Recommendations

Obesity Screening

Obesity is a chronic, relapsing, progressive disease process with multiple pathologies and risk factors.

Individuals with obesity are at increased risk of morbidity from chronic disease and all-cause mortality. Health risk related to excess fat mass can be assessed using a variety of methods including:

- Body Mass Index (BMI)
- Waist Circumference (WC)
- The Edmonton Obesity Staging System (EOSS)

Patients with obesity may be at increased nutritional risk if they:

- Are following a dietary approach that is not nutritionally adequate.
- Have evidence of or suspected vitamin and mineral deficiencies.
- Have had bariatric surgery.

There are several potential barriers to obesity treatment. Addressing these barriers before initiating treatment can increase long-term success.

Obesity Treatment Options

The treatment options available for patients living with obesity include:

- Behavioural intervention
- Medication
- Bariatric surgery

Not all adults with excess weight require treatment. Although many people with excess weight benefit from treatment, it is a misconception that all adults with larger body sizes are sick, have a disease, or need to lose weight. Many important considerations may be used to decide on obesity treatment.

Health Benefits

- Weight loss of 3-5% from the baseline that is maintained may produce clinically relevant health improvements for patients living with obesity.
- Even without weight loss, the prevention of weight gain that is associated with healthy behavioural changes can lead to improvements in overall health and quality of life.

Behavioural Intervention

Behavioural interventions for obesity treatment are more successful when they include the following components:

- Behaviour change
- Physical activity
- Nutrition

The scope of this Nutrition Guideline focuses primarily on key nutrition recommendations for behavioural intervention; however, the combination of all three components is more successful than any one intervention alone.

Behaviour Change

Self-monitoring and social support are two of the many strategies that can be considered as part of an obesity intervention.

Physical Activity

The amount of physical activity documented to help with weight loss is 150 – 420 minutes or more per week, and to help with weight maintenance is 200 – 300 minutes or more per week.
This level of physical activity may not be realistic for all patients living with obesity.

Nutrition

The following nutrition recommendations are supported by the evidence for obesity treatment:

- Calorie restriction to achieve a state of negative energy balance
- Meal timing and spacing:
  - Spreading food out throughout the day (avoid skipping meals or grazing) and eating more food earlier in the day (e.g. eat something within 2 hours of waking up)
- Food-based dietary approaches:
  - Following a dietary pattern with associated health benefits (e.g. Portfolio or Mediterranean dietary patterns)
  - Limiting the intake of liquid calories
  - Reducing portion sizes at meals and snacks, or using single-serve portion-sized foods, such as meal replacement products
  - Increasing vegetables and fruit throughout the day can reduce calorie density in the diet, enhance satiation, and assist with decreasing overall energy intake
- Macronutrient-based dietary approaches:
  - Modifying carbohydrate or fat intake, while ensuring minimum requirements are met.
  - Eating enough protein and fibre at meals to promote satiety after eating
- Meal replacement products:
  - Used in conjunction with portion control and structured meal plans, as part of a comprehensive obesity treatment plan

Considerations

- Eating behaviours can be influenced by several factors (e.g. hunger, appetite, emotions).
- There are several risks associated with weight loss through lifestyle interventions (e.g. nutrient deficiency, risk of eating disorders, and weight regain).

Weight Expectations

- To sustain the health benefits associated with intentional weight loss, weight loss needs to be sustained.

Through intensive behavioural intervention (including a calorie-restricted diet, physical activity prescription, and behaviour change), weight loss of 5-10% (from the highest weight) over 6 months is achievable, with 3-5% sustained to 1 year, and often all weight regained by 6 years.

Medication

Medications may be an appropriate treatment option for some patients with obesity. The medications available in Canada for the treatment of obesity are:

- Lipase inhibitors (orlistat [Xenical®])
- Glucagon-like peptide 1 (GLP-1) receptor agonists (liraglutide [Saxenda®])
- Noradrenergic appetite suppressant/opioid antagonist (bupropion/naltrexone [Contrave®])

Nutrition Considerations

Medications used for obesity treatment require concurrent intensive behavioural interventions and energy restriction for optimal weight and health outcomes.

- Orlistat can impact nutritional status due to its fat-malabsorption effect. Recommend a nutritionally balanced, lower-fat diet to help reduce adverse effects. Supplementation with a multivitamin containing fat-soluble vitamins (A, D, E and K) is recommended.

Non-obesity Specific Medications

Some medications that are commonly used by patients with obesity (e.g. anti-depressants) may impact weight and nutrition status, even if they are not specifically prescribed for weight change purposes.

Herbal Supplements and Over-the-Counter (OTC) Medications

Currently, there are no herbal supplements or over-the-counter medications recommended for weight loss.

Bariatric Surgery

Bariatric surgery refers to many different surgical interventions for the treatment of obesity. The two bariatric surgery procedures commonly done in Alberta are:

- Sleeve gastrectomy (SG)
- Roux-en-Y gastric bypass (RYGB)

Effectiveness

- Bariatric surgery is the most effective treatment option available for obesity. On average, bariatric surgery results in 20-30% initial weight loss or about 50-60% excess weight loss (EWL).
- Bariatric surgery can result in greater short and long-term weight outcomes and greater improvement in co-morbid conditions and quality of life scores than all other treatment options.

Nutrition Recommendations Before Surgery

- A well-planned, energy-restricted diet is recommended before bariatric surgery.
- A pre-operative liquid diet (POLD) may be prescribed by surgeons to support patient's preparation for bariatric surgery.

Nutrition Recommendations After Surgery

Patients progress through three dietary stages after bariatric surgery to get back to eating solid foods. Once on to solid foods, general nutrition recommendations for patients after bariatric surgery include:

Food and Supplements:

- Eat until satisfied (avoid eating until full)
- Limit portions to approximately 1-1½ cups (250-375 mL) at each meal or snack
- Eat at least 4 times per day. Choose mostly solid foods at meals and snacks
- Ensure meals and snacks are well-planned and include a source of protein at each eating occasion
- Eat slowly and chew food well (take about 15-30 minutes to eat)
- Avoid textures that are difficult to chew (e.g. sticky, doughy, stringy, and tough)
- Limit food and drinks with sugar to prevent dumping syndrome
- Take vitamin and mineral supplements for life
- Fibre supplements and/or protein supplements may be recommended

Fluids:

- Minimum of 1.5L (6 cups) of fluid daily, eventually up to 9-12 cups per day
- Separate solids and liquids and wait 30 minutes after eating solid foods before drinking
- Sip small amounts of fluid throughout the day between meals
- Choose water and calorie-free fluids (non-carbonated) more often
- Avoid drinks with bubbles or gas (carbonated)

Considerations

Nutrition-related risks of bariatric surgery may include:

- Inadequate or excessive weight loss
- Weight regain
- Vitamin and mineral deficiencies
- Gastrointestinal issues
- Dumping syndrome
- Malnutrition

Pregnancy after Bariatric Surgery

- Pregnancy increases the risk of nutrient deficiencies after bariatric surgery due to increased nutrient needs to support the mother and fetus, therefore all women who become pregnant after bariatric surgery will require vitamin and mineral supplementation.
- Pregnancy after bariatric surgery should be delayed until 24 months when weight stability is achieved and no nutritional deficiencies exist.

Weight Bias

Weight bias is the negative attitudes or stereotypes about individuals with obesity. Weight bias negatively impacts interactions, leading to prejudice and discrimination. Some strategies to help reduce weight bias include:

- Use people-first language
- Focus on the positives that may be accomplished with obesity treatment
- Collaboratively identify behavioural goals with the patient that are important to them
- Acknowledge the difficulties faced by the patient, and avoid attributing blame
- Provide a welcoming and respectful environment
- Maintain privacy and sensitivity for all patients

Introduction

The purpose of the *Adult Obesity Care Nutrition Guideline* is to provide health professionals with an overview of the evidence-based nutrition recommendations for the management of adults (18-64 years) with obesity and provide answers to commonly asked questions (See *Key Questions List*).
Nutrition-related recommendations will be provided for the following topics:

- Obesity Screening
- Obesity Treatment Options
  - Behavioural intervention
  - Medication
  - Bariatric surgery
- Weight Bias

While comprehensive, it is important to note that this Nutrition Guideline will not include detailed information specific to:

- **Pediatrics and older adults (65 years and older):** Nutrition recommendations for the treatment of obesity are different for these populations.
- **Other diseases or specialty areas**: refer to additional Nutrition Guideline available by Nutrition Services for disease specific and specialty care information.

This information is intended as a general resource only and is not meant to replace the medical counsel of a physician or individual consultation with a Registered Dietitian (RD). It is the responsibility of the health professional to evaluate the situation of each patient in their care, and apply the Nutrition Guidelines appropriately. Individuals who are at high risk of malnutrition or who have a medical condition that is impacted by nutrition should receive RD intervention. See *Nutrition Guideline: Referral to a Registered Dietitian* for more information.

Note: For purposes of this Nutrition Guideline, the single term patient will be used to refer to clients, patients, and residents.

Background

The Nutrition Guideline was developed by AHS RDs of the *Adult Bariatric Care Integrated Nutrition Practice Working Group* and reviewed by stakeholders across the province, including the Diabetes, Obesity, and Nutrition Strategic Clinical Network. The Nutrition Guideline is based on scientific evidence or best practice.

Key Questions List

Key questions related to the nutritional management of obesity that are addressed in this Nutrition Guideline are listed below.

Obesity Screening

- What is obesity?
- What factors influence weight balance?
- What are the health risks related to obesity?
- How is health risk related to obesity assessed?
- How can patients with obesity at increased nutritional risk be identified?
- What are some potential barriers to obesity treatment?

Obesity Treatment Options

- What are treatment options for patients living with obesity?
- Is treatment recommended for all patients living with obesity?
- What are some considerations when selecting an obesity treatment?
- What are the potential health benefits associated with obesity treatment?
- What strategies are recommended when discussing weight and treatment options with patients?

Behavioural Intervention

- What are the components of an intensive behavioural intervention for obesity treatment?
- How much weight loss can be expected through intensive behavioural intervention?
- What can support behaviour change during obesity treatment?
- What are some considerations for physical activity during obesity treatment?

Nutrition

Calorie Restriction

- What calorie level is recommended for weight loss?
- What is nutritional adequacy?

Meal Timing and Spacing

- What is the recommended meal timing and spacing for obesity treatment?
- What is the evidence to support intermittent fasting for obesity treatment?

Food-Based Dietary Approaches

- Which dietary patterns are associated with improved health outcomes for patients living with obesity?
- What impact do liquid calories have on obesity treatment?
- What are some portion control strategies for obesity treatment?
- What impact do vegetables and fruits have on obesity treatment?

Macronutrient-Based Dietary Approaches

Carbohydrates

- What types of carbohydrates are recommended for obesity treatment?
- What is a restricted carbohydrate diet?
- What is the evidence to support a restricted carbohydrate diet for obesity treatment?
- What are the potential benefits of dietary fibre for patients living with obesity?
- What are the potential benefits of fibre supplements for obesity treatment?

Protein

- What impact does protein have on obesity treatment?
- Are protein supplements recommended for obesity treatment?

Fat

- What impact does dietary fat have on obesity treatment?

Meal Replacement Products

- What are meal replacement products?
- Are meal replacement products recommended for obesity treatment?
- What are low-calorie liquid diets?

Considerations

- What factors influence food intake?
- Do patients require vitamin and mineral supplements when following a calorie-restricted diet?
- What are the potential risks of weight loss through dietary approaches?
- What factors can help with the prevention of weight regain following weight loss through behavioural intervention?
- What is recommended for a patient that experiences a weight "plateau"?

Medication

- What prescription medications are available in Canada for obesity treatment?
- What are some nutrition considerations for obesity medications?
- What is the nutritional impact of non-obesity specific medications that are commonly used by patients with obesity?
- Are there any herbal supplements or over-the-counter medications that are proven to be effective for obesity treatment?

Bariatric Surgery

- What is bariatric surgery?
- When is bariatric surgery recommended as a treatment for obesity?
- Which bariatric surgery procedures are commonly done in Alberta?

Effectiveness

- What is the effectiveness of bariatric surgery as a treatment for obesity?
- What are the potential health benefits of bariatric surgery?

Nutritional Recommendations

- What are the nutrition recommendations for patients before surgery?
- What are the nutrition recommendations for patients after surgery?
- Are fibre supplements recommended after surgery?
- Are protein supplements recommended after surgery?

Considerations

Risks/Complications

- What are the potential nutrition-related risks associated with surgery?
- What is considered inadequate or excessive weight loss after surgery?
- What factors may contribute to weight regain after surgery?
- Is there a risk of vitamin and mineral deficiency after surgery?
- What potential gastrointestinal issues are common after surgery?
- What are the signs and symptoms of dumping syndrome?
- What are the nutrition recommendations for managing dumping syndrome?
- Are patients at risk of malnutrition after surgery?
- What are the signs and symptoms of malnutrition?

Pregnancy after Bariatric Surgery

- Are there nutrition risks if pregnancy occurs too soon after surgery?
- What are the recommendations for vitamin and mineral supplements in pregnancy after surgery?
- Are there specific nutrition considerations for women who experience nausea and vomiting in pregnancy after surgery?

Weight Bias

- What is weight bias?
- What strategies can be used to reduce weight bias?

Resources

- What resources are available for healthcare providers?
- What resources are available for patients?

Answers to Key Questions

Obesity Screening

Return to *Key Questions List*

Not all patients who carry excess weight require treatment. Assessing for overall health and nutritional risk, and acknowledging the complexities of obesity are important steps in the decision to move forward with obesity treatment. The following section will answer key questions related to:

- Defining obesity
- Factors influencing weight balance
- Health risks related to obesity
- Assessing for health risk related to obesity
- Identifying patients with obesity who are at nutritional risk
- Potential barriers to obesity treatment

What is obesity?

