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Bariatric surgery

Bariatric surgery can lead to significant weight loss and help improve many obesity-related conditions, such as type 2 diabetes or high blood pressure.[1] Bariatric surgery structurally modifies the gastrointestinal (GI) tract to reduce calorific consumption or absorption. In addition to restricting caloric absorption, bariatric surgeries also have the unintended potential to restrict absorption of other enteral products, including vitamins, minerals, and medications. After surgery, people typically experience rapid weight loss and might require adjustments to long term medication regimens owing to changing medication distribution patterns and the effects of weight loss on chronic disease states.[2]

As part of the medicines optimisation process post-surgery, it is important to consider how bariatric surgery can affect the medication(s) a person is taking and the effects of that medicine on the person. This bulletin provides information for prescribers on optimising medicines for people that have undergone bariatric surgery. Regular medication reviews are essential to optimise medicine use due to changing medication needs in both the short and long term post bariatric surgery.

Recommendations

- Ensure the type of bariatric surgery the person has undergone is recorded in the notes so the effect on drug absorption and pharmacokinetics is understood.
- Medications in liquid formulations may be required for up to six weeks post-surgery when people can usually only tolerate a liquid diet. Avoid costly, unlicensed, 'special' liquids where possible. Alternative options if appropriate include:
  - Dispersing tablets in water.
  - Soluble or orodispersible tablets.
  - Crushing tablets.
  - Opening capsules.
  - A different route of administration.
  - Prescribing an alternative liquid medicine.
  - Temporarily stopping the medicine.
- Where commissioning arrangements permit, secondary care specialists may be able to retain prescribing responsibility for short term medicines, which may not be available as licensed liquid formulations.
- Convert liquid medicines back to solid dose forms when solid nutrients are reintroduced.
- Formulations to be avoided after bariatric surgery include:
  - Modified release, as any delay in drug release may reduce absorption. Immediate release plain formulations are preferred.
  - Enteric or film coated tablets may be problematic, as any delay in drug release may reduce absorption. Immediate release plain tablets are preferred.
  - Effervescent tablets may cause discomfort. If necessary, the tablet should be fully dissolved and allowed to settle before drinking.

Recommendations

  - » Liquids with high sugar content (sucrose, corn syrup, lactose, maltose, fructose, honey or mannitol) as they can lead to dumping syndrome. Use sugar free versions where available.
  - » Large volumes of liquids due to reduced stomach capacity. Consider staggered doses or a licensed, higher strength liquid to reduce the volume of each dose.
  - » Large tablets (diameter greater than 10mm) may get stuck in the pouch. Consider crushing tablets, a smaller diameter alternative tablet, dissolving or dispersing the tablet, alternative administration route, soluble tablets or liquid formulations.
- Pre-surgical consultations should include a comprehensive nutritional assessment and any nutritional deficiencies identified should be investigated and corrected before surgery.
- Pre-surgical consultations should also include a review with a pharmacist to help prepare for medication changes after bariatric surgery.
- People should be offered a follow-up care package for a minimum of two years within the bariatric service. After discharge, ensure all people are offered at least annual monitoring of nutritional status, advice on appropriate supplementation and how to obtain supplements in line with local commissioning policy (purchase OTC or NHS prescription) following bariatric surgery.
- Ensure medication is regularly reviewed for decreased efficacy, side effects and signs of toxicity, and the continued need for medicines for long term conditions, such as diabetes, as weight loss occurs. The interval between reviews is dependent on individual patient circumstances. A post-operative review with a pharmacist may support improvements in compliance with vitamin supplements and medications.
- Following all bariatric procedures, a complete multivitamin and mineral supplement (containing thiamine, iron, zinc, copper and selenium) is recommended (purchase OTC or NHS prescription in line with local policy).
- Vitamins and minerals are included in the NHS England Guidance for Clinical Commissioning Groups on conditions for which over the counter (OTC) items should not routinely be prescribed in primary care:
  - » Exceptions are made for vitamins and minerals for medically diagnosed deficiency, including for people who have undergone surgery that results in malabsorption.
  - » As gastric banding does not result in malabsorption, this would not fulfil the exception criteria. People with a gastric band should purchase a suitable OTC multivitamin and mineral preparation for self-care.
  - » A Roux-en-Y gastric bypass (RYGB), sleeve gastrectomy (SG) or biliopancreatic diversion and duodenal switch (BPD/DS) does result in malabsorption. Patients should be encouraged to purchase OTC multivitamin and mineral supplements for self-care.
  - » Patients, who have undergone procedures that result in malabsorption and are unable to afford to purchase OTC products, may be eligible to receive an NHS prescription, according to local commissioning policy.
- Because peoples' requirements and adherence may vary over time, multivitamin and mineral supplement should be reviewed regularly and adjusted accordingly.
- People who do not meet the NICE or Scottish Health Board bariatric surgery criteria and choose to fund their bariatric surgery privately will not receive multivitamin and mineral supplements on NHS prescription or NHS funded follow-up care.

