management, patient[MeSH Terms]) OR (early intervention[MeSH Terms]))

Combined concepts:

(((((((bariatric surgeries[MeSH Terms]) OR (bariatric surgery[MeSH Terms])) OR (bariatric medicine[MeSH Terms])) OR (medicine, bariatric[MeSH Terms])) OR (gastric bypass[MeSH Terms])) OR (gastric bypass, roux en y[MeSH Terms])) OR (bypass, roux en y gastric[MeSH Terms])) AND (((care management, patient[MeSH Terms]) OR (early intervention[MeSH Terms]))))) AND ("Long Term Adverse Effects"[Mesh] OR "Postoperative Complications"[Mesh])

Tiab terms

Concept 1

((((((bariatric surgery[Title/Abstract]) OR (gastro intestinal surgery[Title/Abstract])) OR (bypass gastric[Title/Abstract])) OR (gastric surgery[Title/Abstract])) OR (metabolic surgery[Title/Abstract])) OR (gastric sleeve[Title/Abstract])) OR (gastric binding[Title/Abstract])

Concept 2

((((((complications[Title/Abstract]) OR (adverse effects[Title/Abstract])) OR (adverse events[Title/Abstract])) OR (side effects[Title/Abstract])) OR (adverse effect[Title/Abstract])) OR (adverse event[Title/Abstract])) OR (side effect[Title/Abstract])

Concept 3

((((((postoperative intervention*[Title/Abstract]) OR (Follow-up[Title/Abstract])) OR (post-operative intervention*[Title/Abstract])) OR (Management[Title/Abstract])) OR (Care pathway[Title/Abstract])) OR (Early intervention[Title/Abstract])) OR (Re-surgery[Title/Abstract])

Combined concepts:

(((((((bariatric surgery[Title/Abstract]) OR (gastro intestinal surgery[Title/Abstract])) OR (bypass gastric[Title/Abstract])) OR (gastric surgery[Title/Abstract])) OR (metabolic surgery[Title/Abstract])) OR (gastric sleeve[Title/Abstract])) OR (gastric binding[Title/Abstract])) AND (((((((complications[Title/Abstract]) OR (adverse effects[Title/Abstract])) OR (adverse events[Title/Abstract])) OR (side effects[Title/Abstract])) OR (adverse effect[Title/Abstract])) OR (adverse event[Title/Abstract])) OR (side effect[Title/Abstract]))) AND (((((((postoperative intervention*[Title/Abstract]) OR (Follow-up[Title/Abstract])) OR (post-operative intervention*[Title/Abstract])) OR (Management[Title/Abstract])) OR (Care pathway[Title/Abstract])) OR (Early intervention[Title/Abstract])) OR (Re-surgery[Title/Abstract]))

Complete search strategy

(((((((((bariatric surgery[Title/Abstract]) OR (gastro intestinal surgery[Title/Abstract])) OR (bypass gastric[Title/Abstract])) OR (gastric surgery[Title/Abstract])) OR (metabolic surgery[Title/Abstract])) OR (gastric sleeve[Title/Abstract])) OR (gastric binding[Title/Abstract])) AND (((((((complications[Title/Abstract]) OR (adverse effects[Title/Abstract])) OR (adverse events[Title/Abstract])) OR (side effects[Title/Abstract])) OR (adverse effect[Title/Abstract])) OR (adverse event[Title/Abstract])) OR (side effect[Title/Abstract]))) AND (((((((postoperative intervention*[Title/Abstract]) OR (Follow-up[Title/Abstract])) OR (post-operative intervention*[Title/Abstract])) OR (Management[Title/Abstract])) OR (Care pathway[Title/Abstract])) OR (Early intervention[Title/Abstract])) OR (Re-surgery[Title/Abstract]))) OR (((((((((bariatric surgeries[MeSH Terms]) OR (bariatric surgery[MeSH Terms])) OR (bariatric medicine[MeSH Terms])) OR (medicine, bariatric[MeSH Terms])) OR (gastric bypass[MeSH Terms])) OR (gastric bypass, roux en y[MeSH Terms])) OR (bypass, roux en y gastric[MeSH Terms])) AND (((care management, patient[MeSH Terms]) OR (early intervention[MeSH Terms])))) AND ("Long Term Adverse Effects"[Mesh] OR "Postoperative Complications"[Mesh]))

Filters: Free full text, Full text, Clinical Trial, Clinical Trial, Phase III, Clinical Trial, Phase IV, Guideline, Meta-Analysis, Practice Guideline, Pragmatic Clinical Trial, Randomized Controlled Trial, Systematic Review, 10 years, English.