Obesity is a chronic, relapsing, progressive disease process with multiple pathologies and risk factors.[1]

What factors influence weight balance?

Factors known to influence weight balance include:[2–4]

- Physiology
- Medications
- Genetics, hypothalamic changes, and neuroendocrine disorders
- Physical environments
- Psychosocial factors
- Mental health (e.g. depression, eating disorders)

Given the multiple factors that impact weight balance, it is important to recognize the complexity of achieving and maintaining weight loss. Weight outcomes are not controlled solely by the behaviours of an individual,[3] and individual choice is shaped by the wider context in which it occurs.[4]

What are the health risks related to obesity?

Individuals with obesity are at increased risk of morbidity from cardiovascular disease (CVD), type 2 diabetes, gallbladder disease, osteoarthritis, obstructive sleep apnea, respiratory problems, and certain forms of cancer.[4,5] Obesity is also associated with an increased risk of all-cause mortality.[5]

How is health risk related to obesity assessed?

Health risk related to excess fat mass can be assessed using a variety of methods, including:

- Body Mass Index (BMI)
- Waist Circumference (WC)
- The Edmonton Obesity Staging System (EOSS)

Body Mass Index (BMI)

BMI is a screening tool that uses weight and height to help identify health risk associated with obesity.[6] categories and their associated health risks are summarized in **Table 1** below. BMI is not a direct measure of body fat but is the most widely investigated indicator to date of health risks associated with weight.[6]

Considerations:

- BMI does not take into account the presence or severity of co-morbidities, therefore it should be interpreted in conjunction with other health risk measures.
- The BMI ranges, associated health risks, and treatment targets are different for children and older adults (≥65 years).
- BMI cannot determine if excess weight is associated with higher fat mass, lean mass, and/or fluid retention.
- BMI does not identify adiposopathy[7] (dysfunction of adipose tissue) in people with lower or higher BMI.
- BMI cannot determine the effect of weight on health and quality of life.[8,9]

Waist Circumference (WC)

WC is an indicator of health risk associated with excess abdominal fat. Excess abdominal fat (regardless of total fat mass) is an independent predictor of disease risk and morbidity.[5] See **Table 1** for a summary of health risk classification using both BMI and WC.[6]

Table 1. Health Risk Classification using both Body Mass Index (BMI) and Waist Circumference (WC)[6,10]

		BMI		
		18.5-24.9	25-29.9	30-34.9
WC	<102cm (Males) <88cm (Females)	Least Risk	Increased Risk	High Risk
	≥102cm (Males) ≥88cm (Females)	Increased Risk	High Risk	Very High Risk

Considerations:

- WC is only valid as a relative health risk tool within a BMI range of 25–34.9 kg/m^2.[5]
- WC measurements lose predictive power incrementally at BMI values exceeding 35 kg/m^2, therefore, for patients with a BMI above 35kg/m^2, WC does not provide additional information regarding the level of risk.[6]
- There are different disease-specific and ethnic-specific waist circumference cut-off points. The cutoff points listed in the table above do not apply to all patients.[10]
- Measured height, weight, and WC are recommended, as self-reported measurements have been found to be inaccurate.[11,12]

Edmonton Obesity Staging System (EOSS)

The EOSS is a system to classify the severity of obesity that may help to assess health risk associated with excess weight.[13] In addition to BMI to determine obesity class, a stage is identified by assessing for:

- The presence and severity of risk factors (e.g. borderline hypertension)
- Co-morbidities (e.g. sleep apnea)
- Functional limitations (e.g. limitations in activities of daily living)

Independent of BMI, the EOSS stage demonstrates correlation to morbidity and mortality.[14] It is a useful tool to assist health professionals with an assessment of obesity-related health risk and guide clinical decisions for treatment.

How can patients with obesity at increased nutritional risk be identified?

Patients with obesity may be at increased nutritional risk if they:

- Are following a dietary approach that is not nutritionally adequate. For example:
  - a calorie-restricted diet that is <1200kcal per day
  - avoiding certain foods or macronutrients (e.g. following a ketogenic diet)
  - inadequate intake of protein, fibre, whole grains, and healthy fats
- Have evidence of or suspected vitamin and mineral deficiencies
- Have had bariatric surgery

Referral to an RD is recommended for patients with obesity at increased nutritional risk.

What are some potential barriers to obesity treatment?

Some examples of potential barriers to obesity treatment include:[15]

- **Mental health:** Mood/personality disorder, anxiety, attention deficit disorder, addiction, psychotic or cognitive disorder, sleep disorder
- **Mechanical:** Chronic pain (osteoarthritis, plantar fasciitis), reflux disease, obstructive sleep apnea.
- **Medical:** Thyroid disease, PCOS
- **Social:** Education, employment, low income, disability
- **Other:** Readiness to change, knowledge, beliefs, skills, time constraints, language, learning disability, impaired cognition, lack of social support

Identifying and addressing barriers to obesity treatment can help prevent patient feelings of failure, low self-esteem, and improve self-efficacy.[15]

Obesity Treatment Options

Return to *Key Questions List*

This section will focus on specific treatment options for patients living with obesity and considerations for treatment selection.

What are treatment options for patients living with obesity?

Treatment options for patients living with obesity include:

- Behavioural intervention
- Medication
- Bariatric Surgery

Table 2 below summarizes the treatment options that may be considered for patients based on BMI.

Table 2. Treatment Options for Obesity by Category of Body Mass Index[16,17]

Treatment	BMI (kg/m²)				
	Overweight		Obesity		
			Class I	Class II	Class III
	25.0-26.9	27.0-29.9	30-34.9	35.0-39.9	≥40
Behavioural Intervention	Yes	Yes	Yes	Yes	Yes
Obesity Medication	No	Yes, with co-morbidity	Yes	Yes	Yes
Bariatric Surgery	No	No	No	Yes, with co-morbidity	Yes

There are some important considerations when selecting an obesity treatment, and obesity treatment is not always recommended. For more information, see: "Is treatment recommended for all patients living with obesity?" and "What are some considerations when selecting an obesity treatment?"

Is treatment recommended for all patients living with obesity?

Not all adults with excess weight require treatment. Although many people with excess weight benefit from treatment, it is a misconception that all adults with larger body sizes are sick, have a disease, or need to lose weight. These misconceptions contribute to weight bias, stigma, and discrimination, affecting both children and adults.[8,9]

What are some considerations when selecting an obesity treatment?

BMI is not the only factor that may be used to decide on treatment selection. Other important considerations include:

- Age and life stage
- Body composition
- Health risk (see EOSS)
- Comorbid conditions and medications (health status)
- Readiness to make behaviour changes
- Personal goals or interest in obesity treatment
- Individual ability to comprehend treatment options and make informed decisions about care.
- Weight history and the etiology of their weight gain: Have root causes for obesity (e.g. genetics, medications, mental illness) been explored and treated if possible?
- Safety: participation in obesity treatment is contraindicated in conditions where caloric restriction or weight loss may impede or impair health (e.g. pregnancy[18] or active cancer[19])
- Medical history with eating disorders or disordered eating (e.g. active Binge Eating Disorder [BED] or Bulimia Nervosa [BN])
- Barriers to treatment

What are the potential health benefits associated with obesity treatment?

Weight loss of 3-5% from the baseline that is maintained may produce clinically relevant health improvements for patients living with obesity.[4] That being said, weight loss is not the only outcome associated with health benefits. Even without weight loss, the prevention of weight gain from healthy behavioural changes can lead to improvements in overall health and quality of life.

Potential health benefits associated with weight loss are highlighted in **Table 3** on the following page.

Table 3. Potential health benefits associated with weight loss (by percentage from Baseline Body Weight [BBW])

Weight Loss (%BBW)	Potential Health Benefits
3-5%	• Improved triglycerides (TG), blood glucose (BG) levels, and reduced risk of developing type 2 diabetes[4,20] • Improvement in polycystic ovarian syndrome (PCOS) and fertility[20]
5-10%	• Improved blood pressure, LDL, and HDL cholesterol [4,20] • Potentially reduced risk for emergent depression[20] • Reduced mobility decline with aging and improved knee functionality, speed, walking distance, and pain[20] • Improved symptoms of urinary incontinence and sexual function in both men and women[20]
10% +	• Reduced risk and symptoms of obstructive sleep apnea (OSA)[20] • Improvement in non-alcoholic steatotic hepatitis activity score[20]
5-15% +	• Reduced risk for in hepatic steatosis[20] • Improvement in quality of life scores[20]
• There is some evidence that intentional weight loss may reduce the risk of some cancers related to obesity (e.g. endometrial cancer)[21,22]	

What strategies are recommended when discussing weight and treatment options with patients?

The treatment of obesity is complex. Weight outcomes are not in the direct control of patients; therefore, honest and open discussions with patients about realistic weight loss and health outcomes from obesity interventions can help manage patient expectations, with the goal to prevent feelings of failure and frustration.

Use the Term 'Best Weight'

Using the term 'Best Weight' to frame a patient's goal weight discussion may be helpful.[23] 'Best Weight' is the weight a person achieves while living a life they truly enjoy.[23] Enjoyment encompasses the consumption of the foods they love and doing the amount of exercise they enjoy. Weight loss achieved by eating the smallest amount of calories and doing the largest amount of exercise a person can tolerate may be unsafe and is unlikely to be maintained.[23]

Focus on Behavioural Goals

To support patients, focus on behavioural goals that are in their direct control, rather than clinical outcomes. An example of a patient's goal could be to have fruit at breakfast, instead of a goal to lose 5 lbs.

Behavioural Intervention

Return to *Key Questions List*

The following section will answer questions on behavioural intervention as a treatment for obesity, with a focus on nutrition recommendations. The following topics are covered:

What are the components of an intensive behavioural intervention for obesity treatment?

The three components of an intensive behavioural intervention for obesity treatment are:[24]

- Behaviour change
- Physical activity
- Nutrition

While the scope of this Nutrition Guideline focuses primarily on key nutrition recommendations for behavioural interventions, the combination of all three components is more successful than any one intervention alone. Behavioural intervention is the cornerstone of treatment and continues regardless of medical or surgical interventions added.[4]

Although health care providers can provide general education and support in these areas, an interdisciplinary approach to obesity treatment is recommended.[4]

How much weight loss can be expected through intensive behavioural intervention?

To sustain the health benefits associated with intentional weight loss, weight loss needs to be sustained. While long-term maintenance of weight loss is one of the challenges in obesity treatment, it is possible.[4]

Evidence supports that through intensive behavioural intervention (including a calorie-restricted diet, physical activity prescription, and behaviour change), weight loss of 5-10% (from the highest weight) over 6 months is achievable, with 3-5% sustained to 1 year, and often all weight regained by 6 years.[4] Weight loss may not be linear for all patients and the rate of loss may be variable and unpredictable.[4]

Considerations

- It is important to note that only 20% of people attempting weight loss through behavioural intervention can achieve and maintain a 5% weight loss over a year.[25]
- Weight loss greater than 5-10% may be very difficult for patients to achieve and maintain through behavioural intervention alone.[4]
- Healthcare providers and patients may have higher expectations for weight loss from behavioural interventions than what evidence suggests is attainable. For some patients, additional treatment options, including medication or bariatric surgery, may need to be considered as an adjunct to treatment through behavioural intervention.

What can support behaviour change during obesity treatment?

To support behaviour change, healthcare providers may consider using several behaviour changes strategies as part of an intervention based on the patient's individual needs. For example:

- **Self-monitoring**: Can be used by patients to help increase their awareness of dietary behaviours, track their progress toward goal achievement, and support self-management.[26]
- **Social support**: Can be used to help patients build a supportive network of family, friends, colleagues, and health professionals for information, encouragement, and emotional support.[26]

Referral to a health care provider is recommended for support with behaviour change during obesity treatment. An interdisciplinary approach to obesity treatment is recommended to support the patient's individual needs during obesity treatment.

What are some considerations for physical activity during obesity treatment?

Higher levels of physical activity and reduced time spent in sedentary activities are common to those who successfully lose and then maintain their weight.[3] Some considerations for physical activity during obesity treatment include:[4]

- The amount of physical activity documented to help with weight loss is 150–420 minutes or more per week, and the amount of physical activity documented to help with weight maintenance is 200–300 minutes or more per week.
- This level of physical activity may not be realistic for all patients living with obesity.

Referral to a health care provider is recommended for support with physical activity during obesity treatment. An interdisciplinary approach to obesity treatment is recommended to support the patient's individual needs during obesity treatment.

Nutrition

Key nutrition recommendations that may be considered as part of a behavioural intervention for the treatment of obesity include:

- Calorie restriction
- Meal timing and spacing
- Food-based dietary approaches
- Macronutrient-based dietary approaches
  - Carbohydrates
  - Protein
  - Fat
- Meal replacement products

Calorie Restriction

What calorie level is recommended for weight loss?

A caloric restriction to achieve a state of negative energy balance is required for weight loss.[4] Calorie level recommendations for weight loss can either be set as target ranges or as a reduction target from baseline calorie intake. Initial recommendations are listed in **Table 4** below.

Table 4. Recommended Calorie Level for Weight Loss[4]

Sex	Calorie Target	Reduction Target
Men	1,500 to 1,800 kcal/day	500-750 kcal reduction from baseline calorie intake, with a minimum of 1500 kcal/day
Women	1,200 kcal to 1,500 kcal/day	500-750 kcal reduction from baseline calorie intake, with a minimum of 1200 kcal/day

Different targets may be needed for different patients depending on their height, weight, age, activity level, and their goals. For individualized targets, referral to an RD is recommended.