Background

The terms 'overweight' and 'obesity' are used to describe excess body fat. Obesity results from an imbalance between energy intake and energy expenditure. Many factors can influence this, including lifestyle, genetics, medical conditions, and medication.[3]

Obesity is associated with an increased risk of developing a number of chronic diseases and conditions, including type 2 diabetes, coronary heart disease, hypertension, stroke, depression, certain cancers, obstructive sleep apnoea, breathlessness, and psychological distress. It is also associated with decreased life expectancy and has significant effects on demands on the health service and the economy (for example from hospital admissions or time off work).[3] Obesity is a major public health problem in England and globally, however most of the complications of obesity can be reduced by weight loss.[3,4]

The burden on the NHS due to obesity and related illnesses is well recognised, and in 2006-7 it was estimated to cost more than £5 billion. Uplifted for inflation, in 2019 this is estimated at £6.1 billion. A 2011 analysis estimated that if current trends continue, over 20 years, two million quality adjusted life years (QALYS) will be lost, whereas if a 1% reduction in Body Mass Index (BMI) was achieved by every adult, three million QALYS would be gained.[4] The Health Survey for England 2019 reported that:[4,5]

- During 2019 in adults aged 16 and over:
  - 68% of men and 60% of women were overweight or obese.
  - 27% of men and 29% of women were obese.
- Obesity increased across age groups from 13% of adults aged between 16 and 24, to 36% of those aged 65 to 74.
- Obesity was lower among adults aged 75 and over (26%).
- Adults living in the most deprived areas were the most likely to be obese.
- Among children, 18% of boys and 13% of girls were obese.
- Children with an obese parent were more likely to be obese.

Different weight classes are defined according to a person's BMI as follows:[3]

- Healthy weight — BMI of 18.5–24.9kg/m^2.
- Overweight — BMI of 25–29.9kg/m^2.
- Obesity 1 — BMI of 30–34.9kg/m^2.
- Obesity 2 — BMI of 35–39.9kg/m^2.
- Obesity 3 — BMI of 40kg/m^2 or more.

BMI is calculated by dividing a person's weight in kilograms by the square of their height in metres. An online calculator is available at https://www.nhs.uk/.[3]

Multicomponent interventions are the treatment of choice. These include:[3]

- Offering general advice on healthy weight and lifestyle.
- Offering structured advice regarding physical activity and diet.
- Consider the use of behavioural interventions.
- Consider starting drug treatment in people with a BMI of 27kg/m^2 with associated risk factors (such as type 2 diabetes, hypertension, or dyslipidaemia).
- Consider starting drug treatment in people with a BMI of 30–34.9kg/m^2 (obesity I) in people with associated risk factors (such as type 2 diabetes, hypertension, or dyslipidaemia).

- Consider starting drug treatment in people with a BMI of 35kg/m^2 or more (obesity II and obesity III).
- Consider the need for referral to weight management services (tier 2 services) or specialist obesity services (tier 3 services).
- Consider the need for bariatric surgery.

Bariatric surgery is a major operation and, in most cases, should only be considered after trying to lose weight through a healthy diet and exercise.[1] In the US, forty years of follow-up of 20,000 people who had bariatric surgery found that all-cause mortality was 16% lower than in a comparison group matched for age, sex, and BMI. Mortality after bariatric surgery was lower in both men and women, with the largest falls in cardiovascular disease, cancer, and diabetes. Suicide, in contrast, was more than twice as common in people who received surgery.[6] The increased risk of suicide highlights the importance of a multi-disciplinary team (MDT) follow-up which includes input from psychologists.

Main types of bariatric surgery

There are several different types of weight loss surgery. They are usually done under general anaesthetic using laparoscopic (keyhole) surgery, but they each work in a slightly different way.[7]

Gastric band:[7,8]

- The gastric band is sometimes referred to more fully as laparoscopic adjustable gastric band (LAGB) and helps reduce the amount of food eaten.
- A band is placed around the stomach, creating a small pouch towards the top.
- It takes less food to fill the pouch, so the person does not need to eat as much before they feel full.
- The band is connected to a small device placed under the skin (usually near the middle of the chest) so the band can be tightened after surgery.
- It is adjustable and reversible.
- The band will usually be tightened for the first time about four to six weeks after surgery. This is done by injecting the device with saltwater solution using a needle passed through the skin. Anaesthetic is not needed for this.
- The band will need to be tightened a few times to get to the ideal tightness for the individual.

Gastric bypass:[7,8]

- There are a number of variations of gastric bypass operation but the most popular one conducted in the UK is called a Roux–en–Y gastric bypass (RYGB).
- A gastric bypass is where surgical staples are used to create a small pouch at the top of the stomach.
- The pouch is then connected to the small intestine, missing out (bypassing) the rest of the stomach.
- This means it takes less food to feel full and the person will absorb fewer calories from the food they eat.
- The size of stomach pouch and the length of small intestine that is bypassed are carefully calculated to ensure that people will be able to eat enough for their body's needs at normal weight.

Sleeve gastrectomy:[7,8]

- Sleeve gastrectomy (SG) is where a large part of the stomach is removed so it's much smaller than it was before, the size of the stomach is reduced by about 75%.
- The stomach is divided vertically from top to bottom leaving a banana shaped stomach along the inside curve.
- This means the person cannot eat as much as they could before surgery, and they feel full sooner.