TOTAL RESULTS: 89 results

APPENDIX II: Evidence table

Author, year, country	Title	Type of Surgery	Intervention	Sample size	Results	Conclusion	Method
Giustina A. et al., 2023, Italy	Vitamin D status and supplementation before and after Bariatric Surgery: Recommendations based on a systematic review and meta-analysis	Not specified.	High-dose cholecalciferol supplementation (> or equal 2000IU/day) vs low doses (< 2000 IU/day)	n= 57 studies	- Lower rates of vitamin D insufficiency with high-dose supplementation - Prevalence VIT D insufficiency 25(OH)D < 30 ng/mL was 85%	Pre/post-op vitamin D assessment and high-dose supplementation recommended	Systematic review
Martinez-Ortega A. et al., 2020, Spain	Recommendations Based on Evidence by the Andalusian Group for Nutrition Reflection and Investigation (GARIN) for the Pre- and Postoperative Management of Patients Undergoing Obesity Surgery	Restrictive (SG), malabsorptive (BPD-DS), and mixed (RYGBP)	Multidisciplinary nutritional and micronutrient strategy	n=193 articles	- Consensus on pre-operative micronutrient screening - Very Low Calory Diet pre-op - Systematic use of specific multivitamin supplements -Multidisciplinary care and follow-up	Structured approach to nutrition and supplementation is vital; further research needed.	Evidence-based review with expert consensus recommendations, opinion
Anvari S. et al., 2021, Canada	Iron supplementation following bariatric surgery: A systematic review of current strategies	RYGB, MGB, SG, AGB, BPD-DS	Review of iron supplementation strategies	49 studies, n=12,880 patients	- Oral iron most common strategy, however limited by adherence and side effects. - IV iron highly effective	IV iron superior for refractory ID/IDA; more high-quality studies needed.	Systematic review

Busetto L. et al., 2017, EU	Obesity Management Task Force of the European Association for the Study of Obesity Released BPractical Recommendations for the Post-Bariatric Surgery Medical Management	Not specified.	Review of post-op care essentials	Not applicable.	- Long-term diet adjustments and supplementation critical - regular follow-ups required.	Multidisciplinary follow-ups necessary to ensure long-term success.	Expert consensus statement, opinion
Ciudin A. et al., 2021, Spain	Canagliflozin: A New Therapeutic Option in Patients That Present Postprandial Hyperinsulinemic Hypoglycemia after Roux-en-Y Gastric Bypass: A Pilot Study	RYGB	Canagliflozin for PHH management	n=21 patients	Significant reduction in PHH with canagliflozin	Effective for PHH prevention; recommended for post-RYGB patients without response to dietetic recommendations.	Prospective uncontrolled intervention study, Quasi-Experimental.
Courtalin M. et al., 2023, France	An Evaluation of the Implementation of the European Calcified Tissue Society Recommendations on the Prevention and Treatment of Osteoporosis Secondary to Bariatric Surgery	Not specified	ECTS recommendations for osteoporosis	N= 170 patients	A fifth of the included population was found to be eligible for osteoporosis medication after the application of the ECTS 2022 recommendations	DXA recommended for BMD measurement pre/post-surgery	Retrospective cohort study (observational)
de Heide L.J.M, et al., 2022, The Netherlands	Medical and surgical treatment of postbariatric hypoglycaemia: Retrospective data from daily practice	Not specified.	Evaluate medical and surgical treatment of postbariatric hypoglycaemia	n=120 patients	- 45-75% efficacy of pharmacotherapy - 20% required surgical interventions.	Pharmacotherapy successful in half to three quarters of patients. Combination therapy was often of value; surgery effective in refractory cases.	Retrospective cohort study (observational)

El Nakeeb A. et al., 2022, Egypt	Prevalence, Predictors, and Management of Gastroesophageal Refux Disease After Laparoscopic Sleeve Gastrectomy: a Multicenter Cohort Study	Laparoscopic sleeve gastrectomy (LSG)	GERD management with PPIs, non-invasive endoscopic techniques, and invasive surgical alternatives	n=1537 patients	- 24.7% experienced post-op GERD - 79.2% responded to PPIs.	GERD common post-LSG; PPIs effective for most patients. Surgical intervention for anatomic abnormalities.	Retrospective cohort study (observational)
Fink J. et al., 2022, Germany	Obesity Surgery : Weight Loss, Metabolic Changes, Oncological Effects, and Follow-Up	All types of bariatric surgery.	Not applicable.	Not applicable.	- Lifelong follow-up essential - complications include nutritional deficiencies and GERD.	Regular follow-ups critical for managing complications and adjusting care.	Evidence-informed opinion
Flores L. et al., 2014, USA	Prospective Study of Individualized or High Fixed Doses of Vitamin D Supplementation After Bariatric Surgery	Not specified.	Vitamin D supplementation	n=228 patients	- First study: Increase mean 25(OH)D levels from 40 to 77 nmol/L - Second study: Increase mean 25(OH)D levels from 32 to 80 nmol/L	Both schedules of daily VD3 supplementation were effective.	Prospective non-randomized intervention, Quasi-Experimental.
Garg T. et al., 2016, USA	A postoperative nutritional consult improves bariatric surgery outcomes	Not specified.	Registered dietician involvement post-operative	n=570 patients	Patients followed by dietician had significantly fewer readmissions due to dietary-related problems and also improved nutritional bloodmarkers.	Combined registered dietician and surgical follow-ups may help improve post-op outcomes.	Retrospective cohort study

