NATIONAL CLINICAL GUIDELINES

BARIATRIC AND METABOLIC SURGERY IN ADULTS

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المبادئ الإرشادية السريرية لدولة قطر
NATIONAL CLINICAL GUIDELINES FOR QATAR

وزارة الصحـــــة العامـــــة
Ministry of Public Health
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Abbreviations

The abbreviations used in this guideline are as follows:

ACSM	American College of Sports Medicine
ASCVD	Atherosclerotic Cardiovascular Disease
BiPAP	Bilevel Positive Airway Pressure
BMI	Body Mass Index
BPD/DS	Bilio-Pancreatic Diversion with Duodenal Switch
CBC	Complete Blood Count
COCP	Combined Oral Contraceptive Pill
CPAP	Continuous Positive Airway Pressure
CT	Computed Tomography Scan
DEXA	Dual-Energy X-ray Absorptiometry Scan
DHEAS	Dehydroepiandrosterone Sulphate
DVT	Deep Vein Thrombosis
ERCP	Endoscopic Retrograde Cholangiopancreatography
GCC	Gulf Cooperative Council
GI	Gastrointestinal Tract
H. pylori	*Helicobacter pylori*
HbA_{1c}	Glycated Haemoglobin
iPTH	Intact Parathyroid Hormone
IU	International Unit
LAGB	Laparoscopic Adjustable Gastric Banding

MDT	Multidisciplinary Team
MOPH	Ministry of Public Health of Qatar
NAFLD	Non-Alcoholic Fatty Liver Disease
NSAIDs	Nonsteroidal Anti-Inflammatory Drugs
RBC	Red Blood Cell
RYGB	Roux-en-Y gastric Bypass Surgery
SADI-S	Single Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy
SGLT2	Sodium-Glucose Cotransporter-2
T4	Thyroxine
TIBC	Total Iron Binding Capacity
TSH	Thyroid Stimulating Hormone

View Pathway

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1 Information about this Guideline

1.1 Objective and Purpose of the Guideline

The purpose of this guideline is to provide a framework for patient care and clinical safety by defining the appropriate use of bariatric and metabolic surgery (including endoscopic procedures) in adults. The objective is to improve the appropriate management and referral of patients presenting to provider organisations in Qatar. It is intended that the guideline will be used primarily by physicians in primary and specialist care settings.

1.2 Scope of the Guideline

Aspects of care covered within this guideline, include:

- Definition of obesity, referral criteria, role of bariatric and metabolic surgery in the management of obesity in adults, including:
    - Indications and contraindications for bariatric and metabolic endoscopy and surgery.
    - Pre-operative assessment, perioperative and post-operative management.
    - Follow-up care.

1.3 Editorial Approach

This guideline document has been developed and issued by the Ministry of Public Health of Qatar (MOPH), through a process which aligns with international best practice in guideline development and localisation. The guideline will be reviewed on a regular basis and updated to incorporate comments and feedback from stakeholders across Qatar.

The editorial methodology, used to develop this guideline, has involved the following critical steps:

- Extensive literature search for well-reputed published evidence relating to the topic.
- Critical appraisal of the literature.
- Development of a draft summary guideline.
- Review of the summary guideline with a Guideline Development Group, comprised of practising healthcare professionals, subject matter experts and patient representatives, from across Qatar.
- Independent review of the guideline by the National Clinical Guidelines & Pathways Committee, appointed by the MOPH, from amongst stakeholder organisations across Qatar.

Whilst the MOPH has sponsored the development of the guideline, the MOPH has not influenced the specific recommendations made within it.

1.4 Sources of Evidence

The professional literature has been systematically queried using specially developed, customised, and tested search strings. Search strategies are developed to allow efficient yet comprehensive analysis of relevant publications for a given topic and to maximise retrieval of articles with certain desired characteristics pertinent to a guideline.

For each guideline, all retrieved publications have been individually reviewed by a member of the Editorial Team and assessed in terms of quality, utility, and relevance. Preference is given to publications that:

1. Are designed with rigorous scientific methodology.
2. Are published in higher-quality journals.
3. Address an aspect of specific importance to the guideline in question.

Further information about the literature search and appraisal process is included in the appendix.

1.5 Evidence Grading and Recommendations

Recommendations made within this guideline are supported by evidence from the medical literature and where possible the most authoritative sources have been used in the development of this guideline. In order to provide insight into the evidence basis for each recommendation, the following evidence hierarchy has been used to grade the level of authoritativeness of the evidence used, where recommendations have been made within this guideline.

Where the recommendations of international guidelines have been adopted, the evidence grading is assigned to the underlying evidence used by the international guideline. Where more than one source has been cited, the evidence grading relates to the highest level of evidence cited:

- **Level 1 (L1):**
  - Meta-analyses.
  - Randomised controlled trials with meta-analysis.
  - Randomised controlled trials.
  - Systematic reviews.

- **Level 2 (L2):**
  - Observational studies, examples include:
    - Cohort studies with statistical adjustment for potential confounders.
    - Cohort studies without adjustment.
    - Case series with historical or literature controls.
    - Uncontrolled case series.
  - Statements in published articles or textbooks.

- **Level 3 (L3):**
  - Expert opinion.
  - Unpublished data, examples include:
    - Large database analyses.
    - Written protocols or outcomes reports from large practices.

In order to give additional insight into the reasoning underlying certain recommendations and the strength of recommendation, the following recommendation grading has been used, where recommendations are made:

- **Recommendation Grade A (RGA):** Evidence demonstrates at least moderate certainty of a net benefit from the recommendation.
- **Recommendation Grade B (RGB):** Evidence is insufficient, conflicting, or poor and demonstrates an incomplete assessment of net benefit vs harm; additional research is recommended.
- **Recommendation Grade C (RGC):** Evidence demonstrates potential harm that outweighs benefit; additional research is recommended.
- **Recommendation of the GDG (R-GDG):** Recommended best practice on the basis of the clinical experience of the Guideline Development Group members.

1.6 Guideline Development Group Members

The following table lists members of the Guideline Development Group (GDG) nominated by their respective organisations and the National Clinical Guidelines & Pathways Committee. The GDG members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

Guideline Development Group Members		
Name	**Title**	**Organisation**
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Prof Shahrad Taheri	Professor of Medicine Weill Cornell Medicine–Qatar, Senior Consultant in Endocrinology	Hamad Medical Corporation

1.7 National Clinical Guidelines & Pathways Committee Members

The following table lists members of the National Clinical Guidelines & Pathways Committee (NCGPC), appointed by the MOPH. The NCGPC members have reviewed and provided their feedback and approval of the guideline document. Each member has completed a declaration of conflicts of interest, which has been reviewed and retained by the MOPH.

National Clinical Guidelines & Pathways Committee (NCGPC) Members		
Name	**Title**	**Organisation**
Ms Huda Amer Al-Katheeri	Chair of the NCGPC, Director of Strategic Planning & Performance Department	Ministry of Public Health
Shk Dr Mohammed Hamad J. Al Thani	Co-Chair of the NCGPC, Director of Public Health	Ministry of Public Health
Dr Hani Ben Hassen Al Kilani	Senior Consultant, Executive Director for Corporate Clinical Policy and Guidelines	Hamad Medical Corporation
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Dr Ghassan Youseph Hommos	Senior Consultant Endocrinology	Al Emadi Hospital
Dr Egon Toft	VP and Dean	College of Medicine, Qatar University