- The pyloric valve at the bottom of the stomach, which regulates the emptying of the stomach into the small intestine, remains intact.
- This means that although smaller, the stomach function remains unaltered.

Intra-gastric balloon:[7]

- An intra-gastric balloon is a soft balloon filled with air or salt water that's placed in the stomach using a thin tube passed down the throat (known as a gastroscopy).
- The person will not need or be able to eat as much as before to feel full.
- But it is only a temporary measure, and the balloon is usually left in for a maximum of six months.

Biliopancreatic diversion and duodenal switch:[8]

- The biliopancreatic diversion and duodenal switch (BPD/DS) works primarily by creating malabsorption.
- Following a SG, a short segment of the duodenum at the base of the stomach is left but the remainder cut, and the second half of the small intestine bought up and joined to the duodenum (this part of the operation is very similar to a RYGB but is slightly lower down in the digestive tract).
- The bypassed section of small intestine is then re-joined to carry bile and pancreatic juices to the latter part of the small intestine near where it joins the large intestine (colon).
- Digestion and absorption of fat depends on it mixing with bile (from the liver and normally entering the duodenum). As this mixing does not occur until much further on in the intestine after a BPD/DS, the body's ability to digest and absorb calories from fat is severely reduced.
- As a result, weight drops, even when eating quite normally.
- This procedure can cause more side effects than a gastric bypass, so it's less commonly used.[7]

Primary obesity surgery endolumena:[7]

- Primary obesity surgery endolumena is a new technique to shrink the stomach by passing an endoscope into the stomach.
- A surgeon then passes tiny tools through the endoscope, which are used to gather the stomach into folds to make it smaller.
- Primary obesity surgery endolumena is not currently available on the NHS so people will have to pay privately for this treatment.

National guidance

NICE Clinical Guideline [CG189] - Obesity: identification, assessment and management recommends bariatric surgery as a treatment option for people living with obesity if **all** of the following criteria are fulfilled:[9]

- They have a BMI of 40kg/m^2 or more, or between 35kg/m^2 and 40kg/m^2 and other significant disease (for example, type 2 diabetes or high blood pressure) that could be improved if they lost weight.
- All appropriate non-surgical measures have been tried but the person has not achieved or maintained adequate, clinically beneficial weight loss.
- The person has been receiving or will receive intensive management in a tier 3 service.
- The person is generally fit for anaesthesia and surgery.
- The person commits to the need for long term follow-up.

NICE guidance also recommends:[9]

- Bariatric surgery as the option of choice (instead of lifestyle interventions or drug treatment) for adults with a BMI of more than 50kg/m^2 when other interventions have not been effective.
- Offer an expedited assessment for bariatric surgery to people with a BMI of 35kg/m^2 or over who have recent-onset type 2 diabetes (within a ten year timeframe) as long as they are also receiving or will receive assessment in a tier 3 service (or equivalent).
- Consider an assessment for bariatric surgery for people with a BMI of 30 to 34.9kg/m^2 who have recent-onset type 2 diabetes (within a ten year timeframe) as long as they are also receiving or will receive assessment in a tier 3 service (or equivalent).
- Consider an assessment for bariatric surgery for people of Asian family background who have recent-onset type 2 diabetes (within a ten year timeframe) at a lower BMI than other populations as long as they are also receiving or will receive assessment in a tier 3 service (or equivalent). Lower BMI thresholds are:
  - Overweight: BMI 23kg/m^2 to 27.4kg/m^2.
  - Obesity: BMI 27.5kg/m^2 or above.
  - For people in these groups, obesity classes 2 and 3 are usually identified by reducing the thresholds by 2.5kg/m^2.
- Surgical intervention is not generally recommended in children or young people.
- Bariatric surgery may be considered for young people only in exceptional circumstances, and if they have achieved or nearly achieved physiological maturity.

The Welsh Health Specialised Services Committee (WHSSC) has produced a service specification for obesity surgery for complex and severe obesity and a commissioning policy document which sets out the criteria that needs to be fulfilled for an individual to qualify for consideration for bariatric surgery. The policy applies to all seven Health Boards in Wales.[10-12] Individuals must satisfy **all** elements of the criteria set out below:[12]

- The individual is aged 18 years or over **and**
  - has a BMI of 40kg/m^2 or greater and other interventions have not been effective **or**
  - has a BMI range between 35kg/m^2 and 40kg/m^2 and other significant disease (e.g. type 2 diabetes, or high blood pressure) that could be improved if they lost weight **or**
  - is an individual with newly diagnosed diabetes (<10 years) with a BMI range between >30kg/m^2 to <35kg/m^2 and as long as they have or will receive assessment in a Level 3 service **and**
  - all appropriate non-surgical measures have been tried but clinically beneficial weight loss has not been achieved or adequately maintained.
- In addition to the above criteria, the person being considered for bariatric surgery should:
  - have been receiving and complied with a local specialist weight management programme (Level 3 or Level 4 in some urgent or complex cases) described as:
    - for a minimum period of six months if deemed appropriate by the MDT. For patients with BMI > 50kg/m^2 attending a specialist obesity service, this period should include the stabilisation and assessment period prior to obesity surgery. Patients with new onset type 2 diabetes may have their surgical assessment concurrently with the Level 3 specialist multi-disciplinary weight management service.
    - be generally fit for anaesthesia and surgery
    - be able to commit to long term follow-up post-surgery.