Haal S. et al., 2021, The Netherlands	Ursodeoxycholic acid for the prevention of symptomatic gallstone disease after bariatric surgery (UPGRADE): a multicentre, double-blind, randomised, placebo-controlled superiority trial	RYGB or SG	Ursodeoxycholic acid prophylaxis	n= 985 patients	No significant reduction in occurrence of symptomatic gallstone disease in all patients after bariatric surgery; Significant reduction in gallstone risk in patients without pre-existing gallstones (RYGB group).	Effective for specific groups; further studies needed for SG outcomes.	Randomized controlled trial
Hossain I. et al., 2023, Canada	Ursodeoxycholic acid for prevention of gallstone disease after laparoscopic sleeve gastrectomy: an Atlantic Canada perspective	Laparoscopic sleeve gastrectomy	Prophylactic ursodeoxycholic acid	n= 751 patients	Cholecystectomy rate was not significantly associated with UDCA administration; Significant lower ERCP rates with UDCA (0.3% vs. 2.5%)	Lower rates of ERCP in patients receiving routine ursodeoxycholic acid	Retrospective cohort study
Li L. Et al., 2016, USA	Substance use after bariatric surgery: A review	Not specified.	Substance use post-operative	n= 40 studies	New-onset substance use post-surgery ranged 34.3%-89.5%.	Substance use evaluation pre/post-op needed to mitigate risks.	Review
Lu C-W. et al., 2015, Taiwan	Fracture Risk After Bariatric Surgery: A 12-Year Nationwide Cohort Study	Not specified.	Investigate the fracture risk in patients after bariatric surgery versus propensity score-matched controls	n=7091 patients	Increased fracture risk in surgical group, particularly post-malabsorptive procedures.	Fracture risk mitigation essential, especially for malabsorptive surgeries.	Retrospective cohort study

Mahawar, K. K. et al., 2020, United Kingdom	Ascertaining Areas for Long-Term Follow-Up of Bariatric Surgical Patients for Primary Care: A Narrative Review.	Not specified, multiple types.	Not applicable	Not applicable.	Twelve key issues were identified that highlight the importance of long-term follow-up after bariatric surgery. These include dietary guidance, exercise, new medication use, adjustments to existing medications, supplementation, complication management, the necessity of regular follow-ups, participation in support groups, contraception and pregnancy considerations, body contouring surgery, psychological support, and hematological monitoring.	A multidisciplinary approach is essential to ensure optimal patient outcomes and prevent long-term complications.	Narrative review
Mischler, R. A et al., 2018, USA	Comparison of Oral Iron Supplement Formulations for Normalization of Iron Status Following Roux-en-y Gastric Bypass Surgery: a Randomized Trial	RYGB	Oral Iron Supplementation	n=14 patients	- Significant improvements in all iron markers after 8 weeks of ferrous sulfate supplementation ($p<0.0001$). - In contrast, no significant changes were observed in the HIP group ($p>0.05$).	The administration of $FeSO_4$ was found to be effective in treating iron deficiency following Roux-en-Y gastric bypass (RYGB). In contrast, heme iron supplementation did not demonstrate efficacy in addressing	Randomized controlled trial

						this deficiency.	
Neovius, M. et al., 2018, Sweden	Risk of suicide and non-fatal self-harm after bariatric surgery: results from two matched cohort studies.	Ventricle-banded gastroplasty, gastric banding, gastric bypass	Review of suicide and non-fatal self-harm risk	n1= 4047 n2= 36418	- The incidence of suicide and non-fatal self-harm was significantly higher in the surgery group (n=87) compared with the control group (n=49) (p=0.0021). - In the second cohort a higher risk of suicide and non-fatal self-harm was observed in the gastric bypass group (n=341) compared with the lifestyle group (n=84) (p<0.0001)	Higher risk of suicide and non-fatal harm events in the surgery groups highlights the importance of screening and detecting high risk patients for postoperative monitoring.	Cohort studie
Pizza, F. et al., 2020, Italy	The Role of Ursodeoxycholic Acid (UDCA) in Cholelithiasis Management After One Anastomosis Gastric Bypass (OAGB) for Morbid Obesity	OAGB	Ursodeoxycholic acid prophylaxis	n= 190 patients	At 12 months postoperatively, gallstone formation was observed in 24/95 (25.3%) of patients in the control group, compared to 4/95 (4.2%) in the UDCA group ($p < 0.05$)	Significantly lower incidence of gallstone development with UDCA prophylaxis.	Randomized controlled trial
Rao, R. et al., 2023, Australia	Four-Year Nutritional Outcomes in Single-Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy Patients: an Australian Experience	Single-anastomosis Duodeno-ileal bypass with Sleeve Gastrectomy	Administration of different nutritional supplements	n= 196 patients	In the first 18 months postoperatively, nutritional deficiencies were observed in 14.2% of patients. However, at 48 months, no nutritional	Adequate correction of nutritional deficiencies is essential and can be achieved through multidisciplinary follow-up and the use of well-formulated	Retrospective cohort study