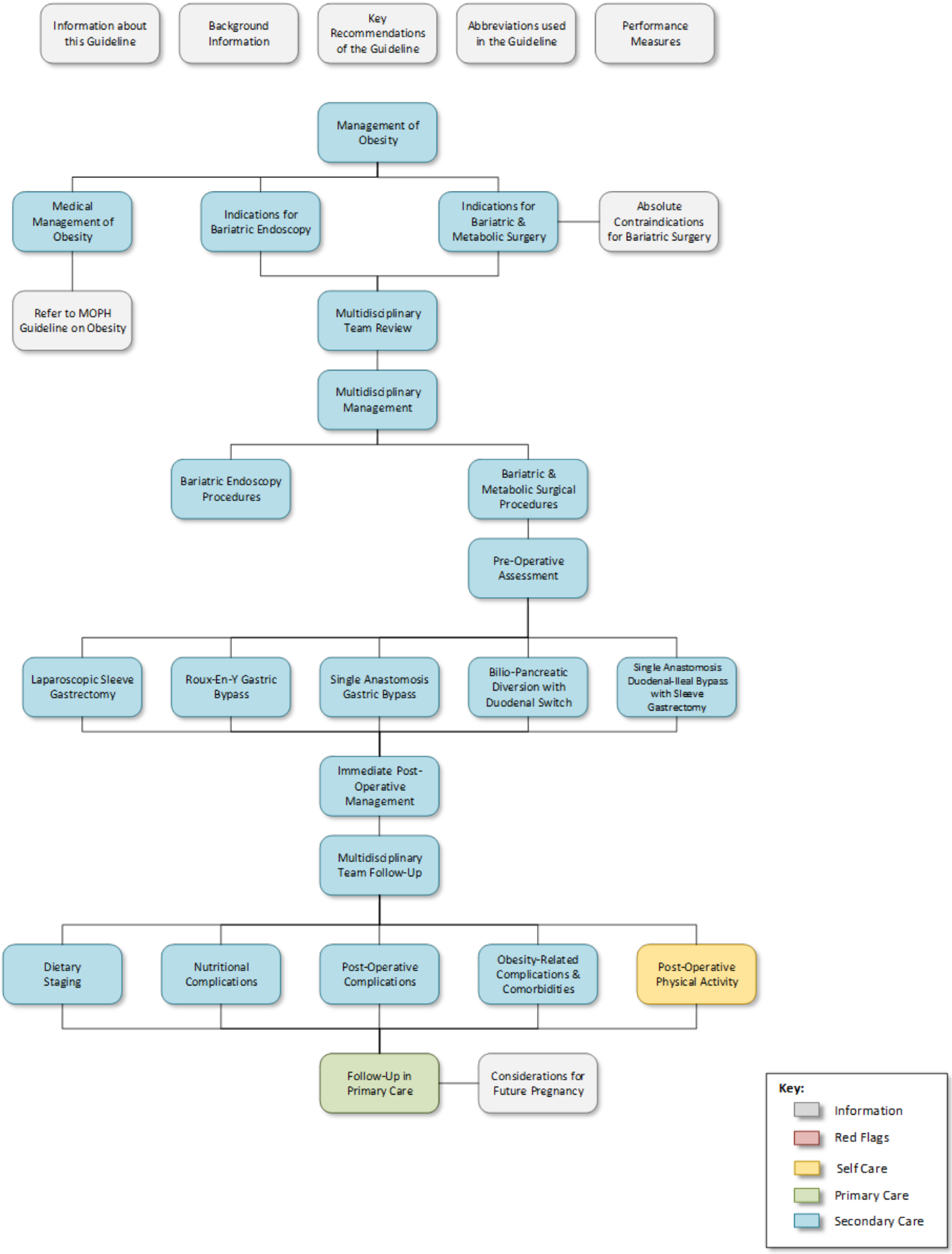
1.8 Responsibilities of Healthcare Professionals

This guideline has been issued by the MOPH to define how care should be provided in Qatar. It is based upon a comprehensive assessment of the evidence as well as its applicability to the national context of Qatar. Healthcare professionals are expected to take this guidance into account when exercising their clinical judgement in the care of patients presenting to them.

The guidance does not override individual professional responsibility to take decisions which are appropriate to the circumstances of the patient concerned. Such decisions should be made in consultation with the patient, their guardians, or caregivers and should consider the individual risks and benefits of any intervention that is contemplated in the patient's care.

2 Diagnosis & Management Pathway

Click on a box below to see the relevant page of the Pathway.



3 Key Recommendations of the Guideline

The key recommendations of this guideline are as follows:

Indications for Endoscopic Bariatric Procedures (*Section 5.1*):

- Endoscopic bariatric procedures are indicated in the following patients [**R-GDG**]:
  - BMI ≥27 kg/m^2 with obesity-related complications [**R-GDG**].
  - BMI ≥30 kg/m^2 *without* obesity-related complications [**R-GDG**].
  - BMI ≥40 kg/m^2 when:
    - The patient prefers non-surgical management.
    - There is a contraindication to surgery.
    - Pre-operative weight loss as a "bridge therapy" to safe surgery is required [1]:
      - Patients at high risk of a poor outcome may benefit even from modest weight loss, resulting in lowering of blood pressure, improving glucose tolerance, and reduction in thrombotic risk.

Indications for Bariatric and Metabolic Surgical Procedures (*Section 5.2*):

- Bariatric and metabolic surgery is indicated in the following patients [2–6]:
  - BMI 30-34.9 kg/m^2 with uncontrollable type 2 diabetes:
    - The patient should be assessed, and their comorbidity management optimised, prior to surgery.
    - Consider surgery at a lower BMI (≥27.5 kg/m^2) after MDT assessment for people of South Asian family origin, who have diabetes [**R-GDG**].
  - BMI 35-39.9 kg/m^2 *with* obesity-related complications.
  - BMI ≥40 kg/m^2 *without* obesity-related complications.
  - Special populations, e.g.:
    - Waiting for organ transplantation with a BMI ≥30 kg/m^2 and demonstrated lack of response to specialist medical weight management[7].
    - Post-renal transplant with a BMI ≥30 kg/m^2 and an uncontrollable obesity complication [**R-GDG**].

Contraindications to Bariatric Surgery (*Section 5.3*):

- Absolute contraindications to bariatric surgery include[4,5,8,9] [**L2, RGC**]:
  - Active cancer with a poor prognosis.
  - Decompensated end-stage cardio-pulmonary disease.
  - Decompensated end-stage liver disease with portal hypertension.
  - Major psychiatric disorders (unless specifically advised by a psychiatrist experienced in obesity).
  - Excess alcohol and/or drug dependencies.
  - Uncontrollable coagulopathy.
  - Any contraindication to receiving general anaesthesia.
  - Current pregnancy.

Management Principles (*Section 6*):

- Surgery for obesity is preferred to be undertaken after consideration by, and in coordination with, an MDT [2].
- All patients should [2,8–10] [**L1, RGA**]:
  - Undergo a full medical evaluation, including hormonal or genetic screening, when appropriate, to exclude rare, treatable causes of obesity.
  - Be adequately informed, motivated, and have realistic expectations.

- Participate in the final decision about the type of surgical intervention.
- Understand the surgical or endoscopic procedure, its risks and benefits, including perioperative mortality.
- Have had all management options discussed with them.
- Understand the importance of complying with nutritional requirements.
- Understand and commit to the need for life-long, follow-up and care.
- Obtain patient information leaflets for all proposed interventions.

Pre-Operative Assessment and Preparation (*Section 6.3*):

- A comprehensive pre-operative assessment of any clinical or psychological factors that may affect adherence to postoperative care requirements should be performed before surgery [2,6,8–10] [**L1, RGA**].
- Pre-operative assessment and preparation should include:
  - Analysis of risks and benefits.
  - Medical assessment and optimisation.
  - Psychological/psychiatric assessment (based on clinical need).
  - Identify patients who are not presently suitable for a bariatric procedure.
  - Preparation specific to the chosen procedure.

Post-Operative Management (*Section 9*):

- Bariatric and metabolic surgery, and bariatric endoscopy, demand appropriate post-operative monitoring to maximise safety and effectiveness in all patients [2,8,10] [**L1, RGA**]:

Immediate Post-Operative Care (*Section 9.1*):

- Specific dietary management tailored to the procedure, in the post-operative period is described in *Section 9.2.1.*
- Nutritional supplementation is required at different levels and for different nutrients according to the procedure performed [2,10] [**L1**, **RGA**]:
  - See *Section 9.1.1* for details on supplementation by procedure.
- Prevention and management of immediate post-operative complications, includes:
  - Diabetes management[2,9–12] [**L1, RGA**].
  - Pulmonary management [**R-GDG**].
  - Prophylaxis against deep venous thrombosis (DVT) [10] [**L2, RGA**].
    - See *Section 9.1.3* for detailed information on each of the above.

Follow-Up by the Bariatric Multidisciplinary Service (*Section 9.2*):

- Patients who have had bariatric surgery should receive follow-up care for a minimum of two years within the bariatric or specialist weight management service with a specific plan communicated with primary care for long-term follow-up [2,10,11] [**L1, RGA**].
- The frequency of follow-up visits depends on the bariatric procedure performed and the severity of obesity-related complications [2,9,10] [**L1**].
- Follow-up and support from the MDT should include [**R-GDG**]:
  - Monitoring weight loss and weight maintenance.
  - Monitoring dietary staging (*Section 9.2.1*).
  - Monitoring for nutritional deficiencies (*Section 9.2.2*).
  - Monitoring for post-operative complications (*Section 9.2.3*).
  - Management of obesity-related complications and other comorbidities (*Section 9.2.4*).
  - Post-operative physical activity advice and support (*Section 9.2.5*).
  - Psychological support.
  - Information about professionally-led or peer-support groups.

Follow-Up in Primary Care (*Section 9.4*):

- In primary care [2,10,13], after two years of sustained specialist follow up post-surgery [**R-GDG**].
    - Keep a register of bariatric surgery patients:
    - Encourage patients to:
        - Check their own weight regularly.
        - Attend an annual weight and diet review with a health professional.
        - Attend for annual blood tests.
    - Provide contraception/pregnancy advice for women of child-bearing age (*Section 9.5*).
    - Continue reviewing obesity-related complications listed in *Section 4.3*.
    - Screening for micronutrient deficiencies, bone health, and control of nutrition-related noncommunicable diseases.
    - Review and adjust regular medications.

4 Background Information

4.1 Definition

Obesity is an increasing healthcare challenge that leads to significant deleterious health, psychological, and social consequences [2,14]:

- Obesity is a chronic disease characterised by excessive adipose fat accumulation with multiple organ-specific complications.
- Excessive fat deposits occur within the subcutaneous adipose tissue and both around and within viscera.
- Excessive fat accumulation around and within the viscera is associated with the greatest cardio-metabolic risk.