Formalised MDT led processes for the screening of co-morbidities and the detection of other significant diseases should be in place. The WHSSC service specification has full details on the process.[11,12]

The Scottish Government's main strategy for supporting healthy weight is A Healthier Future: Scotland's Diet and Healthy Weight Delivery Plan,[13] published in 2018. The delivery plan contains a number of

measures to restrict the promotion and advertising of foods high in fat, sugar and salt, and actions to tackle childhood obesity. This includes more support to children, young people and families to achieve a healthy weight, and training for frontline staff in services that work with them. The plan sets out five outcomes, each supported by a range of actions:[13,14]

- Children have the best start in life – they eat well and have a healthy weight.
- The food environment supports healthier choices.
- People have access to effective weight management services.
- Leaders across all sectors promote healthy diet and weight.
- Diet-related health inequalities are reduced.

Public Health Scotland supports co-ordinated action to reduce the prevalence of obesity in Scotland and associated health inequalities. This includes supporting the delivery of effective weight management services for the treatment of overweight and obesity.[14]

Scotland has a tiered approach to the prevention and management of overweight and obese adults. Bariatric surgery is tier 4 for people presenting with comorbidities where weight reduction is the highest priority in their care management. Individuals will have already been seen in the tier 3 service where they will have been screened and assessed for consideration for bariatric surgery.[15]

Each Scottish Health Board has its own weight management programs and criteria for bariatric surgery (if available). If bariatric surgery is not available within the local Health Board, as appropriate, people are referred to other Health Boards or specialist centres. Links to information on services offered by individual Scottish Health Boards are provided below:

- NHS Ayrshire and Arran
- NHS Borders
- NHS Dumfries and Galloway
- NHS Western Isles
- NHS Fife
- NHS Forth Valley
- NHS Grampian
- NHS Greater Glasgow and Clyde
- NHS Highland
- NHS Lanarkshire
- NHS Lothian
- NHS Orkney
- NHS Shetland
- NHS Tayside

Impact of bariatric surgery on drug absorption

As a result of bariatric surgery, alterations in the process of oral drug absorption may be expected, which may alter the oral pharmacokinetic profiles of drugs. Table 1 summarises these alterations, for which a distinction is made between changes occurring upon restrictive procedures, i.e. procedures leading to a limitation in the amount of food in the stomach such as adjustable gastric banding, or to limit digestive capacity such as SG, versus combined restrictive/malabsorptive procedures that also cause malabsorption of nutrients, such as RYGB. Whether or not these changes ultimately lead to altered pharmacokinetics of a specific drug will depend on individual drug properties.[16] Ensure the type of bariatric surgery the person has undergone is recorded in the person's notes so the effect on drug pharmacokinetics is understood.

Table 1: Theoretical changes relevant to oral drug absorption after bariatric surgery related to restrictive and restrictive/malabsorptive procedures[16]

Change relevant to oral drug absorption	Restrictive procedures	Restrictive/malabsorptive procedures
Decreased contact time with digestive juices/enzymes	Yes	Yes
Increased stomach pH	Yes	Yes
Decreased absorption surface in the small intestine	-	Yes
Decreased exposure to bile acids and enterohepatic circulation	-	Yes

Disintegration

The first step in the absorption of solid formulations like tablets and capsules is disintegration in the GI tract. Disintegration is affected by several variables, such as gastric volume and mixing, which can both be diminished after bariatric surgery.[16] The stomach is the primary area for disintegration of standard release tablets or capsules in a process that involves a combination of mechanical forces, gastric acid, and saliva.[17] Due to a reduced gastric volume, tablets may not fully dissolve, resulting in altered exposure of the drug. For this reason, administration of oral liquids is often proposed after bariatric surgery, even though hard evidence to support this statement is lacking. A disadvantage of liquid formulations like suspensions is that these formulations may contain sugars, which may, in large amounts, lead to dumping syndrome.[16]

Dumping syndrome happens when particularly sugary or starchy food move suddenly into the small intestine. Before surgery the stomach digests most of the sugar and starch. After surgery, the small intestine has to draw in water from the rest of your body to help break down the food. Much of the extra water is taken from the blood, which means people experience a sudden fall in blood pressure causing symptoms such as faintness, sweating and palpitations.[18]