					deficiencies were detected in the cohort.	nutritional supplementation.	
Robinson, D. E. et al., 2021, United Kingdom	Bariatric surgery increases the rate of major fracture: self-controlled case series study in UK Clinical Practice Research Datalink	Not specified	impact of bariatric surgery on fracture risk	n= 5487 patients	Major fractures nearly tripled in the five years following surgery compared to the five years before (IRR = 2.70; 95% CI, 1.31–5.57). The overall fracture incidence also increased (IRR = 1.73; 95% CI, 1.09–2.77), Peripheral fracture rates remained unchanged. Risk factors: including age, sex, medication use, and geographic region	Bariatric surgery increases the risk of major fractures, while peripheral fractures do not increase significantly.	Self-Controlled Case Series combined with a cohort
Sakran, N. et mal., 2020, Israel	The use of Ursolit for gallstone prophylaxis following bariatric surgery: a randomized-controlled trial.	SG, OAGB, RYGB	Ursodeoxycholic acid prophylaxis	n= 209 patients	Gallstone formation in 45.7% of the placebo group compared to 23.9% in the UDCA group (p=0.029)	The effect was only significant in the LSG subgroup.	Randomized controlled trial
Salman, M. A. A. et al., 2022, Egypt	Ursodeoxycholic acid for the prevention of gall stones after laparoscopic sleeve gastrectomy: a prospective controlled study.	Sleeve gastrectomy	Ursodeoxycholic acid prophylaxis	n= 332 patients	8.5% of patients in the UDCA group developed gallstones, compared to 32% in the control group (p<0.001).	These results support the use of UDCA in the prophylaxis of gallstones	Randomized controlled trial

Schijns, W. et al., 2020, the Netherlands	A randomized controlled trial comparing oral and intravenous iron supplementation after Roux-en-Y gastric bypass surgery.	RYGB	Oral or IV iron supplementation	n= 120 patients	Twelve months after treatment, the recurrence rates were 69.7% in the FF group, 74.2% in the FG group, and 27.8% in the FCM group.	This study indicates that IV treatment is the most effective option. However, due to its higher cost, the optimal treatment choice following RYGB remains debatable.	Randomized controlled trial
Şen, O. et al., 2020, Turkey	Cholelithiasis after Sleeve Gastrectomy and Effectiveness of Ursodeoxycholic Acid Treatment.	LSG	Ursodeoxycholic acid prophylaxis	n= 280 patients	UDCA-treated patients: gallstones developed in 10.5%, compared to 37.5% in the control group ($p<0.01$)	Significant difference between UDCA group and placebo group.	Retrospective cohort study
Sharma, A. et al., 2023, United Kingdom	Role of Ursodeoxycholic Acid in the Prevention of Gallstones Formation in Bariatric Patients—a Systematic Review and Meta-Analysis of Randomised Trials.	Not specified	Ursodeoxycholic acid prophylaxis	n= 14 papers	UDCA group gallstone incidence: 8.3%, control group: significantly higher incidence of 38.1%. These findings indicate a substantial reduction in gallstone formation with UDCA use (Risk Ratio [RR] 0.27, 95% Confidence Interval [CI] 0.18-0.41, $p<0.001$).	UDCA appears to reduce the risk of gallstones from 38% to 8%, with a 500-600 mg daily dose for 6 months being effective in preventing gallstone formation.	Systematic review
Sista, F. et al., 2022, Italy and France	Long-term results of laparoscopic gastric sleeve: The importance of follow-up adherence.	LSG	Review of long-term effect of follow-up	n= 285 patients	GERD: notable difference was observed, with a higher incidence of GERD in the non-compliant group ($p=0.26$)	long-term follow-up compliance plays an important role in reducing insufficient weight loss and GERD.	Retrospective cohort study