As a chronic relapsing disease, obesity requires long-term follow-up care. The care should be shared between specialist centres and primary care with specific plans for patient follow-up and support. Treatments for obesity should be individualised, taking into account biological, psychological, social, and environmental factors that may impinge on the individual's obesity and obesity complications [**R-GDG**].

Bariatric and metabolic surgery is currently the most effective and durable treatment for greater degrees of obesity complicated by cardiometabolic diseases such as type 2 diabetes and cardiovascular disease [**R-GDG**]. Success with surgery, however, is dependent on appropriate patient preparation, expertise of the specialist centre, and regular lifelong follow-up. Endoscopic procedures bridge the gap between medical management of obesity and its complications and bariatric surgery. They should be used judiciously under strict criteria in suitable patients [**R-GDG**].

Obesity is commonly defined by a body mass index (BMI) of ≥30 kg/m^2 in Western populations [2], however different ethnic-specific cut points for defining obesity may need to be considered and lower BMI may be associated with significant complications [9].

Body Mass Index (BMI) [2]:

- Is the body weight in kilograms divided by height in metres squared (kg/m^2).
- Is a clinical estimate of excess adiposity in adults.
- Should be interpreted with caution because the calculation alone is not a direct measure of excess adiposity and its impact on health.

The degree of overweight and obesity can be classified as [2,15]:

- BMI 25.0-29.9 kg/m^2 – Overweight.
- BMI 30.0-34.9 kg/m^2 – Obesity Class I.
- BMI 35.0-39.9 kg/m^2 – Obesity Class II.
- BMI ≥40.00 kg/m^2 – Obesity Class III.

Excess weight loss represents the amount of excess weight lost as percentage of total excess weight and can be calculated as follows [16]:

$$\%\ \text{Excess Weight Loss} = \frac{\text{Initial Weight} - \text{Postoperative Weight}}{\text{Initial Weight} - \text{Ideal Weight}} \times 100$$

Total weight loss represents the amount of weight lost as percentage of total weight and can be calculated as follows [16]:

$$\%\ \text{Total Weight Loss} = \frac{\text{Initial Weight} - \text{Postoperative Weight}}{\text{Initial Weight}} \times 100$$

4.2 Epidemiology

Obesity, type 2 diabetes mellitus, and related metabolic and cardiovascular diseases are highly prevalent in Gulf Cooperative Council (GCC) countries [17]. In 2011, prevalence of overweight and obesity in adults of the GCC region ranged from 25-50% and 13-50%, respectively [17,18].

In 2007-2008, prevalence of overweight and obesity in Qatari men was 31.9% and 45.2%, respectively [18]. The prevalence of obesity remained similar (40-50%) in 2012 [19] and 2014 [20].

Ethnic differences exist in the prevalence [2] and genetic background of obesity [21].

4.3 Complications of Obesity

In general, excess adiposity and elevated BMI are associated with all-cause increased mortality [22,23]. Obesity-related complications include [24–29]:

- Cardiovascular diseases:
  - Hypertension.
  - Coronary artery disease.
  - Cerebrovascular accident or transient ischaemic attack.
  - Peripheral vascular disease.
- Metabolic:
  - Type 2 diabetes mellitus.
  - Dyslipidaemia.
  - Non-alcoholic fatty liver disease (NAFLD).
- Respiratory:
  - Obstructive sleep apnoea.
  - Asthma.
  - Obesity hypoventilation syndrome.
- Gastrointestinal:
  - Gastroesophageal reflux disease.
  - Gallstones.
- Orthopaedic and Rheumatological:
  - Osteoarthritis.
  - Degenerative disc disease.
  - Chronic back pain.
- Gynaecological:
  - Abnormal menstruation.
  - Infertility.
- Cancers including:
  - Endometrial.
  - Breast.
  - Ovarian.
  - Prostate.
  - Liver.
  - Kidney.
  - Colon.
- Mental health:
  - Depression.
  - Anxiety.
- Other:
  - Varicose veins.

5 Indications for Bariatric and Metabolic Endoscopy and Surgery

Criteria for an adult patient to be a candidate for bariatric and metabolic surgery include [2–5,30,31]:

- Favourable assessment by multidisciplinary team (MDT), where necessary (see *Section 6.2*).
- Understanding and adherence with the treatment and follow-up requirements.
- No active severe mental health disorder that may affect adherence or outcomes.
- No medical contraindication to surgery (see *Section 5.3*).
- BMI thresholds and indications specified in *Sections 5.1* and *5.2* below.

5.1 Endoscopic Bariatric Procedures

Endoscopic bariatric procedures are indicated in the following patients [30]:

- BMI ≥27 kg/m^2 with obesity-related complications [**R-GDG**].
- BMI ≥30 kg/m^2 *without* obesity-related complications [**R-GDG**].
- BMI ≥40 kg/m^2 when:
    - The patient prefers non-surgical management.
    - There is a contraindication to surgery.
    - Pre-operative weight loss as a "bridge therapy" to safe surgery is required [1]:
        - Patients at high risk of a poor outcome may benefit even from modest weight loss, resulting in lowering of blood pressure, improving glucose tolerance, and reduction in thrombotic risk.

5.2 Bariatric and Metabolic Surgical Procedures

Bariatric and metabolic surgery is indicated in the following patients [2–6,32]:

- BMI 30-34.9 kg/m^2 with uncontrollable type 2 diabetes:
    - The patient should be assessed, and their comorbidity management optimised, prior to surgery.
    - Consider surgery at a lower BMI (≥27.5 kg/m^2) after multidisciplinary assessment for people of South Asian family origin, who have diabetes [**R-GDG**].
- BMI 35-39.9 kg/m^2 with obesity-related complications:
    - Metabolic:
        - Type 2 diabetes mellitus.
        - Dyslipidaemia.
        - NAFLD.
    - Cardiovascular diseases:
        - Hypertension.
        - Coronary artery disease.
        - Cerebrovascular accident or transient ischaemic attack.
        - Peripheral vascular disease.
    - Respiratory:
        - Obstructive sleep apnoea.
        - Asthma.
        - Obesity hypoventilation syndrome.
    - Gastrointestinal:
        - Gastroesophageal reflux disease.
    - Orthopaedic and Rheumatological:
        - Osteoarthritis.
        - Degenerative disc disease.

        - Chronic back pain.
    - Gynaecological:
        - Polycystic ovary syndrome with metabolic complications.
        - Infertility.
- BMI ≥40 kg/m^2 *without* obesity-related complications.
- Special populations [7], e.g.:
    - Patients awaiting organ transplantation after a demonstrated lack of response to specialist medical weight management with a BMI ≥30 kg/m^2.
    - Patients who are post-renal transplant with a BMI ≥30 kg/m^2 and an uncontrollable obesity complication, e.g. type 2 diabetes.
    - In both cases, the decision should occur after multidisciplinary assessment and should be endorsed by the patient's nephrologist [**R-GDG**].

Patients with the following conditions should be reviewed by an obesity specialist multi-disciplinary team before surgery [4,8,9] [**L2, RGB**]:

- Inflammatory bowel disease.
- Eating disorder.
- Uncontrolled psychological disorder or self-harming behaviour.
- Past history of intervention for substance use.
- Developmental delay.
- Autism spectrum disorder.
- Syndromic obesity.
- Untreated endocrine causes of obesity.

5.3 Contraindications

Absolute contraindications to bariatric surgery include [4,5,8,9] [**L2, RGC**]:

- Active cancer with a poor prognosis.
- Decompensated end-stage cardio-pulmonary disease.
- Decompensated end-stage liver disease with portal hypertension.
- Major psychiatric disorders (unless specifically advised by a psychiatrist experienced in obesity).
- Alcohol and/or drug dependencies.
- Uncontrollable coagulopathy.
- Any contraindication to receiving general anaesthesia.
- Current pregnancy.

6 Management Principles

6.1 General Principles

All patients should [2,8–10] [**L1, RGA**]:

- Undergo a full medical evaluation, including hormonal or genetic screening, when appropriate, to exclude rare, treatable causes of obesity.
- Have no absolute contraindication to surgery (as listed in *Section 5.3*).
- Be adequately informed, motivated, and have realistic expectations.
- Participate in the final decision about the type of surgical intervention.
- Understand the surgical or endoscopic procedure, its risks and benefits, including perioperative mortality. The discussion should also include the patient's family, if appropriate.
- Have had all management options discussed with them.
- Understand the importance of complying with nutritional requirements.
- Understand and commit to the need for life-long, follow-up and care.
- Obtain patient information leaflets for all proposed interventions.

6.2 Multidisciplinary Management

Pre-operative and post-operative management for bariatric surgery patients is preferred to be undertaken after consideration by, and in coordination with, an MDT [2]. MDTs should include access to the following specialists [9]:

- Bariatric surgeon or endoscopist.
- Bariatric physician or endocrinologist.
- Dietitian.
- Psychologist.
- Specialist nurse.
- Physical therapist (when appropriate).
- Other specialists e.g. pulmonologist, cardiologist, or psychiatrist (as appropriate).