Dissolution

After disintegration, a drug must become dissolved to be absorbed. This dissolution process is affected by several variables, such as gastric volume, gastric pH and gastric transition time. In healthy people, the stomach is capable of absorbing most acidic drugs and the very weakly basic drugs which are undissociated in the acidic gastric environment.[16] After bariatric surgery the pH within the gastric pouch is higher than that found in a normal stomach. This may reduce the absorption of medicines which are soluble in acidic environments. Medicines that are soluble in alkaline environments are mainly absorbed in the small intestine. In restrictive malabsorption procedures, the majority of the small intestine may be bypassed, reducing the amount of drug which is absorbed in this area.[17] After RYGB, there is limited exposure to acid as a result of a higher gastric pH. The studies after SG are conflicting, showing a higher exposure to acid (as a result of a lower pH), while another study showed a rise of 3–4 pH units 1 day after surgery.[16]

Post bariatric surgery people are generally prescribed prophylactic PPIs during the first months after surgery to reduce the risk of GI complications after surgery, such as ulceration or GI bleeding. Due to the rise in gastric pH, the solubility of more basic drugs could decrease since they become less ionised, and the solubility of acidic drugs could increase since they become more ionised.[16]

GI transit time

Restrictive malabsorption procedures significantly reduce the amount of surface area in the GI tract available for drug administration.[17] After RYGB, a large proportion of the stomach and intestine is bypassed, which can result in altered GI transit time and gastric emptying time. Studies on gastric emptying and intestinal and colonic transit time show that gastric emptying is generally faster after bariatric surgery compared to people who have not undergone bariatric surgery. The data on intestinal and colonic transit time is conflicting with more rapid and even slower small intestinal transit or caecal time reported in RYGB surgery.[16] Drugs which usually remain in the intestine for longer whilst being absorbed are likely to have their bioavailability reduced. Drugs primarily absorbed in the duodenum and jejunum may need to be given via a different route where possible, or doses may have to be adjusted accordingly.[17]

Role of bile salts

After bariatric surgery, the influence of digestive content is also altered. Gastric acid secretion is significantly reduced following RYGB surgery, leading to an increase in pH in the stomach. The altered GI tract may also lead to a delayed action of bile salts. One of the most important physiological

properties of bile salts is the transport by solubilisation of lipophilic substances through hydrophobic barriers. Because bile salts do not reach the GI tract before the jejunum, contact between bile salts and a drug occurs later in comparison to normal subjects. Due to this potentially delayed inlet of bile salts, lipophilic, low soluble drugs might have lower absorption profiles.[16]

Using medicines post bariatric surgery

In addition to the physiological changes after bariatric surgery that can affect the absorption of medicines and supplements, there are other factors relating to medications that should be considered after bariatric surgery.

Drug formulation

The openings produced by certain types of bariatric surgery may be only 1-1.5cm wide and so the ability to absorb drugs may be changed. The following should be considered:[17]

- People should be monitored for any decreased efficacy or adverse effects, and changes made accordingly, rather than a blanket change in medicines after surgery.
- If absorption is reduced, a liquid preparation or an alternative administration route may resolve the problem.
- As the stomach openings produced by certain types of bariatric surgery are small, consider using smaller sized solid formulations, or modifying solid formulations e.g. by crushing or cutting tablets, although this will make their use off-label.

Table 2 outlines the impact of bariatric surgery on medication formulations and offers advice on each formulation.

Table 2: Impact of bariatric surgery on medication formulations

Formulation	Advice
Solid dosage forms	• Immediate-release plain formulations are preferred.[17] • Modified-release formulations should be avoided.[17] • Enteric or film coated tablets may be problematic, as any delay in drug release may reduce absorption.[17] • As the stomach openings may be as small as 1cm (10mm), use tablets with a diameter of less than 10mm to avoid them getting stuck. • If the tablet size is greater than 10mm then consider how to reduce this, e.g. halving tablets if scored, use an alternative manufacturer's version with a smaller diameter, dissolving or dispersing the tablet, an alternative administration route, soluble tablets or liquid formulations. • Refer to Attachment 4 for tablet diameters of selected medicines and the individual Summary of Product Characteristics for information on tablet diameters and dispersal methods.

Formulation	Advice
Liquid formulations	• A liquid diet is needed in the first four weeks after surgery, then soft food from weeks four to six.[1,19] • From week six onwards people gradually return to a normal healthy balanced diet.[1,19] • Medications in liquid formulations can be used for up to six weeks post-operatively when people can usually only tolerate a liquid diet. • Convert liquids back to solid dose forms when solid nutrients are reintroduced. • Avoid using costly, unlicensed, 'special' liquids where possible. Alternative options if appropriate include: » Dispersing tablets in water. » Soluble or orodispersible tablets. » Crushing tablets. » Opening capsules. » A different route of administration. » Prescribing an alternative liquid medicine. » Temporarily stopping the medicine.
Large liquid volumes	• The reduction in the capacity of the stomach can mean that doses need to be staggered, particularly liquid formulations. • Consider using licensed, higher strength liquid formulations to reduce the volume of each dose. • Take care with dose conversion and ensure the person is fully briefed on any new dose.
Sugar containing medicines	• A disadvantage of liquid formulations like suspensions is that these formulations may contain sugars, which may, in large amounts, lead to dumping syndrome.[16] • To minimise dumping syndrome, avoid products (including over the counter (OTC) medicines) that contain a large amount of sucrose, corn syrup, lactose, maltose, fructose, honey and mannitol. • Use sugar-free versions of liquid formulations where available.
Effervescent tablets	• Some centres advise avoiding carbonated beverages after the surgery, as they often cause discomfort.[17] • Therefore, effervescent drug formulations may be best avoided, or at least the tablet should be fully dissolved and allowed to settle before drinking.[17]

Drug administration route

Alternative drug delivery routes may be considered. It is important to note that obesity may impact on drug absorption via the subcutaneous and transdermal routes.[17]

Adverse Drug Reactions (ADRs)

GI ADRs may be more likely in people who have undergone bariatric surgery, due to the smaller size of the stomach.