Weight loss will occur when calorie intake is below total calorie needs, however, this does not continue indefinitely. For more information, see: "What is recommended for a patient that experiences a weight "plateau"?"

Considerations

- Patients eating less than 1200 kcal per day may be at nutrition risk and require vitamin and mineral supplementation. Medical monitoring by a medical doctor is recommended, as well as nutrition assessment by an RD.[4]
- Low-calorie diets (LCD) that provide 900 kcal per day and very-low-calorie diets (VLCD) that provide <900 kcal per day require medical supervision[27] since the rapid rate of weight loss induced by these diets can cause medical complications, including increased risk of gallstones[28] and cardiovascular changes. These diets are not recommended as a long-term treatment and are only considered for select patients with a BMI ≥30.[4]

What is nutritional adequacy?

Nutritional adequacy depends on the composition of the total diet compared to individuals' nutrient needs. The risk of nutrient inadequacy increases when calories are restricted below 1200 kcal per day or when baseline calorie intake is reduced by greater than 500 kcal.[29]

Most dietary approaches for obesity treatment can be adequately provided they are well-planned and monitored. As a dietary approach becomes more restrictive on a specific macronutrient, the risk of inadequacy increases.

The Eat Well Plate from Canada's Food Guide (CFG) is a guide for nutritional adequacy at meals. For more information, visit the CFG website: https://food-guide.canada.ca/en/

Strategies to improve nutritional adequacy within a calorie restriction may include:[29]

- Increase food variety
- Choose nutrient-dense foods
- Consider vitamin and mineral supplementation and/or protein supplementation as needed
- Increase energy expenditure from activity instead of further calorie restriction

Meal Timing and Spacing

What is the recommended meal timing and spacing for obesity treatment?

The ideal number of eating occasions for weight loss and weight maintenance is not known, and specific recommendations for meal timing, or "when to eat", is based on the individual.[4]

Research does indicate, however, that irregular calorie intake throughout the day may be less favourable for the maintenance of body weight and for cardiometabolic health.[30] Evidence also favours eating more calories earlier in the day (e.g. having breakfast), as this has shown to have positive effects on diet quality and cardiometabolic risk factors (lipid and glycemic profiles).[30,31] Alternatively, skipping breakfast is associated with higher BMI,[32] lower nutrient adequacy, weight gain, and increased cardiometabolic risk.[30]

Recommendations

Recommending an intentional approach to eating, with a focus on the frequency and timing of eating, may be the basis of improved diet quality and health outcomes for patients living with obesity.[30] Meal timing and spacing recommendations for patients living with obesity include:

- Spread food intake throughout the day instead of skipping meals (e.g. only eating in the evening) or eating continuously over a longer period (e.g. grazing).[4,30,33]
- Eat something within a couple of hours of waking up (e.g. have breakfast within 2 hours of waking up). Eat more food earlier their day (when patients are more alert and active) versus in the evening.[30,31]
- Plan to have meals and snacks at specific times throughout the day to help manage hunger and portions[30] (e.g. plan to eat 3 meals and 1 or 2 snacks, with 3-5 hours between each eating occasion).

What is the evidence to support intermittent fasting for obesity treatment?

Intermittent fasting may be one approach to support calorie-restricted diets.[34]

Many dietary approaches that include a calorie restriction follow a continuous calorie restriction method, reducing total calories for every day of the week. Intermittent calorie restrictions (or intermittent fasting) concentrate restriction to specific times of day or days of the week. There are different types of intermittent fasting, with no clear benefit of following one fasting schedule over another.[34]

Emerging evidence on intermittent fasting indicates short term, small improvements in weight (with calorie restriction), with minimal harm reported. However, in a review comparing intermittent calorie restriction to continuous calorie restriction, both approaches produced the same weight loss and metabolic improvements. Longer term trials are required to draw definitive conclusions, and evidence is lacking to guide recommendations for the use of intermittent fasting in obesity treatment.[34]

Considerations

Fasting may not be safe for certain populations, including:

- People with additional calorie needs (e.g. pregnancy/lactation)
- People who need to take medications with food
- People with mental health concerns impacting eating and feeding behaviours (e.g. eating disorders, anxiety disorders)
- Patients with diabetes who are at increased risk of hypoglycemia if fasting

Referral to an RD is recommended for patients interested in intermittent fasting for obesity treatment.

Food-Based Dietary Approaches

Which dietary patterns are associated with improved health outcomes for patients living with obesity?

A dietary pattern refers to foods and beverages that are consumed regularly. When certain dietary elements are grouped, they can be associated with increased or decreased chronic disease risk.

The use of dietary patterns in the treatment of obesity focuses on the improvement of health outcomes and diet quality, independent of weight or weight loss.[35]

The table below summarizes dietary patterns that have been studied in patients with obesity and highlights the benefits of each.

Table 5. Summary of Dietary Patterns[4,36,37]

Dietary Pattern	Description	Benefits	Comments on Weight
Portfolio	Based on the consumption of four components: • Plant sterols • Viscous soluble fibre • Soy protein • Nuts	• Lower LDL-C / raise HDL-C as effectively as statins, independent of weight loss. • Improved cardiometabolic risk factors	• Studies were done in patients in the 'overweight' BMI category • Studies were designed to be weight neutral and found benefits
Mediterranean	Emphasis on plant-based foods: • Vegetables and Fruit • Whole grains • Potatoes • Beans • Nuts and seeds • Moderate to high intake of olive oil • Low intake of red meat	• Improved cardiometabolic risk factors • Can be implemented in a step-wise manner • As more of the Mediterranean diet principals are incorporated, greater health outcomes are experienced	• Weight neutral unless combined with calorie restriction. • Wine is a component of the Mediterranean diet • Consider the caloric content of wine as part of the calorie prescription
DASH	High in: • Vegetables and fruit • Whole grains • Low-fat dairy • Poultry • Fish • Nuts	• Effective at lowering blood pressure regardless of weight loss	• Weight neutral unless combined with calorie restriction • Weight loss while following DASH results in greater improvements to blood pressure compared to weight loss from other diet interventions

For more information, please refer to the following *Nutrition Guidelines: Cardiovascular Care and Adult Diabetes Care*

What impact do liquid calories have on obesity treatment?

Evidence on the impact of liquid calories on obesity treatment suggests that:

- Higher intake of sugar-sweetened beverages (or high carbohydrate beverages) is associated with higher body weights and an increased risk of developing type 2 diabetes and CVD.[38]
- Replacing sugar-sweetened beverages with calorie-free beverages (water or diet beverages) can be an effective strategy for calorie restriction, provided these calories are not consumed in other parts of the diet.[4]
- High protein beverages do not lead to increased calorie consumption the same way high carbohydrate beverages do. However, the consumption of protein in a beverage instead of in a solid form generally elicits a weaker satiety response in comparison to solid foods.[39,40]

Sugar substitutes

Sugar substitutes can be used by adults with obesity as part of a calorie-restricted and/or restricted carbohydrate dietary approach.[41,42] Most sugar substitutes contain no calories. Sugar alcohols provide about 2 kcal/g and are less sweet than sugar.

What are some portion control strategies for obesity treatment?

Reduction of portion size is associated with decreased calorie intake with some evidence showing no increase in ratings of hunger.[32]

Portion-control strategies using single-serve portion-size packaged foods, meal replacements (refer to meal replacement products section for more information), portion-controlled serving utensils or portioned plates, are associated with reduced intake and are supportive for weight loss.[4]

What impact do vegetables and fruits have on obesity treatment?

Increasing vegetables and fruit can reduce calorie density in the diet, enhance satiation, and assist with decreasing overall energy intake (especially if consumed instead of higher energy density foods).[4]

Evidence suggests people benefit from reduced mortality when they eat five or more servings of vegetables and fruits per day, regardless of their baseline BMI or weight loss.[35]

Increasing vegetables and fruits as the only nutrition intervention is not sufficient to produce weight loss.[4] However, evidence suggests an increase in vegetable and fruit intake combined with other nutrition interventions is associated with weight loss and maintenance of weight loss.[32]

Macronutrient-Based Dietary Approaches

Several different macronutrient-based dietary approaches can support weight loss or improved health outcomes. The following section focuses on common questions related to:

- Carbohydrates
- Protein
- Fat

Carbohydrates

What types of carbohydrates are recommended for obesity treatment?

Health benefits from carbohydrates are most apparent when the carbohydrates are from high fibre, low glycemic index (GI) food sources with limited added sugar, such as whole grains, fruit, vegetables, legumes, and lower-fat dairy products.[10,43]

Consuming carbohydrates through added sugars and refined foods is not recommended as it promotes hyperglycemia and cardiovascular risk factors (decreased HDL-C and increased triglycerides).[44,45]

For more information, please refer to the following *Nutrition Guidelines: Cardiovascular Care and Adult Diabetes Care*

What is a restricted carbohydrate diet?

The definition of restricted carbohydrate diets varies in the literature. **Table 6** below provides definitions and descriptions that are commonly used.

Table 6. Restricted Carbohydrate Diet Descriptions

Diet	Carbohydrate Amount*
Moderate carbohydrate	• Provides a minimum of 130 grams of carbohydrate daily and between 26-45% total energy from carbohydrate[46]
Low carbohydrate	• Provides less than 130 grams of carbohydrates daily or less than 26% total energy from carbohydrate[46]
Ketogenic (very low carbohydrate high fat‡)	• High in fat and very restricted in carbohydrate, providing 20-50 grams of carbohydrate daily or less than 10% total energy from carbohydrate[47]

*Carbohydrate refers to available or net carbohydrate, which is the total carbohydrate minus dietary fibre.
‡High Fat typically refers to an intake of 65 to 80% of total energy y from dietary fat.

What is the evidence to support a restricted carbohydrate diet for obesity treatment?

Restricting carbohydrate intake is one approach that can support weight loss or improved health outcomes.[4] No macronutrient distribution is superior over another when it comes to weight loss.[48] An intensive behavioural intervention for weight loss can increase the likelihood of weight loss success and long-term obesity treatment while following a restricted carbohydrate diet.

Effectiveness

There is evidence to indicate that restricted carbohydrate diets bring about greater weight reduction in the short-term (6 to 12 months), but often there is no clinical difference in weight loss over the long-term (>12 to 24 months) when compared to other dietary approaches. Mean weight loss achieved in randomized control studies ranges between 1.5-9 lbs (0.7 to 4.0 kg) and is dependent on study quality and duration.[49]

Considerations

- Nutrient deficiencies can occur with any type of restricted diet. Risk of nutrient deficiency increases as carbohydrate intake becomes more restricted, but the risk may be mitigated if the diet is well planned and monitored appropriately.[48]
- A ketogenic diet excludes nutrient-rich foods (e.g. whole grains and fruit) and poses the highest risk of nutrient deficiency among restricted carbohydrate diets.
- Very-low-carbohydrate diets (e.g. Ketogenic diets) are considered contraindicated for some patient populations (e.g. pregnancy, inborn errors of metabolism, renal stones, and chronic metabolic acidosis).[47,50]
- Long-term adherence to any therapeutic diet can be challenging. If a patient is interested in following a restricted carbohydrate diet, it is recommended that health care providers discuss the patient's health and lifestyle goals and their readiness to make lifestyle changes.[48]
- Medical monitoring of patients following a ketogenic diet is consistently recommended in the literature. Recommendations for medical monitoring should be discussed with the patient's physician and based on the patients' medical condition, risk factors, and expected goals/outcomes of the therapeutic diet intervention.

Referral to an RD is recommended for patients following a carbohydrate-restricted diet.

What are the potential benefits of dietary fibre for patients living with obesity?

Dietary fibre includes the edible component of plant material that is resistant to digestion by human enzymes.[51] Dietary fibre can play an important role in the treatment of obesity as it promotes satiety,[51] and can reduce the risk of CVD, type 2 diabetes, and cancer.[51]

Fibre appears to be most beneficial when it is consumed from foods such as vegetables, fruits, whole grains, nuts and legumes (cooked beans, peas and lentils).[51]

What are the potential benefits of fibre supplements for obesity treatment?

Fibre supplements for patients with obesity may be used to slow gastric emptying, improve satiety, meet nutrition requirements, and help constipation.[52]

Evidence for the effectiveness of fibre supplements for weight loss is inconsistent. Choose fibre supplements based on the patient's needs:[52,53]

- Insoluble fibres increase stool volume (e.g. wheat bran, methylcellulose).
- Viscous and soluble fibres delay gastric emptying, increase satiety, and improve stool consistency (e.g. beta-glucan, guar gum, glucomannan, pectin, and psyllium).
- Non-viscous fibres do not increase satiety, but increase stool bulk and have prebiotic properties (e.g. FOS, inulin, wheat dextrin).
- Non- or slow-fermentable fibres cause less gas and bloating (e.g. wheat bran, psyllium, and methylcellulose).

Considerations

Considerations for the use of fibre supplements as part of an intervention for patients with obesity are summarized in **Table 7**.

Table 7. Fibre Supplement Considerations[54,55]

Consideration	Description	Recommendation
Gastrointestinal side effects	• Soluble viscous fibre can cause gastrointestinal side effects, such as flatulence, abdominal pain, diarrhea, constipation, nausea, and/or esophageal/bowel obstructions	To minimize side effects, recommend that patients: • Slowly increase psyllium intake • Consume with generous amounts of water
Medication and nutrient interaction	• Psyllium fibre can reduce the absorption of medications and iron supplements	To reduce the risk of interactionism, provide patients with the following education: • Do not take psyllium (powder or capsules) within 2 hours of taking other medication • Take iron supplements 1 hour before or 4 hours after psyllium to help prevent issues with absorption
For more information, refer to https://www-e-therapeutics-ca.ahs.idm.oclc.org/search		

For considerations on the use of fibre supplements after bariatric surgery, see: "Are fibre supplements recommended after surgery?"