The MDT should provide [2,9] [**L2**]:

- Management of obesity-related complications (see *Section 4.3*).
- Preoperative assessment, including a risk-benefit analysis (see *Section 6.3*).
- Psychological support before and after surgery, if required.
- Regular postoperative assessment, including specialist dietetic and surgical short- and long-term follow-up (see *Section 9.2*).
- Identification and management of issues that may require referral back to the surgical team, including red flags for urgent re-referral (e.g. sepsis).
- Information on, or access to, plastic surgery when appropriate (e.g. abdominal contouring).

6.3 Pre-Operative Assessment and Preparation

A comprehensive pre-operative assessment of any clinical or psychological factors that may affect adherence to postoperative care requirements should be performed before surgery [2,6,8–10] [**L1, RGA**]:

- **Analysis of Risks and Benefits:**
  - Provide information on the different procedures, including potential weight loss and metabolic outcomes.

- **Medical Assessment and Optimisation:**
  - Evaluate for obesity-related comorbidities that may be previously undiagnosed.
  - Complete history and physical examination, including:
    - Weight, height, and BMI.
    - Weight-loss history.
    - Commitment to weight loss.
    - Causes of obesity.
    - Known obesity-related comorbidities.
    - Review potential contraindications related to surgical risk.
  - Laboratory investigations, including:
    - Complete blood count (CBC).
    - Blood type.
    - Prothrombin time/INR.
    - Renal function.
    - Liver profile.
    - Lipid panel.
    - Fasting blood glucose.
    - Urine analysis for albuminuria.
  - Endocrine evaluation:
    - HbA_{1C} with suspected or diagnosed prediabetes or diabetes.
    - TSH and Free T4.
    - If there is suspicion of PCOS, perform the following (as recommended by an endocrinologist):
      - Total and free testosterone.
      - DHEAS.
      - Delta-4 Androstenedione.
    - Screening for Cushing syndrome, if clinically suspected using:
      - 1 mg overnight dexamethasone test.
      - 24-hour urinary free cortisol, over several days.
      - 11 pm salivary cortisol.
  - Optimise glycaemic control:
    - Inability to achieve good glycaemic control, should not delay referral for, or progress to, bariatric surgery.
    - HbA_{1C} value of 6.5-7.0%:
      - May be associated with shorter hospital stays and improved bariatric procedure outcomes.
    - HbA_{1C} of 7% - 8%:
      - Recommended in patients with:
        - Advanced microvascular or macrovascular complications.
        - Extensive comorbid conditions.
        - Long-standing diabetes in which the general goal has been difficult to attain despite intensive efforts
    - In patients with a HbA_{1C} of >8% or otherwise uncontrolled diabetes:
      - Full discussion and patient preparation should occur in collaboration with the patient's endocrinologist [**R-GDG**]
      - Clinical judgment should determine the need and timing for the bariatric procedure.
      - Full discussion and patient preparation should occur in collaboration with the patient's physician.
  - Screen for monogenic and syndromic causes of obesity:
    - Performed on a cases-by-case basis depending on specific history and physical examination findings.
  - Optimise nutritional status including:

        - Review by a registered dietitian.
        - Screening for and treating nutritional deficiencies:
            - Iron studies.
            - Vitamin B12 and folic acid
                - RBC folate, homocysteine, methylmalonic acid may also be required depending on the results.
            - Vitamin D, calcium, and parathyroid hormone levels.
            - Vitamins A and E levels are optional.
            - Consider more extensive testing in patients undergoing malabsorptive procedures based on symptoms and risks.
    - Cardiac evaluation:
        - The need for an electrocardiogram and other non-invasive cardiac testing (e.g. cardiac stress testing, echocardiography), is determined on the basis of the individual risk factors and findings on history and physical examination.
        - Patients with known heart disease require a formal cardiology consultation before bariatric procedures are performed.
    - Pulmonary evaluation:
        - Clinical screening for obstructive sleep apnoea (with confirmatory polysomnography if screening tests are positive) should be considered.
        - Consider using the STOP or STOP-BANG questionnaire as a screening questionnaire and a score of ≥3 should prompt a sleep study [33,34].
        - Patients with obesity hypoventilation syndrome, intrinsic lung disease or disordered sleep patterns should have a formal pulmonary/sleep evaluation, including arterial blood gas measurement, when knowledge of the results would alter patient care.
    - Gastrointestinal evaluation:
        - Consider *Helicobacter pylori (H. pylori)* screening in areas of high prevalence.
        - Consider the following if clinically indicated:
            - Upper gastrointestinal endoscopy.
            - Barium swallow.
            - Abdominal ultrasound.
            - Assessment of fatty liver and liver fibrosis.
    - Venous thromboembolism risk assessment.
    - Smoking cessation advice should be given when appropriate.

- **Psychological/Psychiatric Assessment (Based on Clinical Need):**
    - Identification of patients for whom surgery may be inappropriate e.g. with:
        - Severe learning disability.
        - Active uncontrolled Major Depressive Disorder.
        - Active uncontrolled psychosis.
        - Severe personality disorder.
    - Psychological support before and after surgery.
    - The patients should be encouraged to attend education sessions.

- **Identify Patients Who Are Not Presently Suitable for a Bariatric Procedure:**
    - Such patients should be provided with an intervention or access to treatment before reassessing for surgery e.g. patients with:
        - An untreated or unstable mental health disorder.
        - Excess alcohol or substance use.
        - Active eating disorder.
        - Have self-harmed in the past 12 months.
        - Dementia.

7 Endoscopic Bariatric Procedures

7.1 Intragastric Balloon Treatment

Intragastric balloon treatment [6,25,30,35,36]:

- Intragastric balloons are well established to treat obesity. Their restrictive effect increases the feeling of fullness, early satiety and slow gastric emptying mainly during the first 3 months [1,25,35,36].
- Time-limited therapy: the balloon is typically removed or self-empties after several months [35].
- Long-term weight loss is usually difficult to achieve [35].

Absolute contraindications to intragastric balloon insertion include [1,8]:

- Previous major open gastrointestinal tract (GI) surgery.
- Hiatal hernia of ≥5 cm.
- Oesophageal dysphagia or dysmotility.
- Potential bleeding lesion of the upper GI, e.g. gastric ulcer or chronic use of nonsteroidal anti-inflammatory drugs (NSAIDs).
- Pregnancy.
- Alcohol excess or substance use.
- Severe liver disease with oesophageal or gastric varices.
- Bleeding diathesis or use of anticoagulants.
- Psychiatric disorders without control or treatment.

Relative contraindications, include [1,8]:

- Angioectasis without signs of bleeding.
- Eosinophilic oesophagitis.
- Psychiatric disorders without control or treatment.
- Breastfeeding.

Intragastric balloon complications, include [35]:

- Nausea and vomiting.
- Gastric erosions.
- Ulcerations.
- Gastrointestinal perforation.
- Early deflation of the balloon (especially if they are left for more than 6 months [37]):
- Balloon migration.
- Bowel obstruction.
- Acute pancreatitis.

7.2 Post-Procedure Care

Patients are advised to stay off work for up to 5 days after an endoscopic balloon insertion, in order to adjust to the balloon [**R-GDG**]. Patients are also advised not to take a flight in the first week after balloon insertion [**R-GDG**].

Eating with the Intragastric balloon involves several phases [**R-GDG**]:

- Phase 1: One week before the balloon:
  - Fluids only.
- Phase 2: 24 hours before balloon insertion:
  - Water only.

- Phase 3:
    - Day 1: Water Only.
        - Once water has been tolerated for a day, other liquids can be included.
    - Day 2 – 14: Liquids only.
- Phase 4: Smooth, pureed texture foods.
- Phase 5: Soft and crunchy texture foods.
- Phase 6: Textured food.
- Phase 7. Balloon removal:
    - Water only from 24 hours before removal.

8 Bariatric and Metabolic Surgical Procedures

Bariatric (metabolic) surgery is currently the most effective treatment for obesity [6,6,25,35]. The following surgical methods have been established and applied to treat obesity (see key information about each procedure below) [25]:

- Restrictive procedures:
  - Laparoscopic sleeve gastrectomy and its modifications.
- Hypoabsorptive procedures:
  - Roux-en-Y gastric bypass (RYGB) and its modifications.
  - Single anastomosis gastric bypass (mini-gastric bypass or omega-loop gastric bypass) and its modifications.
  - Bilio-pancreatic diversion with duodenal switch (BPD/DS) gastric bypass and its modifications.
  - Single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S) surgery and its modifications.

8.1 Laparoscopic Sleeve Gastrectomy

Laparoscopic sleeve gastrectomy:

- One of the most common bariatric surgeries at present [4].
- Results in excision of the greater curvature of the stomach, leaving a tubular-shaped pouch with reduced volume [4,8].
- Induces rapid and significant weight loss, that comparative studies find similar to that of the RYGB (see *Section 8.2*) [38].
- The average loss of 60-70% of excess weight [**R-GDG**].
- Involves a relatively short hospital stay of approximately two days [38].
- Causes favourable changes in gastrointestinal hormones that suppress hunger, reduce appetite, and improve satiety [38].

8.2 Laparoscopic Gastric Banding

Laparoscopic gastric band [**R-GDG**]:

- One of the approved but less commonly performed bariatric procedures at present.
- It is pure restrictive procedure with excess weight loss of 40-50%.
- Involves a relatively short hospital stay of approximately one day.