- Non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided where possible as people are more at risk of ulceration, which could be fatal.[17]
- There is an increased risk of GI adverse effects with bisphosphonates, however, people who have undergone bariatric surgery may also be at an increased risk of osteoporosis. Consider other options such as calcitonin salmon nasal spray, teriparatide, or raloxifene where clinically suitable, or an IV bisphosphonate.[20]
- ADRs should be reported via the MHRA's Yellow Card Scheme.[17]

Impact of bariatric surgery on certain medicines

Some commonly prescribed medications have specific advice for prescribing post bariatric surgery. Table 3 and attachment 1 details the specific advice and/or dosing information for commonly used medications following bariatric surgery.

Table 3: Advice post bariatric surgery for commonly used medication[16,20]

Therapeutic group/Drug	Advice
Amiodarone	• Bioavailability may be reduced by shortened intestinal transit time. • Monitor and adjust dose as required.
Antibiotics	• Consider the target site of the infection, severity of infection, possibility of other than oral route of administration and toxicity of the antibiotic of choice when selecting the dose. • Reduced tissue penetration for instance to the skin has been reported. Monitor the effect and possible side effects of antibiotics closely after surgery. • B-lactam (amoxicillin, ampicillin and phenoxymethylpenicillin) - no specific dose alteration seems required, consider dosages in the higher range of the normal dosage. There is evidence for lower concentrations compared to normal weight subjects, however these concentrations are judged high enough to treat common pathogens. • Macrolides (azithromycin and erythromycin) - lower exposure after surgery; discourage use. • Fluoroquinolones (ciprofloxacin and moxifloxacin) - no specific dose alteration seems required, as absorption is via transportation in the small intestine this may be reduced, consider dosages in the higher range of the normal dosage. No relevant decrease in plasma exposure after surgery has been reported.
Aspirin 75mg daily dose	• There is no data on safety so use should be based on an individual risk versus benefit decision.
Bisphosphonates	• Increased risk of GI adverse effects – avoid where possible. • However, people who have undergone bariatric surgery may also be at an increased risk of osteoporosis. Consider other options such as calcitonin salmon nasal spray, teriparatide, raloxifene etc. where clinically suitable, or an IV bisphosphonate.
Clopidogrel	• No dose adjustment after bariatric surgery even though there is evidence that in obese people there is increased platelet activation.
Contraceptives	• The effectiveness of oral contraception (OC), including oral emergency contraception (EC) could be reduced by bariatric surgery, and OC should be avoided in favour of non-oral methods of contraception. • Non-hormonal barrier contraception should be recommended as reduced absorption cannot be easily monitored. If a hormonal method is required, a levonorgestrel-releasing intrauterine device may be a preferred option. • Oestrogen-containing contraceptives should be avoided before and after surgery to reduce the risk of venous thromboembolism. • A reduction in weight following surgery may also lead to increased fertility.

Therapeutic group/Drug	Advice
Digoxin	• Digoxin absorption is dependent on both GI transit time and P-glycoprotein in the small intestine. The extent of absorption may therefore be reduced. • Monitor and adjust dose as required.
Direct oral anticoagulants (DOACs)	• Avoid use because of potential insufficient effects and the availability of an alternative therapy Vitamin K antagonists (VKAs)/Low Molecular Weight Heparin (LWMH)
H_2 blockers	• The use of acid suppressive agents may lead to a delay in achievement of peak weight loss following surgery. It is not currently known why this occurs. • The extent of weight loss in the long term does not appear to be affected.
Ketoconazole	• Requires an acidic environment for absorption. • Consider an alternative antifungal for Cushing's syndrome.
Lamotrigine	• This is likely to be absorbed in the stomach and proximal small intestine. • Monitor for decreased efficacy.
Levothyroxine	• People who have undergone Roux-en-Y surgery may require a reduction in levothyroxine dose after surgery. • Monitor via regular thyroid function tests for six months post-surgery, with dose adjustment as required.
Lithium	• Monitor people closely after surgery and adjust dose accordingly. • In an in-vitro model lithium had significantly higher dissolution after RYGB compared to preoperatively. • This might explain the lithium toxicity reported in many papers.
Metformin	• Absorbed slowly in the duodenum. • Monitor blood glucose and adjust dose accordingly. Dose may need to be reduced as weight loss occurs.
Metoprolol	• Likely to be absorbed in the stomach and duodenum. • Monitor blood pressure and adjust dose accordingly. Dose may need to be reduced as weight loss occurs.
NSAIDs	• There is an increased risk of GI adverse effects, so the advice is to avoid where possible.
Olanzapine	• Absorbed in the stomach, even if administered in orodispersible form. • Monitor for decreased efficacy. Adjust dose accordingly or consider switching to another antipsychotic.
Prasugrel	• No dose adjustment after bariatric surgery even though there is evidence that in obese people there is increased platelet activation.
Proton Pump Inhibitors (PPIs)	• The use of acid suppressive agents may lead to a delay in achievement of peak weight loss following surgery. It is not currently known why this occurs. • The extent of weight loss in the long term does not appear to be affected. • Monitor for signs of therapy failure, if necessary, reconsider dose and/or administration of opened capsules. • Take into consideration that PPIs are prone to degradation by the acidic environment of the stomach. • Only advise opening capsules when this is allowed according to the Summary of Product Characteristics.