					Insufficient weight loss: non-compliant group: 78 compliant group: 23 (p=0.001)		
Sperb, L. F. et al., 2023, Brazil	Long-Term Changes in Bone Density and Bone Metabolism After Gastric Bypass Surgery: a Retrospective Cohort Study.	RYGB	Review of the calcium-vitamin D-PTH axis and BMD changes	n= 127 patients	First DXA scan: 37,8% had low bone mass vs 44,4% in the second scan. And regarding osteoporosis this was 6,7% vs 11,1%. Vitamin D deficiency with an 41,5% after 2 years. 83,7% SHPT presence after 6 years	Calcium-vitamin D-PTH dysregulation after 5 years of follow-up and a lower BMD.	Retrospective cohort study
Thibault, R. et al., 2016, Switzerland and USA	Twelve key nutritional issues in bariatric surgery.	LSG and LRYGBP	Not applicable	Not applicable	12 keys elements preoperative management, postoperative diet, complications and bone health.	multidisciplinary long term follow-up is necessary.	Narrative review
Tian, Z. et al., 2020, China	Changes in Bone Metabolism After Sleeve Gastrectomy Versus Gastric Bypass: a Meta-Analysis.	SG and GB	Review of changes in bone metabolism	n= 13 studies	Vitamin D deficiency was more severe after RYGB (−1.85, 95% CI: −3.32 to −0.39, p=0.01), and calcium levels were lower in the RYGB group (−0.15, 95% CI: −0.24 to −0.07, p=0.0006). PTH levels remained similar between both groups	RYGB has a more pronounced impact on calcium and vitamin D metabolism compared to SG	Meta-analysis

APPENDIX III: Quality appraisal

	Giustina 2023	Anvari 2021	Li 2016	Sharma 2023	Tian 2020
1. Is the review question clearly and explicitly stated?	Yes	Yes	Yes	Yes	Yes
2. Were the inclusion criteria appropriate for the review question? **(Are all the PICO components clearly stated: Population, Intervention,Comparator, Outcome)**	Yes	Yes	Yes	Yes	Yes
3. Was the search strategy appropriate? **(Search strategy/keywords must be stated)**	Yes	Yes	Yes	Yes	Yes
4. Were the sources and resources used to search for studies adequate? **(At least 2 relevant databases should have been searched and at least one other data source [e.g. grey literature, reference list of included studies])**	Yes	Yes	Yes	Yes	Yes
5. Were the criteria for appraising studies appropriate? **(Authors must have described an appropriate method for assessing quality of included studies, e.g. CASP tool)**	Yes	Yes	No	Yes	Yes
6. Was critical appraisal conducted by two or more reviewers independently?	Yes	Yes	Unclear	Unclear	Unclear
7. Were there methods to minimize errors in data extraction? **(Either all data extraction was performed in duplicate or data extraction with validation methods employed)**	Yes	Yes	Unclear	Yes	Yes
8. Were the methods used to combine studies appropriate? **(If meta-analysis performed did the authors justify their choice of method; if no meta-analysis is justification for this given?)**	Yes	Yes	Yes	Yes	Yes
9. Was the likelihood of publication bias assessed? **(Evidence of statistical testing for publication bias given and/or funnel plot presented)**	Yes	No	No	Yes	Yes
10. Were recommendations for policy and/or practice supported by the reported data?	Yes	Yes	Yes	Yes	Yes
11. Were the specific directives for new research appropriate?	Yes	Yes	Yes	Yes	Yes

1. JBI checklist for Systematic Reviews(42)

	Mischler 2018	Pizza 2020	Haal 2021	Sakran 2020	Salman 2022	Schijns 2020
1. Was true randomization used for assignment of participants to treatment groups?	Yes	Yes	Yes	Yes	Yes	Yes
2. Was allocation to groups concealed?	Unclear	Unclear	Yes	Unclear	Yes	Yes
3. Were treatment groups similar at the baseline?	Yes	Yes	Yes	Yes	Yes	Unclear
4. Were participants blind to treatment assignment?	Yes	No	Yes	Yes	Unclear	No
5. Were those delivering the treatment blind to treatment assignment?	No	No	Yes	Yes	Unclear	No
6. Were treatment groups treated identically other than the intervention of interest?	Yes	Yes	Yes	Yes	Yes	Yes
7. Were outcome assessors blind to treatment assignment?	No	Yes	Yes	Yes	Unclear	No
8. Were outcomes measured in the same way for treatment groups?	Yes	Yes	Yes	Yes	Yes	Yes
9. Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes	Yes
10. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Yes	Yes	Yes	No	No	No
11. Were participants analysed in the groups to which they were randomized?	Yes	Yes	Yes	Yes	Unclear	Yes
12. Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes
13. Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	Yes	Yes		Yes	Yes	Yes

2. JBI Checklist for Randomized Controlled Trials(43)

	Martinez-Ortega 2020	Busetto, 2017	Fink 2022
1. Is the source of the opinion clearly identified?	Yes	Yes	Yes
2. Does the source of opinion have standing in the field of expertise?	Yes	Yes	Yes
3. Are the interests of the relevant population the central focus of the opinion?	Yes	Yes	Yes
4. Does the opinion demonstrate a logically defended argument to support the conclusions drawn?	Yes	Yes	Yes
5. Is there reference to the extant literature?	Yes	Yes	Yes
6.. Is any incongruence with the literature/sources logically defended?	Yes	Yes	Yes

3. JBI Checklist for Textual Evidence: Expert Opinion(44)

	Neovius 2018	Courtalin 2023	de Heide 2022	El Nakeeb 2022	Garg 2016	Hossain 2023	Lu 2015	Rao 2023	Robinson 2021	Sen 2020	Sista 2022	Sperb 2023
1. Were the two groups similar and recruited from the same population?	No	Yes	Yes	Not applicable	Yes	Yes	Yes	Not applicable	Yes	Yes	Yes	Not applicable