8.3 Roux-En-Y Gastric Bypass

Roux-en-Y gastric bypass (RYGB):

- One of the most common bariatric procedure worldwide [39].
- Involves creating a small gastric pouch with intestinal re-routing [3,40].
- The pouch is connected to a 'Roux' limb which bypasses a large portion of the small intestine preventing absorption of nutrients [3].
- Produces sustainable weight loss: the average loss of 70-80% of excess weight [8,40].
- Produces favourable changes in gut hormones that reduce appetite and enhance satiety [38].

8.4 Single Anastomosis Gastric Bypass

Single anastomosis gastric bypass (also known as mini-gastric bypass or omega-loop gastric bypass):

- A minimally invasive procedure performed with laparoscopic technique [41].
- Shorter operating time is required; less complications has been reported [41,42].
- The size of the stomach is reduced by a loop anastomosis between the tubular gastric pouch and the intestine, bypassing up to 200cm of the upper part of the intestine [41,42].
- The procedure can be used in super-obese individuals [42].
- Results in 30-40 % body weight loss from baseline (60-80% excess weight loss) [41].
- The most rapid weight loss occurs in the first 6 months after surgery [41].
- More effective inducing remission of diabetes compared to RYGB [41].

8.5 Bilio-Pancreatic Diversion with Duodenal Switch

A biliopancreatic diversion with duodenal switch (BPD/DS) gastric bypass:

- A two-component procedure [38,43]:
    - Creating a smaller, tubular stomach pouch by removing a portion of the stomach.
    - Bypassing approximately 3/4 of the small intestine.
- The amount of food that is consumed is reduced after surgery, but this effect lessens with time [38]. The reduction of caloric and food absorption results from separating the flow of food from the flow of bile and pancreatic juices [43].
- Results in 60-70% percent excess weight loss or greater [38,43].
- More effective in weight loss than RYGB, or laparoscopic sleeve gastrectomy [38].
- More effective inducing remission of type 2 diabetes than sleeve gastrectomy [44].

8.6 Single Anastomosis Duodenal-Ileal Bypass with Sleeve Gastrectomy Surgery

Single anastomosis duodenal-ileal bypass with sleeve gastrectomy (SADI-S):

- A combination of sleeve gastrectomy (restrictive) with a distal intestinal bypass (hypoabsorptive) [8,45].
- Results in average excess weight loss of 80-90% [**R-GDG**].
- Reduces the absorption of fat by 70% or more [38].
- Causes favourable changes in gastrointestinal hormones to reduce appetite and improve satiety[38].
- Is the most effective in inducing remission of type 2 diabetes compared to: RYGB, laparoscopic sleeve gastrectomy or adjustable gastric banding [38].

9 Post-Operative Management and Follow-Up

Bariatric and metabolic surgery, and bariatric endoscopic procedures, demand appropriate post-operative monitoring to maximise safety and effectiveness in all patients [2,8,10] [**L1, RGA**].

9.1 Immediate Post-Operative Care

9.1.1 Immediate Post-Operative Dietary Management and Nutritional Supplementation

Immediate post-operative dietary care:

- See post-operative dietary staging in *Section 9.2.1*.

Nutritional supplementation should be started according to the bariatric procedure [2,10] [**L1**, **RGA**]:

- **Laparoscopic Sleeve Gastrectomy:**
  - Multivitamins plus minerals: 1-2 chewable tablets per day.
  - Elemental calcium: 1,200-1,500 mg per day.
  - Vitamin D: 2,000-3,000 IU per day, titrated to therapeutic vitamin D levels of >30 ng/ml. The replacement of choice should be cholecalciferol [**R-GDG**].
  - Total iron: 18-60 mg per day via multivitamins and additional supplements.

- **Roux-en-Y Gastric bypass and Omega Loop Gastric Bypass:**
  - Multivitamins plus minerals: 1-2 tablets chewable per day.
  - Elemental calcium: 1,200-1,500 mg per day.
  - Vitamin D: 2,000-3,000 IU per day, titrated to therapeutic vitamin D levels of >30 ng/ml. The replacement of choice should be cholecalciferol [**R-GDG**].
  - Total iron: 18-60 mg per day via multivitamins and additional supplements.
  - Vitamin B12: 1000 mcg once monthly parenterally or, daily if oral.

- **Biliopancreatic Diversion with Duodenal Switch and Single Anastomosis Duodeno-Ileal Bypass with Sleeve Gastrectomy (SADI-S):**
  - Multivitamins plus minerals: 1-2 tablets per day.
  - Elemental calcium: 1,800-2,400 mg per day.
  - Vitamin D: 2,000-3,000 IU per day, titrated to therapeutic hydroxyvitamin D levels of >30 ng/ml. The replacement of choice should be cholecalciferol [**R-GDG**].
  - Total iron: 18-60 mg per day via multivitamins and additional supplements.
  - Vitamin B12: 1000 mcg once monthly parenterally or, daily if oral.
  - Daily supplementation with fat soluble vitamins (A, D, E, & K).

9.1.2 Immediate Post-Operative Medication Management

Considerations for Post-Operative Medication [**R-GDG**]:

- Crushed or liquid rapid-release medication should be used instead of extended-release medications to maximise absorption in the immediate post-procedure period.
- Minimal daily nutritional supplementation for patients with biliopancreatic diversion with/without duodenal switch, Roux-en-Y gastric bypass, and sleeve gastrectomy should be in chewable form.

9.1.3 Prevention and Management of Immediate Post-Operative Complications

Diabetes Management [2,9–12] [**L1, RGA**]:

- Intravenous insulin is recommended for glycaemic control in the immediate postoperative period in patients with type 2 diabetes.
- Subcutaneous insulin therapy, using:
  - A rapid acting insulin analogue (e.g. insulin lispro or aspart) before meals; and
  - A basal long-acting insulin analogue (e.g. insulin glargine, detemir, or degludec).
  - Insulin doses should be adjusted (due to low calorie intake) to minimise the risk of hypoglycaemia.
- The following diabetes medications should be discontinued:
  - Insulin secretagogues (sulfonylureas and meglitinides).
  - Sodium-glucose cotransporter-2 (SGLT2) inhibitors.
  - Thiazolidinediones.
- Metformin and/or incretin-based therapies may be continued postoperatively based on initial HbA_{1C} and until prolonged clinical resolution of type 2 diabetes is demonstrated by normalised glycaemic targets.
- Endocrinology consultation should occur for patients with type 1 diabetes, or with type 2 diabetes and uncontrolled hyperglycaemia.
- Patients with diabetes should be advised to monitor blood glucose at home after discharge from hospital using pre-prandial, 2-hour postprandial, and bedtime monitoring.

Pulmonary Management [**R-GDG**]:

- Includes intensive respiratory therapy and incentive spirometry, oxygen supplementation to avoid hypoxemia, and early institution of continuous positive airway pressure (CPAP) or bilevel positive airways pressure (BiPAP), when clinically indicated.

Prophylaxis Against Deep Venous Thrombosis (DVT) [10] [**L2, RGA**]:

- Recommended for all patients after a bariatric surgical procedure.
- Prophylactic regimens after bariatric surgery should be according to hospital policy, and may include:
  - Use of sequential compression devices; with
  - Unfractionated heparin or low-molecular-weight heparin.
  - Prophylaxis should be administered within 24 hours following bariatric surgery if there is no contraindication.
- Extended chemoprophylaxis after hospital discharge should be considered for high-risk patients, such as those with a history of DVT, known hypercoagulable state, or limited ambulation.
- Early ambulation is encouraged in the early post-operative period.

9.2 Follow-Up by the Bariatric Multidisciplinary Service

Patients who have had bariatric surgery should receive follow-up care for a minimum of two years within the bariatric or specialist weight management service with a specific plan communicated with primary care for long-term follow-up [2,10,11] [**L1, RGA**]. The frequency of follow-up visits depends on the bariatric procedure performed and the severity of obesity-related complications [2,9,10] [**L1**].

The recommended schedule for appointments with the bariatric team should include [**R-GDG**]:

- First meeting: 1-2 weeks after surgery.
- Follow-up visits depend on type of surgery performed:
  - Laparoscopic Sleeve Gastrectomy:
    - 1, 3, 6, 12 months and annually thereafter.

- Roux-en-Y Gastric Bypass, Omega Loop Gastric Bypass:
  - 1, 3, 6-12 months and 6-monthly thereafter
- Biliopancreatic Diversion with Duodenal Switch and SADI:
  - 1, 3, 6 ,12 months and 6-monthly thereafter.

In addition to monitoring weight loss and weight maintenance, follow-up and support from the MDT should include [**R-GDG**]:

- Monitoring dietary staging.
- Monitoring for nutritional deficiencies.
- Monitoring for post-operative complications.
- Management of obesity-related complications and other comorbidities.
- Post-operative physical activity advice and support.
- Psychological support.
- Information about professionally-led or peer-support groups.

9.2.1 Monitoring Dietary Staging

The aim of dietary recommendations post-bariatric surgery are [46]:

- To provide adequate energy and nutrients to support tissue healing after surgery and support preservation of lean body mass during extreme weight loss.
- Select foods and beverages which minimise reflux, prevent early satiety and dumping syndrome, while maximising weight loss and weight maintenance.