Protein

What impact does protein have on obesity treatment?

Protein may help with obesity treatment by promoting satiety and changes to body-composition in favour of fat-free body mass.[56]

When compared to carbohydrate and fat, protein may help patients feel full longer.[40] It is recommended to include foods with protein at meals and snacks to improve satiety throughout the day.[40]

Amount of protein
The amount of protein needed to induce satiety is not known, but some studies show post-prandial satiety to be higher with 30 grams of protein per meal in comparison to lower protein meals.[40]

Protein intake of 1.2-1.6 g/kg ideal body weight (IBW) is recommended during active weight loss and maintenance to help preserve lean body mass. Most diets that may be considered low carbohydrate or low fat tend to fall within the recommended 10-35% of total calorie intake recommendations for protein.[4]

Type of protein
Encourage patients to choose the source of dietary protein they prefer (e.g. plant, animal, or both). The type of protein may influence cardiometabolic risk when selected as part of a dietary pattern (e.g. Portfolio dietary pattern).

Referral to an RD is recommended to ensure adequate protein intake during active weight loss.[19]

For more information, please refer to the following *Nutrition Guideline: Cardiovascular Care*

Are protein supplements recommended for obesity treatment?

Routine protein supplements may not be necessary if patients can eat adequate protein through food. Protein supplements can be used for patients with obesity to promote satiety and help maintain lean body mass during weight loss if dietary intake is insufficient or if it is the patient's preference.[40]

Considerations
If patients are using protein supplements, or providers suspect protein intake is inadequate, referral to an RD is recommended.

There are many supplements with protein on the market. It is important to consider the quality and safety of the product, as highlighted in **Table 8** on the following page:

Table 8. Quality and Safety of Protein Supplements

Consideration	Description
Calories	• Some supplements may be higher in calories. Protein supplements with limited additional calories from carbohydrate or fat may be preferred for patients needing additional protein only and following a calorie-restricted diet.
Quality	• Not all dietary protein sources are of equal quality. Dietary proteins that contain all nine indispensable (essential) amino acids are complete proteins and considered high quality.[57] • Casein and whey protein are generally considered high-quality protein.[58] • Some plant-based proteins, such as pea protein, are not complete. With a combination of sources, plant-based proteins can be considered high-quality sources.[58] • Collagen products are often marketed for weight loss or building muscle mass but are not considered high-quality protein supplements since they are incomplete.

Safety	• Products with a license have been assessed by Health Canada and found to be safe, effective, and of high quality under their recommended conditions of use.[59]
	• Healthcare Providers can identify licensed natural health products by looking for the eight-digit Natural Product Number (NPN) on the label.[59]
	• Protein supplements may be contraindicated for patients with:
	  ○ Certain medical conditions (e.g. patients with chronic kidney disease)
	  ○ An allergy to an ingredient (e.g. milk, soy)

For considerations on the use of protein supplements after bariatric surgery, see: "Are protein supplements recommended after surgery?"

Fat

What impact does dietary fat have on obesity treatment?

Higher dietary fat intake is generally associated with higher weight status.[60] Fat is the most calorically dense macronutrient, providing approximately 9 kcal/g, compared to 4 kcal/g for carbohydrates and protein.

Dietary fat modifications for weight loss are common. The ketogenic diet is one example of a very low carbohydrate, high-fat diet. Both low fat and high-fat diets have been studied in weight loss, with both diets resulting in a reduction of caloric intake and reduced body weight. Generally, as carbohydrate intake goes down, fat intake increases. Both low fat and high-fat diets tend to have reduced adherence over time as maintaining these diets in the current food environment is challenging.[4]

Very-low-fat diets (less than 15% of daily calories from fat) are not recommended. The high carbohydrate content of these diets can increase triglyceride levels, and their high fibre content (up to 40 to 70 grams daily) may improve satiety but can decrease the absorption of calcium, iron, and zinc. Very-low-fat-diets require monitoring for their impact on triglyceride levels and nutritional adequacy.[61]

If a patient is considering modifying fat intake for obesity treatment, referral to an RD is recommended.

Meal Replacement Products

What are meal replacements products?

Meal replacements refer to a variety of products that can be used to replace meals. Products can include liquid shakes, bars or pre-portioned meals. Meal replacements can be formulated to replace some or all meals to help with obesity treatment. Depending on their intended use (partial or full meal replacement) the nutrition criteria for the product differs.

Canadian Food and Drug Regulations (FDR) prescribe the standards and composition for the different types of meal replacement products for use in calorie-restricted diets.[27]

Are meal replacement products recommended for obesity treatment?

Meal replacement products used in conjunction with portion control and structured meal plans can be part of a comprehensive obesity treatment plan. Use of meal replacement products has been associated with improvements in diet quality.[62]

Partial meal replacements: Using a partial meal replacement strategy (replacing 1-2 meals per day with pre-portioned meal replacement products) may produce greater short- and long-term weight loss compared to traditional foods.[4,63]

Total meal replacements (or low-calorie liquid diets): There is limited evidence to support total meal replacements as a long-term strategy for weight loss or maintenance.

If a patient is considering using or is using meal replacement products to lose weight or as part of a calorie-restricted diet intervention, referral to an RD is recommended.

What are low-calorie liquid diets?

Low-calorie liquid diets replace all meals with liquid meal replacement products. They are often used as part of a comprehensive obesity treatment program or as a pre-operative liquid diet (before bariatric surgery). Low-calorie liquid diets are currently defined as providing 900 calories daily and must be authorized by a physician and only dispensed through an approved supplier (e.g. a pharmacy).[27] The Optifast 900 program is a common example of a low-calorie liquid diet product available in Canada.

Some patients may experience side effects while following a low-calorie liquid diet. Side effects may include:[64]

- Bad breath or dry mouth
- Gastrointestinal upset (e.g. constipation, diarrhea, heartburn)
- Dizziness
- Tired, fatigue
- Feeling cold
- Hair loss, dry skin, brittle nails
- Gallstones
- Hunger
- Muscle cramps

Low-calorie liquid diets are not meant to be followed long-term. Patients following a low-calorie liquid diet require medical monitoring by a physician and referral to an RD.

Considerations

Considerations for behavioural interventions for patients with obesity are provided below.

What factors influence food intake?

Eating behaviours and factors influencing food intake are complex. Eating behaviours can be influenced by several factors including (but not limited to) a patient's:

- Hunger (the physical need to eat)
- Appetite (the desire to eat)
- Thoughts and thinking patterns
- Emotions
- Environment

Several nutrition strategies can be used to manage these factors. For example, self-monitoring may be a helpful strategy to increase the patient's awareness of how these factors influence their food intake. For additional support, referral to an RD is recommended.

Do patients require vitamin and mineral supplements when following a calorie-restricted diet?

In most cases, routine supplementation with vitamin and mineral supplements when following a calorie-restricted diet is not required. Vitamin and mineral supplementation may be advisable depending on factors such as the level of calorie restriction, nutritional adequacy, and the patient's medical history.

Referral to an RD is recommended for patients with suspected nutritional inadequacy.

What are the potential risks of weight loss through dietary approaches?

Potential risks of weight loss through dietary approaches are highlighted in **Table 9.**

Table 9. Risks of Weight Loss through Dietary Approaches

Risk	Context	Strategies to minimize risk
Nutrient deficiencies	The greater the food or caloric restriction, the greater the risk of nutritional inadequacy.[4]	Consider micronutrient or protein supplements as needed.[4]
Sustainability	Dietary and behavioural changes need to be continued to maintain weight loss. The greater an intervention differs from the baseline, the harder long-term adherence becomes.[4]	Consider smaller goals, individualized for the patient.[4]
Eating disorders	In a subset of individuals, perceived pressure for thinness, thin-ideal expectancies, and thin-ideal internalization are risk factors for disordered eating cognitions and behaviours.[65]	Screen for eating disorders and refer as necessary (e.g. mental health provider).
Reduced muscle mass and bone density	All weight loss is associated with reduced muscle mass and bone mineral density.[66,67]	Several strategies have been studied to maintain muscle mass and bone density, including:[66,67] • Resistance exercise training • Adequate protein intake • Adequate calcium and vitamin D intake

What factors can help with the prevention of weight regain following weight loss through behavioural intervention?

Obesity is a chronic condition. Any behavioural intervention used to lose weight needs to be sustainable for the patient in order to support long-term weight maintenance.

The prevention of weight regain is an important and difficult phase of obesity treatment. Short term "quick fix" solutions focusing on maximizing weight loss are generally unsustainable and often associated with high rates of weight regain.[4]

Prevention of weight regain is not solely up to the individual but influenced by multiple factors, including:[68]

- Energy balance and metabolism
- Co-morbid conditions
- Mental health (e.g. depression)
- Level of activity/mobility
- Social support
- Coping style
- Stressful life events

To achieve and maintain health benefits and behaviour changes, sustainable behavioural changes are required. Nutrition, physical activity, and behaviour modification all play an important role. Combining all three interventions, as opposed to any one alone, is more likely to result in successful maintenance of weight loss and help with the prevention of weight regain.[4]

Some other considerations for sustainable behavioural interventions include:

- The closer a dietary intervention is to baseline intake, the more likely that intervention will be successful in the short and long-term.
- Self-monitoring is a strong predictor of dietary change and weight outcome due to an increased awareness of food intake.
- Long-term and frequent contacts between the patient and health care provider can further promote weight loss and weight maintenance.[4]

What is recommended for a patient that experiences a weight "plateau"?

Throughout weight loss, patients will reach caloric equilibriums (sometimes called a "plateau"). This is a normal part of how our bodies achieve energy balance.[23] During the process of weight loss, the following changes take place:

- **Metabolic adaptation** (also known as adaptive thermogenesis): Weight loss lowers the number of calories a body burns in a day, above and beyond changes that would be anticipated for weight loss alone.[69]
- **Endocrine changes:** Weight loss induces changes in circulating hormone levels known to increase hunger and decrease satiety.[3]

There are no known behavioural strategies to combat these changes. Metabolic adaptation and endocrine changes are thought to be significant contributors to the challenges of long-term weight loss and weight maintenance. As a patient loses weight, their total calorie needs decrease. The calorie target previously required for weight loss will eventually equal total calorie needs. To continue to lose weight after a weight plateau, patients will need to find new ways to establish a caloric deficit.[23] Consideration should be given to a patient's 'Best Weight' as further weight loss may not be safe or realistic.

It is important to recognize the complexity of obesity treatment and that energy balance and metabolism are unique to each patient. If your patient experiences a weight plateau, referral to an RD is recommended to determine if it is safe and realistic to continue aiming for weight loss or to transition to a focus on weight maintenance.

Medication

Return to *Key Questions List*

The following section answers key questions on prescription medications, over-the-counter (OTC) medications, and/or herbal supplements for obesity treatment.

What prescription medications are available in Canada for obesity treatment?

Medications available in Canada for the treatment of obesity are:[70]

- Lipase inhibitors (orlistat [Xenical®])
- Glucagon-like peptide 1 (GLP-1) receptor agonists (liraglutide [Saxenda®])
- Noradrenergic appetite suppressant/opioid agonist (buproprion/naltrexone [Contrave®])

Obesity medications may be indicated when adults are overweight (BMI 27 – 29.9 kg/m2) and present with co-morbidities or have obesity (BMI ≥30 kg/m2).

What are some nutrition considerations for obesity medications?

Medications used for obesity treatment require concurrent intensive behavioural intervention and caloric restriction for optimal weight and health outcomes.

Nutrition considerations related to obesity medications are summarized in **Table 10** below.

Table 10. Nutrition Considerations for Obesity Medications

Medication Classification	Name (Brand®)	Nutrition Considerations
Lipase inhibitors	orlistat (Xenical®)	• Orlistat works by impairing the absorption of dietary fat, resulting in side effects such as fecal spotting, abdominal pain, diarrhea and anal fissures.[71] • Recommend a hypocaloric, nutritionally balanced diet with less than 30% of the calories from fats.[4,71] • Supplementation with a multivitamin containing fat-soluble vitamins (A, D, E and K) and beta carotene is recommended.[4,71]
Glucagon-like peptide 1 (GLP-1) receptor agonists	liraglutide (Saxenda®)	• No specific nutrition considerations.
Noradrenergic appetite suppressant/opioid antagonist	bupropion/ naltrexone (Contrave®)	

If a patient is experiencing nutrition-related complications associated with obesity medication, referral to an RD is recommended.

What is the nutritional impact of non-obesity specific medications that are commonly used by patients with obesity?

Some medications that are commonly used by patients with obesity (e.g. anti-depressants) may impact weight and nutrition status, even if they are not specifically prescribed for weight change purposes. Some medications may inadvertently promote weight gain or weight loss, while others may be weight-neutral.[72,73]

If a patient has any concerns regarding the impact that their medication is having on their weight, they should discuss their concerns with their primary care provider.

For more information, refer to the Compendium of Pharmaceutical Specialties at: https://www.e-therapeutics.ca

Are there any herbal supplements or over-the-counter medications that are proven to be effective for obesity treatment?