2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?	Yes	Not applicable.	Not applicable	Not applicable	Yes	Yes	Yes	Not applicable	Yes	Yes	Yes	Yes
3. Was the exposure measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Were confounding factors identified?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not applicable	Not applicable	No	Yss	Not applicable
5. Were strategies to deal with confounding factors stated?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Not applicable	Not applicable	No	No	Not applicable
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Unclear	Unclear
7. Were the outcomes measured in a valid and reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Not applicable	Yes	Not applicable	Not applicable
10. Were strategies to address incomplete follow up utilized?	Yes	Yes	Yes	Yes	No	No	Yes	No	Not applicable	No	Not applicable	Not applicable
11. Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

4. JBI Checklist for Cohort Studies(45)

	Ciudin 2021	Flores 2014
1. Is it clear in the study what is the "cause" and what is the "effect" (i.e. there is no confusion about which variable comes first)?	Yes	Yes
2. Was there a control group?	No	No
3. Were participants included in any comparisons similar?	Not applicable.	Yes
4. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes	Yes
5. Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	Yes	Yes
6. Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes
7. Were outcomes measured in a reliable way?	Yes	Yes
8. Was follow-up complete and if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes
9. Was appropriate statistical analysis used?	Yes	Yes

5. JBI Checklist for Quasi-Experimental Studies(46)

	Thibault 2016	Mahawar 2020
1. Is the generator of the narrative a credible or appropriate source?	Yes	Yes

2. Is the relationship between the text and its context explained? (where, when, who with, how)	Yes	Yes
3. Does the narrative present the events using a logical sequence so the reader or listener can understand how it unfolds?	Yes	Yes
4. Do you, as reader or listener of the narrative, arrive at similar conclusions to those drawn by the narrator?	Yes	Yes
5. Do the conclusions flow from the narrative account?	Yes	Yes
6. Do you consider this account to be a narrative?	Yes	Yes

6. JBI Checklist for Textual Evidence: Narrative(47)

APPENDIX IV: Personal reflection

Zelfreflectie Julie Carbonez

De thesis waaraan ik samen met mijn collega-haio Demi De Vriendt werkte, kaderde binnen een groepsopdracht waarbij we vanuit een gedeelde onderzoeksvraag samen een thesis opstelden: een gezamenlijke scoping review over postoperatieve complicaties na bariatrische heelkunde en het belang van multidisciplinaire en eerstelijnsopvolging in België. Gedurende drie academiejaren hebben we intensief samengewerkt aan dit project. Deze lange looptijd vereiste een doordachte planning, duidelijke taakverdeling en regelmatige communicatie, die we gedurende het volledige proces zorgvuldig hebben nagestreefd.

Vanaf het begin hebben we samen een duidelijke structuur uitgewerkt om de thesis gefaseerd aan te pakken. We planden op regelmatige tijdstippen werkmomenten in en stelden tussentijdse deadlines op die we beide opvolgden. Het proces verliep over het algemeen zeer vlot en constructief. We vulden elkaar goed aan, wat zorgde voor een fijne, aangename samenwerking. Tijdens momenten van twijfel of vertraging was er steeds ruimte om zaken bespreekbaar te maken, wat een open en respectvolle communicatie bevorderde. We merkten snel dat duidelijke afspraken en regelmatige afstemming noodzakelijk waren om een project van deze omvang en duur tot een goed einde te brengen.

Wat betreft het contact met onze promotor, hadden we ongeveer om de drie maanden een feedbackmoment. Deze momenten waren cruciaal om na te gaan of we op schema zaten en voldeden aan de verwachtingen van onze promotor. Omdat we in het begin merkten dat we soms vergaten wat inhoudelijk besproken werd tijdens de meetings , zeker wanneer we er pas enkele weken later concreet mee aan de slag gingen, begon ik na elk overleg een kort verslag op te stellen. Dit bleek een bijzonder nuttige werkwijze te zijn om het overzicht te behouden, gemaakte afspraken vast te leggen en een duidelijke agenda te bepalen voor het verdere verloop van het werk. Zo konden we bij elk nieuw overleg teruggrijpen naar eerdere afspraken en de juiste opvolging doen. Op deze manier was er ook een duidelijke taakverdeling en konden we verwarring of dubbele werk vermijden.

Qua taakverdeling denk ik dat we zo goed mogelijk de taken probeerden te verdelen, maar ik merkte dat ik af en toe spontaan het initiatief nam om bepaalde stappen vooruit te zetten, vooral op momenten waarop het tempo wat leek te vertragen door de drukte van de praktijk of andere verplichtingen. Dit kwam vooral voort uit mijn behoefte aan structuur en mijn streven naar stiptheid, ik werk graag op tijd en merk dat ik onrustig en onzeker word wanneer zaken te lang blijven liggen. Tegelijkertijd waardeerde ik het enorm dat Demi vaak de kalmte wist te bewaren wanneer ik me zorgen maakte over het tempo of de omvang van het werk. Haar nuchtere blik hielp me relativeren en bracht rust in het proces. Op die manier vulden we elkaar mooi aan en ontstond er een fijne samenwerking waarin ieders sterktes tot hun recht kwamen.