Key points in dietary management [46]:

- Prior to discharge patients should be counselled about the principles of healthy eating, including at least 5 daily servings of fresh fruits and vegetables.
- Protein intake should be individualised, assessed, and guided by the dietitian according to gender, age, and weight.
- A minimal protein intake of 60 g per day and up to 1.5 g/kg of ideal body weight per day, should be adequate.
- Concentrated sweets should be eliminated from the diet after any bariatric procedure to reduce dumping syndrome and caloric intake.

Dietary management of the patient post-bariatric surgery is managed through a series of clearly defined stages through which the patient progresses according to their tolerance of the diet.

Stage 1: Clear fluids [12,13] [**L1, RGA**]**:**

- Time period: 1-3 days post-surgery.
- Allowed foods:
  - Water, non-carbonated, decaffeinated and no added sugar drinks, fresh strained juices, strained soups, jelly, mint or green tea, and strained herbal drinks.
- Consumption:
  - Drink liquids 30 ml (2 tablespoons) every 15-30 minutes and to make sure that the total intake is 1-2 litres per day.

Stage 2: Full fluids (low in fat and simple sugars) [12,13] [**L1, RGA**]:

- Time period: 3 days to 2 weeks post-surgery.
- Allowed foods:
  - Low fat milk, laban, and yogurt.
  - Custard made with low fat milk (no added sugar).

    - Fresh juices with no added sugar.
- Consumption:
    - 6-7 meals daily, each meal should consist of 120 ml of fluid (1/2 cup).
    - Consume every 1 hour.

Stage 3: Pureed Foods [12,13] [**L1, RGA**]:

- Time period: 2-4 weeks post-surgery.
- Allowed foods:
    - Low fat labneh & cheese (cottage/cream cheese).
    - Boiled egg (or scrambled with a little oil).
    - Pureed or cooked vegetables or fruits (without skins or seeds).
    - Minced meat, fish or chicken.
    - Commercial food prepared for babies.
- Consumption:
    - 5- 7 meals daily, each meal should consist of no more than 60-90 g (4-6 tablespoons).
    - Consume every 2 hours.
    - At least 3 meals should contain protein foods (meat/fish/chicken or alternatives such as cheese and labneh).
    - Drink 1-2 litres of fluids daily (30 ml, 30 minutes before or after meals).

Stage 4: Soft Foods [12,13] [**L1, RGA**]:

- Time period: 4-6 weeks post-surgery (depending on patient's tolerance).
- Allowed foods:
    - Skinless boiled or grilled chicken (minced or chopped).
    - Grilled or cooked fish.
    - Low fat minced meat.
    - Canned tuna without oil.
    - Low fat cheese.
    - Well-cooked starches (e.g. rice, potato, macaroni), in small amounts.
    - White bread with trimmed crusts.
    - Soft-pealed fruit and vegetables without seeds (e.g. banana, apple, papaya, pear)
- Consumption:
    - Eat 3-4 meals daily.
    - Each meal should contain no more than 30 g of meats, fish, or chicken or two tablespoons labneh or cream cheese.

Stage 5: Regular Food [12,13] [**L1, RGA**]:

- Time period:
    - Solid food is introduced gradually and in small amounts with the food of the previous stages.
    - Patients should be guided by their dietitian for daily requirements.
- General guidelines[10,12,13] [**L1, RGA**]:
    - Food should be chewed fully.
    - Consume 1.5 litres of water daily (30-60 ml every 15 minutes).
    - Drink 2 cups of low-fat milk or yogurt (60 ml every 15 minutes).
    - Drink fluids 30 mins before or after meals.
    - Eat 3 small meals during the day.
    - Eliminate high-fat or high-sugar foods.
    - Avoid foods with skin, peel, membrane, and seeds.

Complete fasting after bariatric surgery requires special attention and should be avoided[47] for the first 6-12 months following bariatric surgery [**R-GDG**]. Healthy patients may fast in Ramadan, as long as they are properly hydrated before fasting [13,47] [**L2**].

9.2.2 Monitoring for Nutritional Complications

Monitoring for nutritional complications [48]:

- Blood tests recommended at baseline and in each visit, as needed:
  - CBC.
  - Complete metabolic panel.
  - Iron studies including iron levels, TIBC, and ferritin.
  - Vitamin B12 level annually, then every 3-6 months if B12 is supplemented.
  - Serum folic acid (RBC folic acid is optional).
  - 25-vitamin D and intact parathyroid hormone levels (iPTH).
  - Vitamin A:
    - For patients after RYGB, this is optional.
    - For patients who have undergone a biliopancreatic diversion with duodenal switch and SADI-S, perform Vitamin A levels at baseline and every 6-12 months thereafter.
  - Copper, zinc, selenium evaluation if specific findings suggestive of deficiencies.
  - Thiamine evaluation if specific findings of deficiency.
  - Bone density scan (DEXA) at two years post operation.

9.2.3 Monitoring for Post-Operative Complications

Postoperative complications of bariatric endoscopy and surgery include [4,5,8,35,36,49,50]:

- Short-term complications (<30 days):
  - Haemorrhage:
    - Gastrointestinal and intra-abdominal.
  - Staple-line leak.
  - Anastomotic leak (Gastro-Jejunal or Jejuno-Jejunal).
  - Stenosis, stricture, kinks, and twists.
  - Thromboembolic events:
    - DVT, pulmonary embolus, portal vein thrombosis.
  - Pulmonary complications:
    - Pneumonia and atelectasis.
  - Intra-abdominal infections:
    - Peritonitis, sepsis, collections.
  - Multi-organ failure.
  - Dehydration, light-headedness, nausea, vomiting.
  - Wound complications:
    - Wound infection, haematoma, dehiscence.
  - Balloon complications:
    - Balloon intolerance, migration, gastrointestinal perforation, intestinal obstruction, peptic ulceration, pancreatitis.
  - Death.

- Long term complications (>30 days):
  - Cholelithiasis or choledocholithiasis.
  - Dumping syndrome.
  - Reflux oesophagitis.
  - Strictures.

    - Nutritional deficiencies:
        - Vitamin B1, B12, folic acid.
        - Vitamin A, D, E, and K (more common with hypoabsorptive procedure
        - Calcium, iron, zinc, copper, and selenium.
        - Protein malnutrition.
    - Steatorrhoea and flatulence.
    - Diarrhoea or constipation.
    - Hair loss.
    - Urolithiasis.
    - Excessive weight loss resulting in malnutrition.
    - Neurological complications:
        - Wernicke's encephalopathy.
        - Korsakoff's psychosis.
        - Peripheral neuropathy.
    - Psychological complications.

Specific Complications of Bariatric Endoscopy Procedures:

- Intragastric Balloon Procedures [35]:
    - Nausea and vomiting.
    - Gastric erosions.
    - Ulcerations.
    - Gastrointestinal perforation.
    - Early deflation of the balloon (especially if they are left >6 months [37]):
    - Balloon migration.
    - Bowel obstructions.

Specific Post-Operative Complications of Bariatric Surgical Procedures:

- Sleeve Gastrectomy [4,50]:
    - Strictures.
    - Gastro-oesophageal reflux disease.
    - Haemorrhage.
    - Staple line leak.
    - Nutritional deficiencies.
- Roux-en-Y Gastric Bypass, Omega Loop Gastric Bypass or SADI-S [3,50]:
    - Anastomotic leaks.
    - Anastomotic strictures and stenosis.
    - Small bowel obstruction.
    - Internal herniation.
    - Intussusception.
    - Marginal ulceration.
    - Gastro-gastric fistulas.
    - Cholelithiasis and choledocholithiasis.
    - Small bowel obstruction.
    - Dumping syndrome.
    - Nutritional deficiencies.

Monitoring for Post-Operative Surgical Complications:

- If the following symptoms occur after surgery, refer the patient to emergency department for surgical review [10,11]:
    - Severe abdominal pain.
    - Fever.
    - Shortness of breath.
    - Palpitations.