Currently, there are no recommended herbal supplements or OTC medications for weight loss. Evidence for the efficacy of these products to consistently stimulate weight loss or prevent weight gain is absent or inconclusive.[4]

If patients are using a product or have questions, consultation with an RD, pharmacist or physician is recommended. A helpful resource is the Natural Medicine Comprehensive Database https://naturalmedicines.therapeuticresearch.com

Bariatric Surgery

Return to *Key Questions List*

Patients who have had bariatric surgery are at increased nutritional risk and require intensive support from an interdisciplinary team of health care providers. This section covers the following topics:

- Understanding bariatric surgery
- Determining if bariatric surgery is appropriate for your patient
- Bariatric surgery procedures performed in Alberta
- The effectiveness of bariatric surgery
- Nutrition recommendations before and after bariatric surgery
- Considerations after bariatric surgery:
  - Nutrition-related risks and complications
  - Pregnancy

What is bariatric surgery?

Bariatric surgery refers to many different surgical interventions designed as a tool to assist in obesity treatment.[16,17] Each procedure assists with obesity treatment by restricting food intake through the creation of a small pouch in the stomach. Some procedures may also produce malabsorption by altering the gastrointestinal tract.

Treatment for obesity, including bariatric surgery, is more successful when supported by a team of interdisciplinary health care providers. If a patient is interested in learning more about bariatric surgery, encourage them to talk to their doctor.

When is bariatric surgery recommended as a treatment for obesity?

Every patient has different treatment needs. Family doctors and specialists can work with patients to develop a plan that is best for them.

People who may benefit from bariatric surgery are:[74]

- Between 18-65 years old.
- Have a BMI of 40 kg/m^2 or higher.
- Have a BMI 35 kg/m^2 or higher with one or more weight-related health problems, such as high cholesterol, high blood pressure, sleep apnea, diabetes, or joint problems.
- Have tried several methods to manage their weight, but their weight is still affecting their health and/or quality of life.
- Have learned about the benefits and risks of bariatric surgery.
- Are ready and able to make important behavioural changes and maintain these changes.

Which bariatric surgery procedures are commonly done in Alberta?

Two types of bariatric surgery procedures are commonly done in Alberta. **Table 11** below highlights these two procedures, along with a description of their mechanisms for weight loss and maintenance of weight loss.

Table 11. Bariatric Surgery Procedures Performed in Alberta[75,76]

Procedure	Description	Mechanism
Sleeve Gastrectomy (SG)	• The stomach is reduced to about 20% of its original size by surgical removal of a large portion of the stomach. The result is a sleeve or tube-like structure.[74,77] • This procedure cannot be reversed because most of the stomach is removed. • Some people may have another surgery to change to a gastric bypass.	• A small volume of a sleeve (approximately 80-125 mL) limits the amount of food a patient can eat at one time to about ½-1 cup (125-250 mL) in the early weeks or months after bariatric surgery, and up to 1-1 ½ cups (250-375 mL) long term. • Patients will feel full eating smaller portions. When patients eat less food, they may take in fewer calories, which can help them lose weight.[74,77] • After surgery, the body will produce less *ghrelin*, which is an appetite hormone. This helps patients to feel less hunger.[77,78] • There are no changes to the intestine; the only change is to the stomach. This means the body will absorb most of the nutrients from the foods they eat.[77]
Roux-en-Y Gastric Bypass (RYGB)	• The stomach is divided into a small upper pouch and a much larger lower "remnant" pouch. • The small intestine is rearranged to connect to both pouches.[74,77]	• Small pouch volume (approximately 30-50 mL or 2-3 Tbsp.) limits the amount of food a patient can eat at one time to about 1 cup (125–250 mL) in the early weeks or months after bariatric surgery, and up to 1-1 ½ cups (250 mL) long term. • Patients will feel full after eating smaller portions. When they eat less food, they may take in fewer calories, which can help them lose weight.[74,77]

Procedure	Description	Mechanism
Roux-en-Y Gastric Bypass (RYGB) ***[continued]***		• A small opening slows down the movement of food and drinks out of the pouch. This may help your patients feel full longer.[77] • After surgery, the body will produce less *ghrelin*, which is an appetite hormone. This helps patients to feel less hunger.[77,78] • Body absorbs fewer nutrients from the food patients eat because it does not go into the bottom part of the stomach and the upper intestine.[77]

Effectiveness

What is the effectiveness of bariatric surgery as a treatment for obesity?

Bariatric surgery is the most effective treatment option available for obesity, as it assists with many of the factors that impact weight balance. Bariatric surgery achieves greater weight outcomes and improvement in co-morbid conditions than other treatment options.

Bariatric surgery results in substantial and sustained weight loss.[79] Weight outcomes for bariatric surgery relate to the patients highest weight. On average, bariatric surgery results in 20-30% total body weight (TBW) loss or about 50-60% excess weight loss (EWL). Excess weight is the total amount of weight above a reference standard for IBW (based on a BMI of 24.9). Five years after surgery, 20% loss of TBW weight or 50% EWL is considered a successful weight outcome.[74]

Considerations
Predicting weight outcomes for an individual after surgery is challenging, as many variables impact weight, and each person and situation are unique. Weight outcomes after bariatric surgery are not to achieve a "normal" weight based on height/weight tables or BMI ranges. These tools were designed to predict health risk, not as bodyweight targets.

What are the potential health benefits of bariatric surgery?

Potential benefits of bariatric surgery include:[74,79]
- Improvement in patient's health and quality of life[80]
- Greater weight loss than other treatments alone
- Improvement in co-morbidities (e.g. type 2 diabetes, hypertension, and CVD)
- Improved breathing
- Ability to move better and be more active[81]
- Improved fertility and pregnancy outcomes[82]
- Lower risk of death from heart disease and some cancers

For more information, see "*What are the potential health benefits associated with obesity treatment?*"

Nutrition Recommendations

What are the nutrition recommendations for patients before surgery?

Before bariatric surgery, it is recommended that all patients follow a well-planned, calorie-restricted diet to build and maintain health behaviour changes that will increase their likelihood of successful outcomes after bariatric surgery.[83]

In the weeks leading up to bariatric surgery, some patients may be prescribed a pre-operative liquid diet (POLD) by the surgeon. A POLD:

- Is a calorie-restricted, lower carbohydrate/higher protein therapeutic diet that is generally recommended for a minimum of 2 weeks and up to 6 weeks before surgery.[84,85]
- Is delivered as a liquid diet using liquid meal replacement products that are approved by Health Canada as products designed to replace all meals in a calorie-restricted diet.[27]
- Can help reduce liver volume and decrease surgical risk.[86,87]

Referral to an RD is recommended for all patients before the initiation of a POLD.

What are the nutrition recommendations for patients after surgery?

Patients follow a three-stage diet progression after bariatric surgery to promote healing and reduce risk of post-operative complications. The three diet stages are summarized below in **Table 12.**

Table 12. Nutrition Recommendations for Patients after Bariatric Surgery[19,83.]

Diet Stage	Description
Stage 1: Full Fluid Bariatric Diet	• Typically initiated in hospital, 0-1 day(s) post-operatively, after approval by the medical team. • Lasts approximately 14 days (2 weeks) after bariatric surgery.
Stage 2: Soft Solids	• A short-term, texture-modified diet to introduce solid foods. • Foods recommended during this stage are softer, moist foods. • Typically begins 14 days after bariatric surgery (following the full fluid bariatric diet). • The length of time for this stage varies based on individual tolerance (may last from a few days to a couple of weeks).
Stage 3: Eating Well after Bariatric Surgery	**General recommendations (food and supplements):** • Eat only until satisfied (avoid eating until full). Limit intake of solid food to approximately 1-1 ½ cups (250-375 mL) at each meal or snack. • Eat at least 4 times per day. Eating 5-6 times per day may be required if portions are very small (e.g. less than 1 cup). • Choose mostly solid foods at meals and snacks. • Ensure meals and snacks are well-planned and include a source of protein at each eating occasion. • Make time for meals and snacks to eat slowly and chew food well (about 15-30 minutes). • Avoid textures that are difficult to chew (e.g. sticky, doughy, stringy, tough) as they may cause discomfort and/or vomiting due to obstruction in the stoma of the pouch. • Limit food and drinks with sugar to prevent dumping syndrome for patients with alterations to their intestine (e.g. RYGB). • Take vitamin and mineral supplements for life

Diet Stage	Description
Stage 3: Eating Well after Bariatric Surgery *(continued)*	**General recommendations (fluid):** • Aim to consume a minimum of 1.5L (6 cups) of fluid daily,[83] with an eventual goal of 9-12 cups of fluid per day.[60] • Separate solids and liquids. Wait 30 minutes after eating solid foods before drinking. • Sip small amounts of fluid throughout the day between meals and snacks. Choose water and calorie-free fluids (non-carbonated) more often.[83] • Avoid drinks with bubbles or gas (carbonated) as they may cause fullness, discomfort, heartburn, or nausea.

Referral to an RD for ongoing nutrition monitoring is recommended after bariatric surgery.

Are fibre supplements recommended after surgery?

Fibre supplement recommendations after bariatric surgery differ depending on the timing after surgery.

In the **early postoperative period** (<30days), the use of fibre supplements is uncommon. If fibre supplements are needed, soluble, non-viscous sources (e.g. inulin, wheat dextrin) are preferred.[19]

Use of fibre supplements in the **long-term postoperative period** (>12 months) is not well studied. If a patient has concerns with postoperative weight gain, a 15g/day fibre supplement is associated with improved health outcomes.[19]

Referral to an RD is recommended for patients considering fibre supplementation after bariatric surgery.

Are protein supplements recommended after surgery?

After bariatric surgery, protein supplements can be used to meet protein requirements. Choose a high-quality protein supplement or ensure protein comes from a variety of sources if using a lower quality protein.[19]

Protein supplements may be indicated for patients after bariatric surgery to:
- Promote satiety.
- Help reduce the loss of skeletal muscle during weight loss.
- Help meet increased protein needs for wound healing.
- Meet protein requirements after bariatric surgery in the early postoperative phase (e.g. when on fluids and transitioning to solid foods).
- Meet requirements after surgery (at any time) if intake is below requirements.

Referral to an RD is recommended for patients with suspected inadequate protein intake after bariatric surgery.

Considerations

The following section will focus on the following considerations for patients after bariatric surgery:

Risks/Complications

What are the potential nutrition-related risks associated with surgery?

Nutrition-related risks of bariatric surgery may include:[74]

- Inadequate or excessive weight loss
- Weight regain
- Vitamin and mineral deficiencies
- Gastrointestinal issues
- Malnutrition

Although bariatric surgery can be an effective obesity treatment, it is **not a cure**. Some people regain some or all of the weight they lose after surgery. Bariatric surgery is only one tool used to treat obesity and it needs to be used in addition to other obesity treatment options (e.g. behavioural intervention and/or medication), not as a replacement.

What is considered inadequate or excessive weight loss after surgery?

Inadequate weight loss (<30% EWL)[88] may be an indication of surgical or technical failure (e.g. loss of integrity of gastric pouch), maladaptive eating behaviours, or psychological complications (e.g. depression, anxiety).

Excessive weight loss (>80% EWL) may indicate protein-energy malnutrition, excessive restriction of intake, excessive exercise, or unintentional weight loss due to other reasons (e.g. obstructions, cancer).

Investigation and referral to the appropriate health care provider is recommended.[19]

What factors may contribute to weight regain after surgery?

It is possible and even expected for patients to regain some weight after surgery. Some patients may even regain all of the weight that they lost. Obesity is a chronic disease that needs to be monitored and managed over time.

Weight regain is a typical pattern of weight change after bariatric surgery, with a mean weight regain of 7% of TBW at 10 years post-surgery.[74] More substantial weight regain of 20-25% of TBW 10 years after bariatric surgery is a risk for all patients, and is dependent on several factors.[25]

Factors that may affect weight regain after bariatric surgery are summarized in **Table 13** on the following page.

Table 13. Potential Factors Contributing to Weight Regain after Bariatric Surgery

Factors	Description
Behaviour and Self-Monitoring[25]	• Decrease or discontinuation of self-monitoring • Changes to physical or mental health impacting lifestyle behaviours (e.g. depression)
Nutrition[25]	• Increased caloric intake; Selection of calorically-dense foods/drinks • Increased frequency of eating: 6 or more times per day (grazing pattern of intake) • Consumption of carbonated beverages (may contribute to decreased satiety over time) • Consuming liquids and solids together, or having liquids too soon (within 30 minutes) after a solid meal • Rate of eating is too slow (grazing pattern, or taking >30 minutes to eat a meal) • Adaptation to feelings of fullness/satiety over time; able to eat an increased portion of food
Medical or Surgical[19,89]	• Decreased metabolic rate due to advancing age, decreased muscle mass, medication, disease, endocrine factors • Medication side effects • New diagnosis or worsening of co-morbid condition (e.g. depression) impacting lifestyle behaviours • Surgical/technical problems (e.g. gastro gastric fistula [RYGB])
Activity[25]	• Increase in sedentary behaviour • Decrease or discontinuation of activity • Decreased energy expenditure (e.g. injury or illness)

For more information on weight regain, see: "*What factors can help with the prevention of weight regain following weight loss through behavioural intervention?*"

Is there a risk of vitamin and mineral deficiency after surgery?

Vitamin and mineral deficiencies can develop after bariatric surgery due to poor oral intake, malabsorption, and increased excretion or losses. Because of this, vitamin and mineral supplementation is recommended for life after surgery, regardless of the procedure.[78]

Basic vitamin and mineral supplement requirements for micronutrient deficiency prevention are the same after both SG and RYGB. Daily supplementation may include:[19]

- One prenatal multivitamin (which provides extra iron and folic acid)
- Calcium citrate, vitamin D_3, and vitamin B_{12} to meet requirements
- Thiamine in the first few months after surgery (e.g. up to 6 months after bariatric surgery)
- Additional iron and/or vitamin A (if required)

Blood work is recommended to detect and monitor for vitamin and mineral deficiencies, with attention to:[78]

- Iron (CBC-diff, ferritin, iron, TIBC and % sat)
- Folic acid (folate)
- Bone health (25-OH vitamin D, calcium and PTH)
- Vitamin B_{12}

Referral to an RD for ongoing nutrition assessment and monitoring of vitamin and mineral deficiencies is recommended.[19]

What potential gastrointestinal issues are common after surgery?