Het literatuuronderzoek, met het opstellen en uitvoeren van een gestructureerde zoekstrategie, was een van de meest tijdsintensieve onderdelen van deze thesis. Het proces vergde veel aandacht, doorzettingsvermogen en nauwkeurigheid, van het zoeken tot het analyseren en samenvatten van relevante artikels. We hebben hier veel tijd aan gespendeerd, maar dankzij een goede onderlinge afstemming en verdeling van werkmomenten konden we dit tot een goed einde brengen.

Ik denk dat deze thesis voor mij concreet heel erg nuttig is in het werkveld. Als toekomstig huisarts zie ik obesitas als een van de grootste uitdagingen van de komende decennia. De prevalentie blijft toenemen, en daarmee ook het aantal bariatrische ingrepen. Dit maakt dat huisartsen steeds vaker geconfronteerd worden met zowel de preoperatieve begeleiding als de lange termijn opvolging van deze patiënten.

Tijdens het werken aan deze thesis werd voor mij duidelijk hoe complex deze opvolging kan zijn, met aandachtspunten zoals voedingstekorten, osteoporose, galstenen, hypoglycemie en

psychologische gevolgen. Het heeft mijn inzicht verdiept in hoe belangrijk het is om niet alleen medische opvolging te bieden, maar ook oog te hebben voor de sociale en psychologische context waarin patiënten zich bevinden, zowel preoperatief als postoperatief. Ook besefte ik dat opvolging niet stopt na één jaar, maar dat blijvende aandacht nodig is, vaak levenslang.

Daarnaast besef ik nu nog meer hoe cruciaal een goede samenwerking is tussen de eerste en tweede lijn. De huisarts speelt hierin een centrale rol, als aanspreekpunt en coördinator van de zorg. Deze thesis toont voor mij het belang aan van gestructureerde, toegankelijke en geïntegreerde opvolging van een steeds groeiende groep patiënten die een bariatrische ingreep ondergaan.

Tot slot heeft deze thesis mij niet alleen veel bijgeleerd op theoretisch vlak, maar ook mijn organisatorische en communicatieve vaardigheden sterk verbeterd. Het werken met deadlines, het structureren van grote hoeveelheden informatie, het opbouwen van een wetenschappelijk document over een langere periode en een fijne samenwerking met zowel een collega-haio als een promotor, zijn allemaal nuttige leerervaringen geweest. Deze thesis was dan ook niet alleen een academisch project, maar ook een persoonlijk groeiproces waarvan ik in de toekomst zeker de vruchten zal plukken in mijn latere carrière.

Zelfreflectie Demi De Vriendt

Bij de start van onze opleiding voelden mijn medestudente Julie en ik beiden dat er een gebrek is aan duidelijke richtlijnen rond de opvolging van patiënten na bariatrische heelkunde binnen de eerstelijnszorg. Deze observatie leidde ertoe dat we ons hierin wilden verdiepen tijdens onze masterproef. Aanvankelijk dachten we aan een klassieke literatuurstudie, omdat dit ons de mogelijkheid leek te geven om een grondige analyse van de bestaande kennis te maken. Dankzij professor Goderis zijn we uiteindelijk uitgekomen bij het opzetten van een scoping review, wat ons toeliet om op een bredere manier te kijken naar het bestaande onderzoek en de leegtes in kaart te brengen. Deze keuze bleek achteraf gezien bijzonder waardevol.

Evaluatie van het groepsproces

De samenwerking met Julie gedurende de voorbije drie jaar is over het algemeen vlot verlopen. Vanaf het begin hebben we geprobeerd structuur aan te brengen door samen een tijdslijn op te stellen. In het eerste jaar was het echter lastig om deze goed te volgen. Er kwamen toen veel nieuwe verantwoordelijkheden op ons af: werk, lesdagen, en andere verplichtingen. Hierdoor werd de masterproef soms naar de achtergrond geschoven en verliep het werktempo trager dan gepland.Toch hebben we er altijd over gewaakt om in communicatie te blijven met elkaar én met onze promotor, professor Goderis. Op regelmatige basis bespraken we onze vorderingen en knelpunten. Een belangrijk struikelblok waar we lang mee geworsteld hebben, was het opstellen van een duidelijke zoekstrategie. Dit bleek veel complexer dan verwacht en nam uiteindelijk meer tijd in beslag dan we aanvankelijk hadden voorzien. Toen we geconfronteerd werden met het grote aantal artikelen dat gescreend moest worden, merkte ik bij mezelf dat ik even de moed verloor. Het voelde alsof we door het bos de bomen niet meer zagen. In die fase had ik het bijzonder moeilijk om gemotiveerd te blijven. Ik geef eerlijk toe dat de thesis vaak aanvoelde als een blok aan mijn been. Gelukkig was Julie een enorme steun. Zij was degene die me er telkens opnieuw door trok, me motiveerde om door te zetten en structuur bracht in het werkproces. Ik ben van nature een uitsteller, maar dankzij haar aanmoedigingen bleef ik toch betrokken en gemotiveerd. Ik denk dat ik omgekeerd ook vaak een steun ben geweest voor haar, het lukte mij toch vaker om de kalmte te bewaren en op momenten van stress steun te bieden. Bij het screenen van de literatuur besloten we om het werk gelijk te verdelen, wat ook later bij de data-analyse een efficiënte strategie bleek te zijn. Deze verdeling werkte goed voor ons en zorgde voor een eerlijk evenwicht in de werkbelasting. Naarmate het proces