  - Continuous vomiting.
  - Dysphagia.
  - Continuous severe diarrhoea.
  - Melaena or vomiting fresh blood.
- Evaluation is required, using appropriate clinical assessment, laboratory testing, and imaging (consider CT of the abdomen).
- If patients with an intragastric balloon experience the following symptoms, consider spontaneous balloon deflation or migration, and perform plain abdominal radiograph to confirm the position and status of balloon inflation [37]. If the state and position of inflation cannot be determined by plain abdominal radiograph, perform CT scan [**R-GDG**]:
  - Increased nausea and vomiting.
  - Cramping.
  - Loss of fullness.
  - Increased hunger.
  - Weight gain.
    - If deflation is confirmed, the balloon should be removed as soon as possible [37].
- If a bariatric patient presents with post-operative right upper-quadrant pain:
  - Consider biliary colic or acute cholecystitis, as patients are at increased risk of developing gallstones due to rapid weight loss.
  - Perform an abdominal ultrasound to check for gallstones.
  - Prophylactic cholecystectomy may be considered in asymptomatic patients with known gallstones and a history of RYGB or BPD/DS, to avoid choledocholithiasis:
    - NB: Traditional ERCP can no longer be performed in these patients. ERCP using a transgastric approach can be performed but requires specialist expertise to perform [**R-GDG**].
    - Cholecystectomy should otherwise be reserved for patients with symptomatic biliary disease.
- Asymptomatic abdominal wall hernias:
  - Do not require immediate repair and can be reviewed after weight loss has stabilised and nutritional status has improved to allow for adequate wound healing (12 to 18 months after bariatric surgery).
- Symptomatic hernias:
  - If a symptomatic hernia occurs after bariatric surgery, prompt surgical evaluation is required.
  - Consider a closed-loop bowel obstruction and perform an abdominal and pelvic CT, in patients who present at any time after bariatric surgery with:
    - Sudden-onset of severe cramping.
    - Periumbilical pain.
    - Recurrent episodes of severe abdominal pain.
  - Exploratory laparotomy or laparoscopy is indicated in patients who are suspected of having an internal hernia as this complication can easily be missed.
- Persistent steatorrhoea after malabsorptive procedures, should prompt evaluation for nutritional deficiencies.
- Prophylactic therapy to prevent post-procedure anastomotic ulcers:
  - Proton-pump inhibitors should be considered for 90 days to 1 year, depending on individual risk.
  - H_2 receptor blockers and sucralfate may also be considered.
  - If *H. pylori* is identified, quadruple therapy, including antibiotics, bismuth, and proton-pump inhibitors, may be used.
  - Patients with de novo gastroesophageal reflux and severe symptoms after sleeve gastrectomy should be treated with proton-pump inhibitor therapy.

9.2.4 Management of Obesity-Related Complications and Other Comorbidities

Management of obesity-related complications and other comorbidities [2,9–12] [**L1, RGA**]:

- Management of diabetes mellitus:
  - Review medication and insulin requirements after surgery.
  - Monitor $HbA_{1C.}$
  - Ensure all patients with diabetes are reviewed by a diabetes specialist physician or endocrinologist.

- Management of hypertension [**R-GDG**]:
  - Monitor blood pressure at each visit.
  - Reassess the need for antihypertensive therapy at each visit.

- Management of dyslipidaemia [**R-GDG**]:
  - Revaluate lipid management every 6-12 months based on ASCVD risk.

- Management of hypothyroidism [**R-GDG**]:
  - Monitor TSH levels regularly.
  - Adjust medication dosing, as dose reductions are more likely with weight loss.

- Consider gout and gallstone prophylaxis in high risk patients with [**R-GDG**]:
  - Oral administration of allopurinol.
  - Oral administration of ursodeoxycholic acid.

- Medication management:
  - Regular medications should be reviewed and optimised [2,9–12] [**L1, RGA**]. Pay additional attention to:
    - Medication for obesity-related conditions.
    - Medication with a narrow therapeutic window (e.g. warfarin).
    - Extended-release medication.
    - Medication with weight requirements for dosing.
  - NSAIDs should be avoided after bariatric surgery.
  - Crushed or liquid rapid-release medications are recommended over extended-release medication to maximise absorption [10] [**L1, RGA**].

9.2.5 Post-Operative Physical Activity

9.2.5.1 Physical Activity Counselling

The following model can be used to ensure comprehensive assessment and management of the post-operative patient's physical activity requirements.

Assess [51]:

- Patients' knowledge, beliefs, and values regarding physical activity.
- Physical activity history, current physical activity level, and physical activity preferences.
- Readiness to change, motivation, self-confidence, and barriers to implementing a physical activity programme.
- Physical limitations and pain associated with physical activity; refer to physical therapy as needed.
- Patients' ability to safely increase physical activity; refer high-risk patients for exercise testing.

Advise [51]:

- Enhance motivation by summarising the benefits of physical activity.
- Help patients develop realistic expectations.
- Discuss safety-related issues and provide guidance on how to minimise risks.
- Provide strategies on how to overcome barriers to physical activity.
- Teach patients how to gauge their physical activity intensity.
- Tailor physical activity recommendations to the patient's capabilities and readiness.

Agree [51]:

- Collaborate with patients to determine specific physical activity goals (including type, duration, frequency, and intensity) and the timeframe for goal evaluation and modification.

Assist [51]:

- Educate patients on behavioural strategies to be successful.
- Provide printed material and tools for self-monitoring physical activity such as pedometers and physical activity diaries.
- Share the patient's physical activity plan with other members of the bariatric team to establish team consensus and commitment.
- Schedule clinic follow-up to answer questions, discuss attainment of goals, provide positive reinforcement for progress toward goals, and revise treatment plan as required.

9.2.5.2 Exercise Prescription in the Post-Operative Phase

Exercise prescription in the post-operative phase [52]:

- Comprehensive treatment following surgery includes exercise that will likely facilitate the achievement and maintenance of energy balance post-surgery.
- Once individuals are cleared for exercise by their physician after surgery, a progressive exercise programme should follow the *FITT principle* of exercise prescription:
    - The FITT principle of exercise prescription is consistent with the *American College of Sports Medicine* (ACSM), comprising of:
        - *Frequency, Intensity, Time*, and *Type* with the addition of *Total Volume* and *Progression.*
    - An exercise programme including aerobic, resistance, flexibility, and neuromotor exercise training is indispensable to improve and maintain physical fitness and health.
    - Low levels of exercise, intermittent exercise, or non–weight-bearing exercise may initially contribute to a successful exercise programme.
- Resistance training should not be started until clearance from the patient's bariatric surgeon is obtained. This can be anywhere from 6 weeks onwards, post-bariatric surgery [52].
- Any exercise plan should consider all obesity complications and their ongoing treatment [**R-GDG**].

Recommendations for progression of cardiorespiratory exercise in the post-operative patient, are provided in the table below [52]. A realistic and acceptable plan should be instituted based on the individual patient [**R-GDG**].

Time Post-Surgery	Frequency	Duration of Exercise
0-2 Weeks	Several times per day	As tolerated
2-4 Weeks	5-6 days per week	20-30 minutes
4-6 Weeks	5-6 days per week	30-40 minutes
>6 Weeks	5-6 days per week	40-60 minutes

Table 9.2.5.2(1): Recommendations for Progression of Cardiorespiratory Exercise Post-Surgery [52].

Resistance Training	Repetition	Frequency	Number of Muscle Groups
0-4 Weeks	1 set of 20	2-3 days per week	8-10
4-8 Weeks	2 sets of 15	2-3 days per week	8-10
>8 Weeks	3 sets of 12-15	2-3 days per week	8-10

Table 9.2.5.2(2): Recommendations for Progression of Resistance Training Post-Surgery [52].

Flexibility training improves and maintains the range of motion of joints which can alleviate the aches and pains often associated with obesity [52]:

- Stretching exercises should be incorporated after a brief warm-up or after an exercise session when muscles are warm.
- The recommendations for exercise testing and prescription are:
    - 2-3 days per week and holding each stretch for at least 60 seconds.

Balance and neuromotor exercises [52]:

- Should be performed every 2-3 days for 20-30 minutes.

9.3 Follow-Up in Primary Care

Refer the patient back to the care of their primary care physician if [9] [**L1**]:

- After two years of sustained specialist follow up post-surgery [**R-GDG**].
- Obesity-related complications have been addressed, ongoing treatment can be continued by a primary care physician, if:
    - The patient does not want, or is not appropriate for, further surgery.
    - The patient is not suitable for specialist weight assessment and management in clinic.

In primary care [2,10,13]:

- Keep a register of patients who have undergone bariatric surgery and record the type of procedure in the register.
- Encourage patients to:
    - Check their own weight regularly.
    - Attend an annual weight and dietary review with a health professional.
    - Attend for annual blood tests.
- Provide contraception/pregnancy advice for women of child-bearing age.
- Continue reviewing obesity-related complications listed in *Section 4.3*.
- Screening for micronutrient deficiencies, bone health, and control of nutrition-related non-communicable diseases.
- Review and adjust regular medications.

9.4 Post-Operative Considerations for Future Pregnancy

Pregnancy should be avoided during the period of rapid weight loss 12-18 months after bariatric surgery [11,53] [**L1, RGA**].

Adequate counselling regarding contraception should be provided to the patient [11,53] [**L2, RGA**]:

- Gut shortening could affect the absorption of oestrogen containing oral contraceptives.
- Absorption of ethinyl oestradiol from the combined oral contraceptive pill (COCP) may be reduced.

- Vomiting and/or diarrhoea can also reduce the efficacy of oral contraceptives.
- COCP containing oestrogen should be avoided after bariatric surgery [53] [**L2, RGB**].
- Long-acting reversible contraception (implants, intrauterine device or system) are preferred [53] [**L2, RGB**].
- Patients with a history of infertility may have an increased probability of early postoperative conception.

Women should undergo a thorough nutritional evaluation prior to and during pregnancy [11,53] [**L2, RGA**]:

- Energy requirements should be individualised.
- Parenteral nutrition support may be considered when required.
- If postprandial syndrome (early dumping) is suspected, rapidly absorbed carbohydrates should be avoided.
- If postprandial hyperinsulinaemic hypoglycaemia (late dumping) is suspected, careful dietary manipulation should be considered. Referral to a nutritionist/dietitian and/or endocrinologist may be required.
- Key nutritional indices should be checked at least once per trimester. Additional nutritional supplementation may be required.