Potential gastrointestinal issues that patients may experience following bariatric surgery are summarized in **Table 14.**

It is important to note that post-bariatric surgery problems reported by patients are not always nutrition-related and may be multifactorial. Referral to a surgeon or medical doctor for medical assessment may be indicated. For patients experiencing nutrition-related complications after surgery, referral to an RD is recommended.

Table 14. Potential Gastrointestinal Issues after Bariatric Surgery

Nutrition-Related Complication	Description	Cause/Risk Factors	When to refer to Healthcare Team
Vomiting	• Nausea/vomiting is reported in 30–60% of patients after bariatric surgery, often in the first post-operative months.[83] • Patients may regurgitate (bring food up) after surgery if they don't follow recommended eating behaviours. This can happen without nausea.	• Eating more than their pouch can hold[83] • Eating too fast[83] • Not chewing well enough[83] • Drinking fluids with solid foods[83] • Persistent vomiting despite compliance with eating behaviours is often a sign of a surgical complication[83]	• Can't eat or drink • Are dehydrated • Have pain or bleeding • Have trouble swallowing • Vomiting bright red or dark brown liquid • The patient has a long list of foods that aren't tolerated (e.g. foods that cause vomiting or regurgitation)
Diarrhea	• Diarrhea is when patients have loose, watery stools usually more than 3 times a day.[90]	• Infection[90,91] • Food intolerances (e.g. lactose intolerance)[90,91] • Reaction to medications[90,91] • Dumping syndrome[90,91] • Intestinal diseases, (e.g. irritable bowel syndrome or inflammatory bowel disease)[90,91]	• Signs of dehydration[90] • Diarrhea for more than 3 days[90] • Pain in the stomach or rectum[90] • Fever of 39° C (102° F) or higher[90] • Blood in their stool or black stools[90]
Constipation	• Constipation is when stool is hard, difficult or painful to pass, or when patients have less than 3 bowel movements a week.[92]	• Not enough fluid or fibre[83] • Post-operative vitamin and mineral supplements (e.g. calcium and iron)[83] • The use of narcotics for post-operative pain[83] • Not being active[83]	• No bowel movement in three days[19,92] • Rectal bleeding[19,92] • Unintentional weight loss[19,92] • Pain[19,92]

Nutrition-Related Complication	Description	Cause/Risk Factors	When to refer to Healthcare Team
Heartburn	• Heartburn is a common complication after bariatric surgery, most often with a LAGB or SG.[93]	• Food choices or intolerances[64] • Eating too quickly[64] • Inadequate chewing[64] • Eating or drinking too much at one time[64] • Consuming fluids and solids at the same time[64] • Consuming carbonated beverages[64] • Consuming caffeine or alcohol[64]	• If heartburn is occurring regularly (e.g. 3 times per week or more)[94] • An SG cannot be reversed because most of the stomach is removed. Some people may need revision surgery to an RYGB to combat excessive heartburn.
Dehydration	• Dehydration is common after surgery • Signs of dehydration include:[94] ○ Feeling thirsty ○ urinating (peeing) less often ○ dark urine ○ dry skin ○ feeling tired ○ feeling light-headed	• Vomiting • Smaller stomach size (less room for food and fluid) • Reduction in water intake due to taste changes • The need to separate liquids from solids • The need to avoid sugar-sweetened or carbonated drinks[83]	• Irritable/disoriented • Low energy • Can't keep down fluids • Severe vomiting or diarrhea[94]

What are the signs and symptoms of dumping syndrome?

Dumping syndrome is identified as a cluster of symptoms that can develop after gastric or intestinal surgery (most commonly with RYGB).[95] Symptoms start to occur after food or beverage intake and present as early as 30 minutes (75% of individuals) or as late as 1 to 3 hours after consumption (25% of individuals).[95] Early and late symptoms of dumping syndrome are summarized in **Table 15.**

Table 15. Early and Late Symptoms of Dumping Syndrome[95,96]

Timing	Description	Symptoms
Early symptoms (30 minutes after eating)	• Early symptoms occur when food and fluid pass into the small intestine too fast	• Nausea • Vomiting • Stomach pain • Cramping • Diarrhea • Feeling of fullness • Bloating • Increased heart rate
Late symptoms (1-3 hours after eating)	• Late symptoms occur when there are changes in the amounts of insulin and sugar in the bloodstream (reactive hypoglycemia)	• Flushing • Sweating • An intense need to lie down • Feeling weak or dizzy • Feeling nervous or shaky • A drop in blood pressure

What are the nutrition recommendations for managing dumping syndrome?

Nutrition recommendations for managing dumping syndrome symptoms include:[83,96]

- Eat 4-6 times per day.
- Eat smaller meals.
- Limit foods high in sugar.
- Choose foods with fibre and protein
- Separate solids from liquids. Wait 30 minutes after eating solid foods before drinking.

Referral to an RD is recommended. For some patients, symptoms may be severe and require assessment by a physician or bariatric surgeon.

Are patients at risk of malnutrition after surgery?

Yes, patients are at risk of malnutrition after bariatric surgery. Malnutrition is a condition that happens when people do not get enough nutrition from the food they eat. This may result from a poor appetite or a disease that requires more nutrients than their bodies are taking in. After bariatric surgery, the risk of malnutrition is higher because of:

- Smaller portions (consuming less food and fewer nutrients overall).[77]
- Potential taste and appetite changes.
- Changes in the absorption of some vitamins and minerals.[78]
- Potential of gastrointestinal complications.[83]
- Potential of surgical complications that affect the ability to eat (e.g. gastric ulcer or esophageal strictures).[19]

Severe malnutrition

Severe malnutrition is the most extreme and visible form of malnutrition, frequently requiring urgent treatment. The risk of severe malnutrition after bariatric surgery is low; however, it can occur. Malnutrition can be severe enough to justify revision surgery[97] (if possible) and/or placement of a feeding tube.[98]

What are the signs and symptoms of malnutrition?

Signs and symptoms of malnutrition include:[99]

- Excessive weight loss
- Hyperphagia (abnormally increased appetite)
- Hair loss
- Muscle wasting
- Edema
- Vitamin and mineral deficiencies

Patients who have concerns with excessive weight loss, dietary restrictions or eating difficulties post-bariatric surgery would benefit from a referral to an RD and a bariatric surgeon.

Pregnancy after Bariatric Surgery

Are there nutrition risks if pregnancy occurs too soon after surgery?

Women who become pregnant soon after surgery are at an increased risk of vitamin and mineral deficiencies. Achieving appropriate gestational weight gain targets and fetal birth weight targets may also be more challenging.

Most guidelines recommend delaying pregnancy for 24 months post-bariatric surgery.[19,100,101] However, even pregnancies over 2 years after bariatric surgery may have some nutritional risk. Malnutrition and vitamin and mineral deficiencies can occur at any time after bariatric surgery, which may impact both maternal and fetal outcomes. Regular monitoring and evaluation is recommended.

What are the recommendations for vitamin and mineral supplements in pregnancy after surgery?

Women who are pregnant after bariatric surgery are at increased risk of multiple vitamin and mineral deficiencies, including:[19,86]

- Iron
- Folate
- Vitamin B_{12}
- Fat-soluble vitamins

Deficiencies have been documented with serious health implications for babies born to mothers after bariatric surgery, and are more common with RYGB than SG.[86] All women who become pregnant after bariatric surgery will require close monitoring and vitamin and mineral supplementation. Referral to a high-risk pregnancy clinic with an RD is recommended.

Are there specific nutrition considerations for women who experience nausea and vomiting in pregnancy after surgery?

Women who experience nausea and vomiting in pregnancy after bariatric surgery are at high risk of nutrient deficiency, which may impact the health of the mother and fetus. In particular, women with nausea and vomiting in pregnancy after bariatric surgery are at high risk of thiamine deficiency.

Nausea and vomiting are non-specific symptoms that are common among pregnant women and after bariatric surgery. It can be challenging to differentiate if the contributing factor is the pregnancy, bariatric surgery, or both. Surgical complications may present as epigastric pain or discomfort, nausea and/or vomiting.[101]

If a woman who is pregnant after bariatric surgery experiences nausea and vomiting, referral for medical assessment is recommended. Consult a bariatric surgeon early in the course of evaluation of abdominal pain, recurrent nausea, and/or vomiting to determine if it is a surgical complication.[102]

Weight Bias

Return to *Key Questions List*

The following section addresses the important topic of weight bias, with specific strategies and suggestions to reduce weight bias when providing care to patients living with obesity.

What is weight bias?

Weight bias is the negative attitudes or stereotypes about individuals with obesity. Weight bias negatively impacts interactions, leading to prejudice and discrimination.[103] Evidence suggests that weight bias can trigger psychological and behavioural changes that may contribute to poor metabolic health and further weight gain.[104]

Weight bias is common in health care and contributes to negative stereotypes and obesity myths, which are not substantiated in the literature. Some examples of weight bias are that people with obesity:[103]

- Can achieve any weight they desire.
- Are less physically active and eat unhealthy diets.
- Lack of motivation and self-control, are lazy, self-indulgent, undisciplined, less productive, less competent, non-compliant, and are looking for the "easy way out".
- Are less intelligent and less educated.

What strategies can be used to reduce weight bias?

When providing care to patients living with obesity, there are several strategies that can help reduce weight bias. Some of these strategies are highlighted in **Table 16** below:

Table 16. Strategies to Help Reduce Weight Bias[104]

Timing	Description
Use people-first language	• Use language such as "a patient living with obesity" as opposed to "an obese patient".
Be positive	• Focus on the positives that may be accomplished with obesity treatment versus the negative effects of failing to address obesity.
Be collaborative	• Collaboratively identify behavioural goals with patients that are important to them. • Focus on person-centred outcomes versus weight-related outcomes.
Be understanding	• Up to 80% of obesity might be genetically determined. • Acknowledge the difficulties faced by the patient and avoid attributing blame.

Provide a welcoming environment	• Provide a welcoming and respectful environment that is appropriate for patients with larger bodies. For example:
	  ○ Provide chairs without arms and with a higher weight capacity.
	  ○ Provide appropriate medical equipment, such as higher capacity weigh scales and different sized cuffs to measure blood pressure.

Be respectful of privacy	• Maintain privacy and sensitivity for all patients by providing a confidential area for measurements (e.g. height and weight) and physical assessment.

Resources

Return to *Key Questions List*

What resources are available for healthcare providers?

AHS Nutrition Services

- **Nutrition Handouts:** Refer to the *Nutrition Education Materials Webpage* for approved provincial Alberta Health Services handouts to support patient education.
- **AHS Nutrition Guidelines:** Provides nurses, physicians, and other health professionals with consistent, evidence-based messaging for key nutrition topics https://www.albertahealthservices.ca/info/Page3505.aspx
- **Nutrition Services Webpage:** Provides information on how to access a dietitian and services available across the province

Weight Bias

- AHS Bariatric Friendly Hospital Initiative: https://www.albertahealthservices.ca/scns/Page13410.aspx
- Obesity Canada (weight bias): https://obesitycanada.ca/weight-bias/
- Obesity Action Coalition: https://www.obesityaction.org/action-through-advocacy/weight-bias/weight-bias-resources/
- Harvard Implicit Association Test for Weight Bias: https://www.health.harvard.edu/blog/addressing-weight-bias-in-medicine-2019040316319
- UConn Rudd Center for Food Policy and Obesity: http://www.uconnruddcenter.org/weight-bias-stigma

Other

- Primary Health Care Resource Centre: https://www.albertahealthservices.ca/info/Page7468.aspx
- Obesity Canada (professional): https://obesitycanada.ca/resources/
- World Obesity Federation: https://www.worldobesity.org/
- American Society for Metabolic and Bariatric Surgery (ASMBS): www.asmbs.org
- Canadian Association of Bariatric Physicians and Surgeons (CABPS): www.cabps.ca

What resources are available for patients?