Therapeutic group/Drug	Advice
Quetiapine	• Likely to be absorbed in the stomach and duodenum. • Monitor for decreased efficacy. Adjust dose accordingly or consider switching to another antipsychotic.
Ramipril	• Absorption is decreased in people with steatorrhoea and malabsorption. It is likely to also be decreased in people who have undergone bariatric surgery. Consider using another ACE inhibitor if a lack of efficacy is problematic. • Dose may need to be reduced as weight loss occurs.
Simvastatin	• Likely converted into active form in the stomach. Efficacy may be reduced. Consider an alternative statin. • Monitor serum lipids.
Sodium valproate	• The extent of absorption valproic acid may be significantly reduced by malabsorptive procedures. It is currently unknown if sodium valproate is similarly affected. • Monitor closely and adjust dose accordingly.
Serotonin-noradrenaline reuptake inhibitors (duloxetine & venlafaxine)	• Monitor for therapy failure including withdrawal symptoms particularly in the first six months after surgery, consider therapeutic drug monitoring. • If necessary, adjust dose accordingly.
Selective serotonin reuptake inhibitors (sertraline, paroxetine, citalopram & escitalopram)	• Monitor for therapy failure including withdrawal symptoms particularly in the first six months after surgery, consider therapeutic drug monitoring. • If necessary, adjust dose accordingly.
Tamoxifen	• Monitor serum concentration regularly (tamoxifen concentration > 5.9 ng/mL).
Ticagrelor	• No dose adjustment after bariatric surgery even though there is evidence that in obese people there is increased platelet activation.
Valproic acid	• The extent of absorption valproic acid may be significantly reduced by malabsorptive procedures. It is currently unknown if sodium valproate is similarly affected. • Monitor closely and adjust dose accordingly.
Warfarin	• The effects of bariatric surgery may be unpredictable: reduced surface area may limit absorption. However, a more alkaline stomach may increase levels of unionised drug. Vitamin K deficiency may lead to an increased risk of bleeding. • The dose after surgery may initially decrease and then normalize to the pre-surgery dose over the following months. • Monitor closely and adjust dose as required.
Zolpidem	• Absorption may be delayed. Take on an empty stomach.

Follow up care post bariatric surgery

NICE [CG189] recommends that people who have had bariatric surgery should be offered a follow-up care package for a minimum of two years within the bariatric service. This should include:[9]

- Monitoring nutritional intake (including protein and vitamins) and mineral deficiencies.
- Monitoring for comorbidities.
- Medication review.
- Dietary and nutritional assessment, advice and support.
- Physical activity advice and support.
- Psychological support tailored to the individual.
- Information about professionally led or peer-support groups.

After discharge from the bariatric surgery follow-up service, ensure that all people are offered at least annual monitoring of nutritional status and appropriate supplementation according to need following bariatric surgery, as part of a shared care model of chronic disease management.[9] The provision of supplementation will depend on the local commissioning policy and shared care agreement. Table 4 shows the recommended blood tests which should be done annually as a minimum for the sleeve gastrectomy, gastric bypass and duodenal switch. Following the gastric band, if there is any suspicion that the patient is not adhering to a nutritionally balanced diet, appropriate blood tests should be done.[21]

Table 4: Annual blood tests following bariatric surgery - guidance for GPs[21]

<table>
<tr><th>Blood tests</th><th colspan="5">Surgical procedure</th></tr>
<tr><th></th><th>Intra-gastric balloon</th><th>Gastric band</th><th>Sleeve gastrectomy</th><th>Gastric bypass</th><th>Duodenal switch</th></tr>
<tr><td>LFTs</td><td rowspan="3">Monitor if any concerns regarding nutritional intake.</td><td colspan="4" rowspan="3">Monitor annually and more frequently if any concerns regarding nutritional intake.</td></tr>
<tr><td>U&Es</td></tr>
<tr><td>FBC</td></tr>
<tr><td>HbA1c and/ or FBG in patients with preoperative diabetes</td><td colspan="5">Monitor as appropriate.</td></tr>
<tr><td>Lipid profile</td><td></td><td colspan="4">Monitor in those with dyslipidaemia.</td></tr>
<tr><td>Serum 25 hydroxy Vitamin D</td><td></td><td>Routine monitoring is usually not required unless the patient has symptomatic vitamin D deficiency.</td><td colspan="3" rowspan="5">Monitor annually and more frequently if any concerns regarding nutritional intake.</td></tr>
<tr><td>Ferritin</td><td></td><td></td></tr>
<tr><td>Folate</td><td></td><td></td></tr>
<tr><td>Calcium</td><td></td><td></td></tr>
<tr><td>Parathyroid hormone</td><td></td><td></td></tr>
</table>