vorderde, begon onze thesis ook echt vorm te krijgen. Dit gaf opnieuw een gevoel van vooruitgang en motivatie. De samenwerking verliep steeds respectvol en open. We konden op elkaar rekenen voor feedback, inhoudelijke ondersteuning en morele steun. Julie zorgde er ook voor dat alles goed bijgehouden werd: van to-do-lijstjes tot notities van onze vergaderingen met de promotor. Dit gaf mij houvast en zorgde voor overzicht.

Persoonlijk aandeel

We hebben geprobeerd het werk telkens zo eerlijk mogelijk te verdelen. Julie nam in het begin vaak het voortouw, wat ervoor zorgde dat ik soms moeite had om haar tempo volledig te volgen. Zeker in de beginfase, toen alles nog nieuw en overweldigend was, voelde ik de druk om bij te blijven. Toch vond ik het belangrijk om mijn verantwoordelijkheid op te nemen en actief betrokken te blijven. Tijdens het opstellen van de zoekstrategie kwamen we meermaals samen om deze gezamenlijk te verfijnen. Daarna verdeelden we de screening van de literatuur op een eerlijke manier, zodat het werk draaglijk bleef. Ook het analyseren en neerschrijven van de resultaten gebeurde in gedeeltes. De methodesectie nam ik volledig voor mijn rekening. Daarnaast schreef ik een deel van de discussie uit, wat me toeliet om inhoudelijk echt bij te dragen aan de kritische verwerking van onze bevindingen. Het correct toepassen van referentiestijl en bronvermelding was eveneens iets wat ik op mij nam. Naar het einde toe voelde ik dat ik opnieuw meer ruimte en energie had om bij te dragen, en heb ik dan ook het verfijnen van de lay-out en het dubbel nalezen van de volledige thesis op mij genomen. We herlazen ook telkens elkaars werk om na te gaan of alles helder en correct geformuleerd was, wat zorgde voor een kwalitatief eindproduct.

Impact op het werkveld

Gezien het toenemende probleem van obesitas en het stijgend aantal bariatrische ingrepen, is het onderwerp van onze masterproef bijzonder relevant. Een goede en gestructureerde opvolging van patiënten binnen de eerstelijnszorg is essentieel, zeker gezien de mogelijke bijwerkingen en lange termijngevolgen van deze ingrepen. Ons werk levert dan ook een nuttige bijdrage door de bestaande literatuur te bundelen en hiaten in de huidige opvolging in kaart te brengen. Het wordt duidelijk dat er nood is aan een meer uitgewerkte en duidelijke structuur binnen de eerstelijnszorg. De zorg voor patiënten na bariatrische heelkunde vereist een multidisciplinaire aanpak, waarbij onder andere huisartsen, diëtisten, psychologen en ook specialisten betrokken worden. Deze samenwerking moet niet alleen goed georganiseerd zijn, maar ook ingebed worden in een werkbaar financieel en organisatorisch model. Zonder een aangepaste financiering en duidelijke verantwoordelijkheden, blijft de opvolging vaak versnipperd en inconsistent. Daarnaast blijkt uit onze bevindingen dat er een gebrek is aan duidelijke, evidence-based richtlijnen die zorgverleners in de eerste lijn kunnen ondersteunen bij deze opvolging. Dit leidt tot onzekerheid en variatie in de zorgkwaliteit. Er is dan ook dringend nood aan verdere wetenschappelijke onderbouwing en praktische handvatten om deze zorg te stroomlijnen. Onze masterproef toont aan dat dit thema niet alleen medische, maar ook structurele en beleidsmatige aandacht verdient. In mijn toekomstige praktijk zal ik zeker extra aandacht besteden aan deze patiëntengroep en het belang van een gecoördineerde en duurzame opvolging. Deze ervaring heeft me doen inzien hoe belangrijk het is om verder te kijken dan de individuele patiëntenzorg en ook na te denken over het bredere zorgsysteem waarin we werken.