AHS Nutrition Services

- **Nutrition Handouts:** Refer to the *Nutrition Education Materials Webpage* for approved provincial Alberta Health Services handouts to support patient education.
- **Nutrition Services Webpage:** Provides information on how to access a dietitian and services available across the province https://www.albertahealthservices.ca/info/Page16475.aspx

Other

- Obesity Canada (public): https://obesitycanada.ca/public-resources/
- Canada's Food Guide: https://food-guide.canada.ca
- My Health Alberta: https://myhealth.alberta.ca

References

1. Bray GA, Kim KK, Wilding JPH. Obesity: a chronic relapsing progressive disease process. A position statement of the World Obesity Federation. Obes Rev An Off J Int Assoc Study Obes. 2017 Jul;18(7):715–23.
2. van der Valk ES, van den Akker ELT, Savas M, Kleinendorst L, Visser JA, Van Haelst MM, et al. A comprehensive diagnostic approach to detect underlying causes of obesity in adults. Obes Rev An Off J Int Assoc Study Obes. 2019 Jun;20(6):795–804.
3. Melby CL, Paris HL, Foright RM, Peth J. Attenuating the Biologic Drive for Weight Regain Following Weight Loss: Must What Goes Down Always Go Back Up? Nutrients. 2017;9(5).
4. Raynor HA, Champagne CM. Position of the Academy of Nutrition and Dietetics: Interventions for the Treatment of Overweight and Obesity in Adults. J Acad Nutr Diet. 2016 Jan;116(1):129–47.
5. Jensen MD, Ryan DH, Apovian CM, Ard JD, Comuzzie AG, Donato KA, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. Circulation. 2014;129(25 Suppl 2):102.
6. Government of Canada, Health Canada. Canadian Guidelines for Body Weight Classification in Adults-Quick Reference Tool for Professionals-Canadian Guidelines for Body Weight Classification in Adults-Quick Reference Tool for Professionals [Internet]. [cited 2020 Jul 28]. Available from: www.healthcanada.ca/nutrition
7. Bays HE, González-Campoy JM, Henry RR, Bergman DA, Kitabchi AE, Schorr AB, et al. Is adiposopathy (sick fat) an endocrine disease? Int J Clin Pract [Internet]. 2008 Oct;62(10):1474–83. Available from: http://onlinelibrary.wiley.com/doi/10.1111/j.1742-1241.2008.01848.x/abstract
8. Bray GA, Heisel WE, Afshin A, Jensen MD, Dietz WH, Long M, et al. The Science of Obesity Management: An Endocrine Society Scientific Statement. Endocr Rev [Internet]. 2018;39:1–54. Available from: https://academic.oup.com/edrv/advance-article/doi/10.1210/er.2017-00253/4922247
9. Schwartz MW, Seeley RJ, Zeltser LM, Drewnowski A, Ravussin E, Redman LM, et al. Obesity Pathogenesis: An Endocrine Society Scientific Statement. Endocr Rev. 2017;38(4):267–96.
10. Anderson TJ, Grégoire J, Pearson GJ, Barry AR, Couture P, Dawes M, et al. 2016 Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult. Can J Cardiol. 2016;32(11):1263–82.
11. Connor Gorber S, Shields M, Tremblay MS, McDowell I. The feasibility of establishing correction factors to adjust self-reported estimates of obesity. Heal Reports. 2008 Sep;19(3):71–82.
12. Johnson WD, Bouchard C, Newton RL, Ryan DH, Katzmarzyk PT. Ethnic differences in self-reported and measured obesity. Obesity (Silver Spring). 2009 Mar;17(3):571–7.
13. Sharma AM, Kushner RF. A proposed clinical staging system for obesity [Internet]. Vol. 33, International Journal of Obesity. Int J Obes (Lond); 2009 [cited 2020 Jul 28]. p. 289–95. Available from: https://pubmed.ncbi.nlm.nih.gov/19188927/
14. Padwal RS, Damjanovic S, Schulze KM, Lewanczuk RZ, Lau DCW, Sharma AM. Canadian Physicians' Use of Antiobesity Drugs and Their Referral Patterns to Weight Management Programs or Providers: The SOCCER Study [Internet]. Vol. 2018. Hindawi; 2011. Available from: https://www.hindawi.com/journals/jobe/2011/686521/
15. Mauro M, Taylor V, Wharton S, Sharma AM. Barriers to obesity treatment [Internet]. Vol. 19, European Journal of Internal Medicine. Eur J Intern Med; 2008 [cited 2020 Jul 28]. p. 173–80. Available from: https://pubmed.ncbi.nlm.nih.gov/18395160/
16. National Institute for Health and Care Excellence (NICE). 1 Recommendations | Obesity: identification,

assessment and management | Guidance | NICE [Internet]. Vol. 2019. NICE; 2014. Available from: https://www.nice.org.uk/guidance/cg189/chapter/1-Recommendations

17. Apovian CM, Aronne LJ, Bessesen DH, McDonnell ME, Murad MH, Pagotto U, et al. Pharmacological management of obesity: an endocrine Society clinical practice guideline. J Clin Endocrinol Metab. 2015 Feb;100(2):342–62.
18. Kapadia MZ, Park CK, Beyene J, Giglia L, Maxwell C, McDonald SD. Weight loss instead of weight gain within the guidelines in obese women during pregnancy: A systematic review and meta-analyses of maternal and infant outcomes [Internet]. Vol. 10, PLoS ONE. Public Library of Science; 2015 [cited 2020 Aug 4]. Available from: https://pubmed.ncbi.nlm.nih.gov/26196130/
19. Mechanick JI, Youdim A, Jones DB, Garvey WT, Hurley DL, McMahon MM, et al. Clinical practice guidelines for the perioperative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient--2013 update: cosponsored by American Association of Clinical Endocrinologists, the Obesity Society, and American Society f. Endocr Pract [Internet]. 2013 Mar;19(2):337–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/23529351
20. Ryan DH. Guidelines for Obesity Management. Endocrinol Metab Clin North Am. 2016;45(3):501–10.
21. Luo J, Chlebowski RT, Hendryx M, Rohan T, Wactawski-Wende J, Thomson CA, et al. Intentional weight loss and endometrial cancer risk. J Clin Oncol [Internet]. 2017 Apr 10 [cited 2020 Aug 5];35(11):1189–93. Available from: https://pubmed.ncbi.nlm.nih.gov/28165909/
22. Byers T, Sedjo RL. Does intentional weight loss reduce cancer risk? [Internet]. Vol. 13, Diabetes, Obesity and Metabolism. Blackwell Publishing Ltd; 2011 [cited 2020 Aug 5]. p. 1063–72. Available from: https://pubmed.ncbi.nlm.nih.gov/21733057/
23. Freedhoff Y, Sharma AM. Best Weight (Guidebook for Health Professionals) [Internet]. Vol. 2019. 2010. Available from: https://obesitycanada.ca/publications/best-weight-book/
24. Academy of Nutrition and Dietetics. Nutrition Care Manual [Online] [Internet]. 2020. Available from: http://www.nutritioncaremanual.org
25. Stoklossa CJ, Atwal S. Nutrition Care for Patients with Weight Regain after Bariatric Surgery. Gastroenterol Res Pract [Internet]. 2013 [cited 2020 Aug 5];2013. Available from: http://dx.
26. Academy of Nutrition and Dietetics. Nutrition terminology reference manual (eNCPT): Dietetics language for nutrition care. [Internet]. Vol. 2019. Chicago (IL): Academy of Nutrition and Dietetics; 2018. Available from: http://ncpt.webauthor.com
27. Government of Canada. Consolidated federal laws of canada, Food and Drug Regulations [Internet]. Vol. 2018. 2018. Available from: http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.,_c._870/index.html
28. Gudzune KA, Doshi RS, Mehta AK, Chaudhry ZW, Jacobs DK, Vakil RM, et al. Efficacy of commercial weight-loss programs: An updated systematic review [Internet]. Vol. 162, Annals of Internal Medicine. American College of Physicians; 2015 [cited 2020 Aug 5]. p. 501–12. Available from: /pmc/articles/PMC4446719/?report=abstract
29. Academy of Nutrition and Dietetics. Evidence analysis library. Adult weight management. [Internet]. Vol. 2019. 2014. Available from: https://www.andeal.org/topic.cfm?menu=5276
30. St-Onge M-P, Ard J, Baskin ML, Chiuve SE, Johnson HM, Kris-Etherton P, et al. Meal Timing and Frequency: Implications for Cardiovascular Disease Prevention: A Scientific Statement From the American Heart Association. Circulation. 2017;135(9):e96–121.
31. Dhurandhar EJ, Dawson J, Alcorn A, Larsen LH, Thomas EA, Cardel M, et al. The effectiveness of breakfast recommendations on weight loss: a randomized controlled trial. Am J Clin Nutr. 2014 Aug;100(2):507–13.
32. Dietitians of Canada. Healthy Weight/Obesity – Dietary Approaches Evidence Summary. In: Practice-based

Evidence in Nutrition [PEN] [Internet]. Vol. 2018. 2017. Available from: http://pennutrition.com

33. Canuto R, da Silva Garcez A, Kac G, de Lira PIC, Olinto MTA. Eating frequency and weight and body composition: a systematic review of observational studies. Public Health Nutr. 2017 Aug;20(12):2079–95.
34. Cioffi I, Evangelista A, Ponzo V, Ciccone G, Soldati L, Santarpia L, et al. Intermittent versus continuous energy restriction on weight loss and cardiometabolic outcomes: a systematic review and meta-analysis of randomized controlled trials. J Transl Med. 2018;16(1):371.
35. Matheson EM, King DE, Everett CJ. Healthy lifestyle habits and mortality in overweight and obese individuals. J Am Board Fam Med JABFM. 2012;25(1):9–15.
36. Salas-Salvadó J, Díaz-López A, Ruiz-Canela M, Basora J, Fitó M, Corella D, et al. Effect of a Lifestyle Intervention Program With Energy-Restricted Mediterranean Diet and Exercise on Weight Loss and Cardiovascular Risk Factors: One-Year Results of the PREDIMED-Plus Trial. Diabetes Care. 2019 May;42(5):777–88.
37. Chiavaroli L, Nishi SK, Khan TA, Braunstein CR, Glenn AJ, Mejia SB, et al. Portfolio Dietary Pattern and Cardiovascular Disease: A Systematic Review and Meta-analysis of Controlled Trials. Prog Cardiovasc Dis. 2018;61(1):43–53.
38. Malik VS, Hu FB. Fructose and Cardiometabolic Health: What the Evidence From Sugar-Sweetened Beverages Tells Us. J Am Coll Cardiol. 2015;66(14):1615–24.
39. Poppitt SD. Beverage Consumption: Are Alcoholic and Sugary Drinks Tipping the Balance towards Overweight and Obesity? Nutrients. 2015;7(8):6700–18.
40. Leidy HJ, Clifton PM, Astrup A, Wycherley TP, Westerterp-Plantenga MS, Luscombe-Marsh ND, et al. The role of protein in weight loss and maintenance. Am J Clin Nutr. 2015;101(6):1320S-1329S.
41. Fitch C, Keim KS. Position of the Academy of Nutrition and Dietetics: use of nutritive and nonnutritive sweeteners. J Acad Nutr Diet. 2012 May;112(5):739–58.
42. Peters JC, Beck J, Cardel M, Wyatt HR, Foster GD, Pan Z, et al. The effects of water and non-nutritive sweetened beverages on weight loss and weight maintenance: A randomized clinical trial. Obesity (Silver Spring). 2016 Feb;24(2):297–304.
43. Sievenpiper JL, Chan CB, Dworatzek PD, Freeze C, Williams SL. Nutrition Therapy. Can J Diabetes. 2018 Apr;42 Suppl 1:S64–79.
44. Jung C-H, Choi KM. Impact of High-Carbohydrate Diet on Metabolic Parameters in Patients with Type 2 Diabetes. Nutrients. 2017;9(4).
45. Committee. DCCPGE. Diabetes Canada 2018 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. Can J Diabetes. 2018;42(Suppl 1):S1–325.
46. Dietitians of Canada. Diet Composition – Low Carbohydrate Summary of Recommendations and Evidence. In: Practice-based Evidence in Nutrition [PEN]. [Internet]. Vol. 2019. 2019. Available from: https://www.pennutrition.com/KnowledgePathway.aspx?kpid=25612&trcatid=42&trid=25973#1.
47. Dietitians of Canada. Diet Composition – Ketogenic Diet. In: Practice-based Evidence in Nutrition [PEN]. [Internet]. Vol. 2018. 2018. Available from: https://www.pennutrition.com/KnowledgePathway.aspx?kpid=25499&trid=27298&trcatid=38
48. Kirkpatrick CF, Bolick JP, Kris-Etherton PM, Sikand G, Aspry KE, Soffer DE, et al. Review of current evidence and clinical recommendations on the effects of low-carbohydrate and very-low-carbohydrate (including ketogenic) diets for the management of body weight and other cardiometabolic risk factors: A scientific statement from the National Lipid Association Nutrition and Lifestyle Task Force. J Clin Lipidol. 2019 Sep 1;13(5):689-711.e1.

49. Churuangsuk C, Kherouf M, Combet E, Lean M. Low-carbohydrate diets for overweight and obesity: a systematic review of the systematic reviews. Obes Rev An Off J Int Assoc Study Obes. 2018;19(12):1700–18.

50. Gupta L, Khandelwal D, Kalra S, Gupta P, Dutta D, Aggarwal S. Ketogenic diet in endocrine disorders: Current perspectives. J Postgrad Med. 2017;63(4):242–51.

51. Dahl WJ, Stewart ML. Position of the Academy of Nutrition and Dietetics: Health Implications of Dietary Fiber. J Acad Nutr Diet. 2015 Nov;115(11):1861–70.

52. Wanders AJ, van den Borne JJGC, de Graaf C, Hulshof T, Jonathan MC, Kristensen M, et al. Effects of dietary fibre on subjective appetite, energy intake and body weight: a systematic review of randomized controlled trials. Obes Rev An Off J Int Assoc Study Obes. 2011 Sep;12(9):724–39.

53. Mudgil D, Barak S. Composition, properties and health benefits of indigestible carbohydrate polymers as dietary fiber: a review. Int J Biol Macromol. 2013 Oct;61:1–6.

54. Health Canada. Monograph: Psyllium - plantago ovata [Internet]. Vol. 2018. 2004. Available from: http://webprod.hc-sc.gc.ca/nhpid-bdipsn/monoReq.do?id=290&lang=eng

55. Therapeutic Research Center. Database: Food, Herbs and Supplements-Professional. [Internet]. Vol. 2018. 2018. Available from: https://naturalmedicines.therapeuticresearch.com

56. Drummen M, Tischmann L, Gatta-Cherifi B, Adam T, Westerterp-Plantenga M. Dietary protein and energy balance in relation to obesity and co-morbidities [Internet]. Vol. 9, Frontiers in Endocrinology. Frontiers Media S.A.; 2018 [cited 2020 Aug 7]. Available from: https://pubmed.ncbi.nlm.nih.gov/30127768/

57. van Baak MA, Larsen TM, Jebb SA, Martinez A, Saris WHM, Handjieva-Darlenska T, et al. Dietary Intake of Protein from Different Sources and Weight Regain, Changes in Body Composition and Cardiometabolic Risk Factors after Weight Loss: The DIOGenes Study. Nutrients. 2017;9(12).