Women with diabetes mellitus, who have undergone bariatric surgery and wish to conceive, should attend pre-pregnancy counselling with a diabetologist experienced in the care of women with diabetes mellitus in pregnancy [**R-GDG**].

10 Key Considerations for Patient Preferences

Patient preferences refer to patient perspectives, beliefs, expectations, and goals for health and life, and to the steps employed by individuals in assessing the potential benefits, harms, costs, and limitations of the management options in relation to one another. Patients may have preferences when it comes to defining their problems, identifying the range of management options and selecting or ranking the outcomes used to compare these options.

It is important for healthcare professionals to develop an understanding of the patient as an individual and the unique way in which each person experiences a condition and its impact on their life.

The following recommendations are therefore made for physicians and other healthcare professionals regarding general principles of patient care in Qatar:

- **Respect Patients:** Treat patients with respect, kindness, dignity, courtesy, and honesty. Ensure that the environment is conducive to discussion and that the patient's privacy is respected, particularly when discussing sensitive, personal issues. Ask the patient how they wish to be addressed and ensure that their choice is respected and used.

- **Maintain Confidentiality:** Respect the patient's right to confidentiality and do not disclose or share patients' information without their informed consent. In this context, students and anyone not directly involved in the delivery of care should first be introduced to the patient before starting consultations or meetings, and let the patient decide if they would like them to be present during consultations.

- **Clarify Third-Party Involvement:** Clarify with the patient at the first point of contact whether and how they like their partner, family members, or carers to be involved in key decisions about their care or management, and review this regularly. If the patient agrees, it is permitted to share information with their partner, family members or carers.

- **Obtain Informed Consent:** Obtain and document informed consent from patients, in accordance with MOPH policy and guidance.

- **Encourage Shared Decision Making:** Ensure that patients are involved in decision making about their own care, or their dependent's care. Ensure that factors that could impact the patient's participation in their own consultation and care (including physical or learning disabilities, sight, speech or hearing impairments and problems with understanding, reading, or speaking English) are addressed.

- **Disclose Medical Errors:** Disclose errors when they occur and show empathy to patients.

- **Ensure Effective Follow-Up and Care:** Educate patients regarding regular follow-up and provide timely and effective follow-up.

- **Ensure Effective Communication:** Explore ways to improve communication including using pictures, symbols or involving an interpreter or family members. Avoid using medical jargon. Use words the patient will understand and confirm understanding by asking questions.

- **Ensure Continuity of Care:** Provide clear and timely sharing of patient information between healthcare professionals especially at the point of any transitions in care.

11 Performance Measures

A list of performance measures is given in the table below. Healthcare organisations are encouraged to monitor service performance using the indicator definitions below[16].

Number	Numerator	Denominator
BS01	The number in the denominator who have been managed in a multi-disciplinary team setting.	The number of people aged ≥18 years who have undergone bariatric and metabolic surgery in the last 12 months.
BS02	The number in the denominator who have had a comprehensive pre-operative assessment including a discussion of risks and benefits and assessment of preoperative medical status.	The number of people aged ≥18 years who have undergone bariatric and metabolic surgery in the last 12 months.
BS03	The number in the denominator who are recorded on a register of bariatric surgery patients in primary care.	The number of people aged ≥18 years who have undergone bariatric and metabolic surgery in the past 12 months.

Table 11.1: Performance measures.

In addition to the above measures, bariatric surgery centres should document the following and provide annual reports of [**R-GDG**]:

- Patient demographics, inclusion/exclusion criteria, rates of obesity complications.
- Type of operations performed (primary, revision or planned second stage).
- Operative approaches used (laparoscopic, laparoscopic converted to open, open, endoscopic).
- The number, frequency, and type of operative complications (including peri-operative and post-operative complications.
- Length of hospital stay.
- Evidence of full weight loss outcomes for each type of procedure provided.
- Outcomes of any obesity complications.
- Patient follow-up.

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Appendix: Detailed Description of the Literature Search

A systematic search for existing literature on obesity, bariatric endoscopy and surgery in adults was performed in the period August 18th – September 19th, 2019.

The search for clinical practice guidelines on obesity, bariatric endoscopy and surgery was performed in the *PubMed* database and websites of relevant organisations and societies including *American Society for Metabolic and Bariatric Surgery, International Physician Society for Obesity, British Obesity and Metabolic Surgery Society (BOMSS), International Federation for the Surgery of Obesity and Metabolic Disorders (IFSO), World Health Organization (WHO),* and other.

Peer-reviewed scientific publications were found in PubMed and via *Google Scholar* Internet search engine. Non-peer reviewed studies were identified in *bioRxiv*. Books were checked in *PubMed*. Information published on medical websites, and drug prescribing information sheets were found via Google search engine.

The included publications were identified using the term "obesity" and, if needed, specified with the following terms in combinations:

Adults, overweight, bariatric surgery/procedure, endoscopic treatment/procedure, weight loss surgery, gastric bypass, sleeve gastrectomy, laparoscopic adjustable band, extreme obesity, management, nutrition, diet, complications, pre-/re-/post-operative, body contouring, follow-up, epidemiology, body mass index, criteria, multidisciplinary management/team.

Figure A.1 below demonstrates graphically the results of the search and application of exclusion criteria.

View Pathway

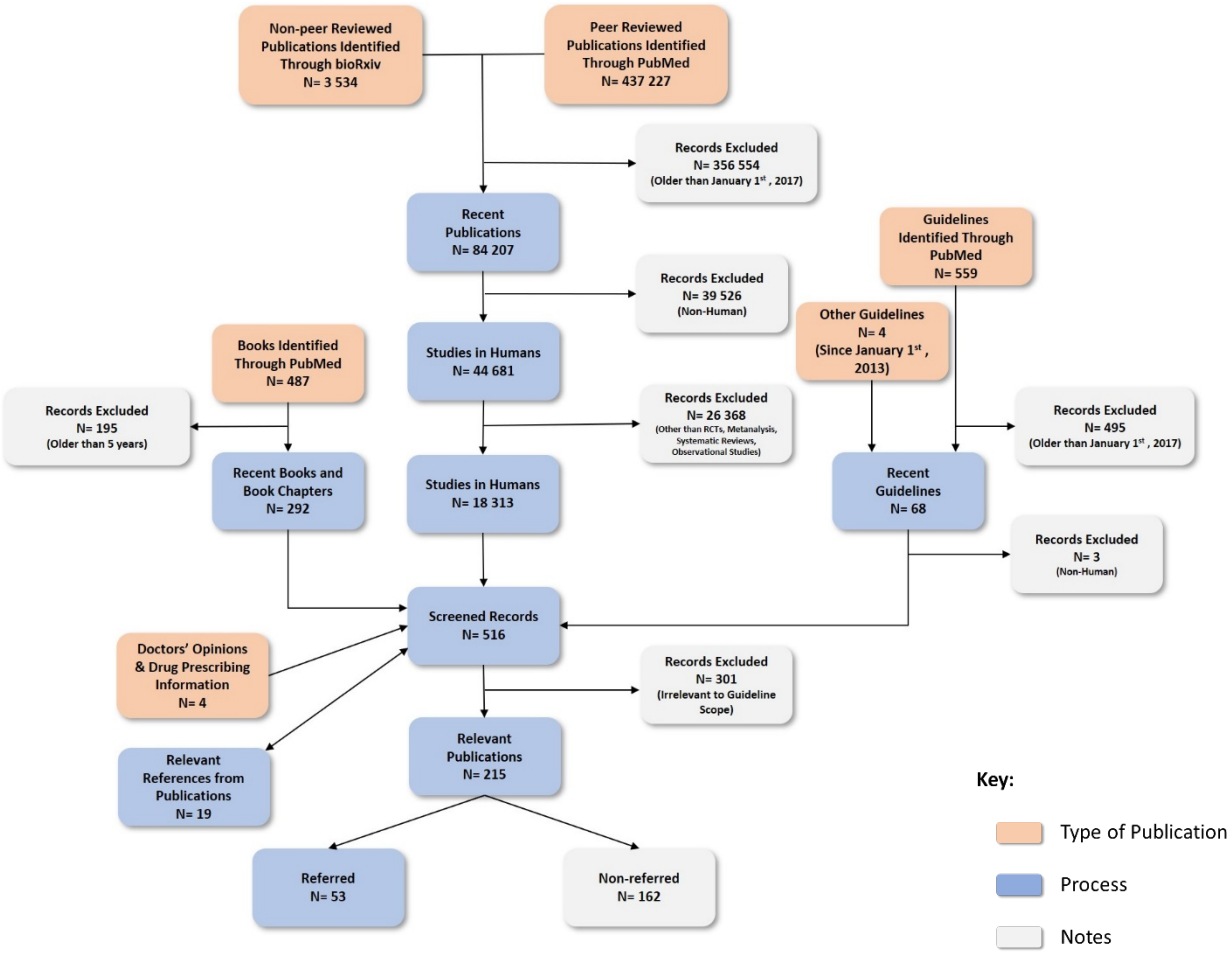

Fig A.1: Literature search results and application of exclusion criteria.

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