58. Hoffman JR, Falvo MJ. Protein - Which is Best? J Sports Sci Med. 2004 Sep;3(3):118–30.

59. Health Canada. Licensed Natural Health Products Database (LNHPD) [Internet]. Vol. 2018. 2007. Available from: https://www.canada.ca/en/health-canada/services/drugs-health-products/natural-non-prescription/applications-submissions/product-licensing/licensed-natural-health-products-database.html

60. Dietitians of Canada. Healthy Weight/Obesity Summary of Recommendations and Evidence. In: Practice Based Evidence [PEN]. [Internet]. Vol. 2019. 2019. Available from: https://www.pennutrition.com/KnowledgePathway.aspx?kpid=803&trid=8762&trcatid=42

61. Health Canada. Dietary Reference Intakes Tables [Internet]. Vol. 2018. 2005. Available from: https://www.canada.ca/en/health-canada/services/food-nutrition/healthy-eating/dietary-reference-intakes/tables.html

62. American Diabetes Association. 8. Obesity Management for the Treatment of Type 2 Diabetes: Standards of Medical Care in Diabetes-2020. Diabetes Care. 2020;43(Suppl 1):S89.

63. Astbury NM, Piernas C, Hartmann-Boyce J, Lapworth S, Aveyard P, Jebb SA. A systematic review and meta-analysis of the effectiveness of meal replacements for weight loss. Obes Rev An Off J Int Assoc Study Obes. 2019 Apr;20(4):569–87.

64. Academy of Nutrition and Dietetics. Pocket Guide to Bariatric Surgery. 2nd ed. Chicago (IL): Academy of Nutrition and Dietetics; 2015.

65. Culbert KM, Racine SE, Klump KL. Research Review: What we have learned about the causes of eating disorders - A synthesis of sociocultural, psychological, and biological research [Internet]. Vol. 56, Journal of Child Psychology and Psychiatry and Allied Disciplines. Blackwell Publishing Ltd; 2015 [cited 2020 Aug 7]. p. 1141–64. Available from: https://pubmed.ncbi.nlm.nih.gov/26095891/

66. Liao C De, Tsauo JY, Wu YT, Cheng CP, Chen HC, Huang YC, et al. Effects of protein supplementation

combined with resistance exercise on body composition and physical function in older adults: A systematic review and meta-analysis. Am J Clin Nutr [Internet]. 2017 Oct 1 [cited 2020 Aug 7];106(4):1078–91. Available from: https://pubmed.ncbi.nlm.nih.gov/28814401/

67. Yarizadeh H, Asadi S, Baharlooi H, Setayesh L, Kakavandi NR, Hambly C, et al. Beneficial impact of exercise on bone mass in individuals under calorie restriction: a systematic review and Meta-analysis of randomized clinical trials. Critical Reviews in Food Science and Nutrition. Taylor and Francis Inc.; 2020.

68. Elfhag K, Rössner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain [Internet]. Vol. 6, Obesity Reviews. Obes Rev; 2005 [cited 2020 Aug 7]. p. 67–85. Available from: https://pubmed.ncbi.nlm.nih.gov/15655039/

69. Fothergill E, Guo J, Howard L, Kerns JC, Knuth ND, Brychta R, et al. Persistent metabolic adaptation 6 years after "The Biggest Loser" competition. Obesity (Silver Spring). 2016;24(8):1612–9.

70. Singh AK, Singh R. Pharmacotherapy in obesity: a systematic review and meta-analysis of randomized controlled trials of anti-obesity drugs [Internet]. Vol. 13, Expert Review of Clinical Pharmacology. Taylor and Francis Ltd; 2020 [cited 2020 Aug 7]. p. 53–64. Available from: https://pubmed.ncbi.nlm.nih.gov/31770497/

71. Bansal AB, Khalili Y Al. Orlistat - StatPearls - NCBI Bookshelf [Internet]. 2020 [cited 2020 Aug 7]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK542202/

72. Association CP. Compendium of pharmaceuticals and specialties [Internet]. Vol. 2018. Toronto: Canadian Pharmaceutical Association; 2015. Available from: https://www.pharmacists.ca/products-services/compendium-of-pharmaceuticals-and-specialties/

73. Wharton S. Current Perspectives on Long-term Obesity Pharmacotherapy. Can J Diabetes. 2016 Apr;40(2):184–91.

74. Dietitians of Canada. Healthy Weight/Obesity – Bariatric Surgery In: Practice-based Evidence in Nutrition [PEN] [Internet]. Vol. 2017. 2014. Available from: http://www.pennutrition.com

75. Quercia I, Dutia R, Kotler DP, Belsley S, Laferrère B. Gastrointestinal changes after bariatric surgery [Internet]. Vol. 40, Diabetes and Metabolism. Elsevier Masson SAS; 2014 [cited 2020 Aug 10]. p. 87–94. Available from: https://pubmed.ncbi.nlm.nih.gov/24359701/

76. Overs SE, Freeman RA, Zarshenas N, Walton KL, Jorgensen JO. Food tolerance and gastrointestinal quality of life following three bariatric procedures: Adjustable gastric banding, Roux-en-Y gastric bypass, and sleeve gastrectomy. Obes Surg [Internet]. 2012 Apr [cited 2020 Aug 10];22(4):536–43. Available from: https://pubmed.ncbi.nlm.nih.gov/22170392/

77. American Society for Metabolic and Bariatric Surgery. Bariatric Surgery Procedures | ASMBS [Internet]. [cited 2020 Aug 7]. Available from: https://asmbs.org/patients/bariatric-surgery-procedures

78. Parrott J, Frank L, Rabena R, Craggs-Dino L, Isom KA, Greiman L. American Society for Metabolic and Bariatric Surgery Integrated Health Nutritional Guidelines for the Surgical Weight Loss Patient 2016 Update: Micronutrients. Surg Obes Relat Dis. 2017 Jan 19;

79. Chang SH, Stoll CRT, Song J, Varela JE, Eagon CJ, Colditz GA. The effectiveness and risks of bariatric surgery an updated systematic review and meta-analysis, 2003-2012 [Internet]. Vol. 149, JAMA Surgery. JAMA Surg; 2014 [cited 2020 Aug 10]. p. 275–87. Available from: https://pubmed.ncbi.nlm.nih.gov/24352617/

80. Hachem A, Brennan L. Quality of Life Outcomes of Bariatric Surgery: A Systematic Review [Internet]. Vol. 26, Obesity Surgery. Springer New York LLC; 2016 [cited 2020 Aug 7]. p. 395–409. Available from: https://pubmed.ncbi.nlm.nih.gov/26494369/

81. Herring LY, Stevinson C, Davies MJ, Biddle SJ, Sutton C, Bowrey D, et al. Changes in physical activity behaviour and physical function after bariatric surgery: A systematic review and meta-analysis. Obes Rev [Internet]. 2016 Mar 1 [cited 2020 Aug 7];17(3):250–61. Available from:

https://pubmed.ncbi.nlm.nih.gov/26783103/

82. Skubleny D, Switzer NJ, Gill RS, Dykstra M, Shi X, Sagle MA, et al. The Impact of Bariatric Surgery on Polycystic Ovary Syndrome: a Systematic Review and Meta-analysis [Internet]. Vol. 26, Obesity Surgery. Springer New York LLC; 2016 [cited 2020 Aug 7]. p. 169–76. Available from: https://pubmed.ncbi.nlm.nih.gov/26431698/

83. Dagan SS, Goldenshluger A, Globus I, Schweiger C, Kessler Y, Sandbank GK, et al. Nutritional recommendations for adult bariatric surgery patients: Clinical practice [Internet]. Vol. 8, Advances in Nutrition. American Society for Nutrition; 2017 [cited 2020 Aug 7]. p. 382–94. Available from: https://pubmed.ncbi.nlm.nih.gov/28298280/

84. Colles SL, Dixon JB, Marks P, Strauss BJ, O'Brien PE. Preoperative weight loss with a very-low-energy diet: quantitation of changes in liver and abdominal fat by serial imaging. Am J Clin Nutr. 2006 Aug;84(2):304–11.

85. Fris RJ. Preoperative low energy diet diminishes liver size. Obes Surg. 2004 Oct;14(9):1165–70.

86. Busetto L, Tregnaghi A, De Marchi F, Segato G, Foletto M, Sergi G, et al. Liver volume and visceral obesity in women with hepatic steatosis undergoing gastric banding. Obes Res. 2002 May;10(5):408–11.

87. St Jeor ST, Howard B V, Prewitt TE, Bovee V, Bazzarre T, Eckel RH. Dietary protein and weight reduction: a statement for healthcare professionals from the Nutrition Committee of the Council on Nutrition, Physical Activity, and Metabolism of the American Heart Association. Circulation. 2001;104(15):1869–74.

88. Snyder B, Nguyen A, Scarbourough T, Yu S, Wilson E. Comparison of those who succeed in losing significant excessive weight after bariatric surgery and those who fail. Surg Endosc [Internet]. 2009 [cited 2020 Aug 7];23(10):2302–6. Available from: https://pubmed.ncbi.nlm.nih.gov/19184204/

89. Rogge MM, Gautam B. Before, after, and after-after. Nurse Pract [Internet]. 2017 Mar 7 [cited 2020 Aug 10];42(3):18–24. Available from: http://journals.lww.com/00006205-201703000-00004

90. Mayo Clinic. Diarrhea - Symptoms and causes - Mayo Clinic [Internet]. 2019 [cited 2020 Aug 7]. Available from: https://www.mayoclinic.org/diseases-conditions/diarrhea/symptoms-causes/syc-20352241

91. Borbély YM, Osterwalder A, Kröll D, Nett PC, Inglin RA. Diarrhea after bariatric procedures: Diagnosis and therapy. World J Gastroenterol [Internet]. 2017;23(26):4689. Available from: https://www.ncbi.nlm.nih.gov/pubmed/28765690

92. Mayo Clinic. Constipation - Symptoms and causes - Mayo Clinic [Internet]. [cited 2020 Aug 7]. Available from: https://www.mayoclinic.org/diseases-conditions/constipation/symptoms-causes/syc-20354253

93. Puzziferri N, Almandoz JP. Sleeve gastrectomy for weight loss [Internet]. Vol. 319, JAMA - Journal of the American Medical Association. American Medical Association; 2018 [cited 2020 Aug 7]. p. 316. Available from: https://pubmed.ncbi.nlm.nih.gov/29340681/

94. Mayo Clinic. Dehydration - Symptoms and causes - Mayo Clinic [Internet]. [cited 2020 Aug 7]. Available from: https://www.mayoclinic.org/diseases-conditions/dehydration/symptoms-causes/syc-20354086

95. Ukleja A. Dumping syndrome: pathophysiology and treatment. Nutr Clin Pract Off Publ Am Soc Parenter Enter Nutr. 2005 Oct;20(5):517–25.

96. Mayo Clinic. Dumping syndrome - Symptoms and causes - Mayo Clinic [Internet]. [cited 2020 Aug 7]. Available from: https://www.mayoclinic.org/diseases-conditions/dumping-syndrome/symptoms-causes/syc-20371915

97. Mahawar KK, Parmar C, Carr WRJ, Jennings N, Schroeder N, Small PK. Impact of biliopancreatic limb length on severe protein-calorie malnutrition requiring revisional surgery after one anastomosis (mini) gastric bypass. J Minim Access Surg [Internet]. 2018 Jan 1 [cited 2020 Aug 7];14(1):37–43. Available from: /pmc/articles/PMC5749196/?report=abstract

98. Charles EJ, Mehaffey JH, Hawkins RB, Safavian D, Schirmer BD, Hallowell PT. Benefit of feeding tube placement for refractory malnutrition after bariatric surgery. Surg Obes Relat Dis [Internet]. 2018 Feb 1 [cited 2020 Aug 7];14(2):162–7. Available from: https://pubmed.ncbi.nlm.nih.gov/28169202/

99. Fujioka K, DiBaise JK, Martindale RG. Nutrition and metabolic complications after bariatric surgery and their treatment. J Parenter Enter Nutr [Internet]. 2011 Sep [cited 2020 Aug 7];35(5 SUPPL.). Available from: https://pubmed.ncbi.nlm.nih.gov/21799192/

100. Parent B, Martopullo I, Weiss NS, Khandelwal S, Fay EE, Rowhani-Rahbar A. Bariatric Surgery in Women of Childbearing Age, Timing Between an Operation and Birth, and Associated Perinatal Complications. JAMA Surg. 2017;152(2):1–8.

101. Abbassi-Ghanavati M, Greer LG, Cunningham FG. Pregnancy and laboratory studies: a reference table for clinicians. Obstet Gynecol. 2009 Dec;114(6):1326–31.

102. Patel JA, Colella JJ, Esaka E, Patel NA, Thomas RL. Improvement in infertility and pregnancy outcomes after weight loss surgery. Med Clin North Am. 2007 May;91(3):515–28, xiii.

103. Dietitians of Canada. Weight Stigma Background [Internet]. [cited 2020 Aug 7]. Available from: https://www.pennutrition.com/KnowledgePathway.aspx?kpid=803&trid=28010&trcatid=38

104. Albury C, Strain WD, Brocq S Le, Logue J, Lloyd C, Tahrani A. The importance of language in engagement between health-care professionals and people living with obesity: a joint consensus statement. Lancet Diabetes Endocrinol [Internet]. 2020 May 1 [cited 2020 Aug 7];8(5):447–55. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2213858720301029