Blood tests	Surgical procedure				
	Intra-gastric balloon	Gastric band	Sleeve gastrectomy	Gastric bypass	Duodenal switch
Thiamine			Routine blood monitoring of thiamine is not required but clinicians should be aware that patients with prolonged vomiting can develop acute thiamine deficiency, which requires urgent treatment.		
Vitamin B12			Monitor annually if on oral vitamin B12. No need to monitor if patient has intramuscular vitamin B12 injections.		
Vitamin A				Measure if concerns regarding steatorrhoea or symptoms of vitamin A deficiency e.g. night blindness.	Monitor annually. May need to monitor more frequently in pregnancy.
Vitamin E, K				Measure vitamin E if unexplained anaemia, neuropathy. Consider measuring INR if excessive bruising/ coagulopathy as may indicate vitamin K deficiency.	
Zinc, Cooper				Monitor annually. Zinc – check if unexplained anaemia, hair loss or changes in taste acuity occur. Copper – check if unexplained anaemia or poor wound healing occurs. Note the zinc levels affect copper levels and vice versa.	
Selenium				Monitor if there is unexplained fatigue, anaemia, metabolic bone disease, chronic diarrhoea or heart failure.	

Supplementation post bariatric surgery

There is a high prevalence of nutritional deficiencies in both adults and adolescents with severe and complex obesity. Bariatric surgery impacts both oral intake and absorption increasing the risk of nutritional deficiencies.[17] One the stomach's functions is to absorb vitamins, particularly vitamins B12, C and D, from food. If the entire stomach has been removed, the person may not get all the vitamins the body needs from their diet.[18] People may be prone to deficiencies of the fat-soluble vitamins (A, D, E

& K), calcium, iron, vitamin B12, and folate. Following all bariatric procedures, a complete multivitamin and mineral supplement (containing thiamine, iron, zinc, copper and selenium) is recommended.[17]

NICE [CG189] recommends that regular, specialist postoperative dietetic monitoring is provided which includes monitoring of the person's micronutrient status and individualised nutritional supplementation. After discharge from the specialist service NICE states that all people should have their nutritional status monitored at least annually and appropriate supplementation given. If there is concern about micronutrient intake adequacy, a supplement providing the reference nutrient intake for all vitamins and minerals should be considered, particularly for vulnerable groups such as older people (who may be at risk of malnutrition) and young people (who need vitamins and minerals for growth and development).[9]

The British Obesity and Metabolic Surgery Society (BOMSS) Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for people undergoing bariatric surgery recommend that all people should have a comprehensive nutritional assessment prior to bariatric surgery. Nutritional deficiencies should be investigated and corrected as clinically indicated before surgery. Specialist postoperative dietetic support should be provided including individualised nutritional supplementation, support and guidance to achieve long term weight loss and weight maintenance.[22]

Because peoples' requirements and adherence may vary over time, the BOMSS guidelines recommend that supplements should be reviewed regularly and adjusted accordingly.[22]

The provision of supplementation will depend on local commissioning policy and shared care agreement.

Table 5: Vitamin and mineral supplement recommendations[22]

Supplement	Type of bariatric surgery	Recommendations
Vitamin and mineral	All types	• A complete multivitamin and mineral supplement (containing thiamine, iron, selenium, zinc and copper). • Vitamin and mineral supplements should be reviewed regularly and adjusted accordingly.
	SG, RYGB or BPD/DS	• A minimum of 2mg of copper and 15mg zinc per day is advised. • Most over the counter supplements such as Sanatogen A-Z contain only 1mg of copper, so two tablets daily will be needed.[23] • Forceval® capsules contain 2mg copper and 15mg zinc, and doubling up on the dosage may be sufficient in some cases to meet the additional requirement[24] – see sections below on copper and zinc.

Supplement	Type of bariatric surgery	Recommendations
Iron	All types	• Women, of reproductive age and who are menstruating, have additional requirements of 50mg to 100mg elemental iron daily (i.e., two 200mg ferrous sulphate or 210mg ferrous fumarate tablets daily). • Advise people to take iron supplements with citrus fruits/drinks or vitamin C. • Advise people to take calcium and iron two hours apart as one may inhibit absorption of the other.
	LAGB	• Following a LAGB people should be able to meet their iron requirements by oral diet and a complete multivitamin and mineral supplement containing the recommended daily allowance of iron.
	SG, RYGB or BPD/DS	• Additional elemental iron is required. • Consider starting with 200mg ferrous sulphate, 210mg ferrous fumarate or 300mg ferrous gluconate daily. However, this may not be sufficient to prevent anaemia.
Folic acid	All types	• Advise people to take a complete multivitamin and mineral supplement providing 400micrograms to 800micrograms folic acid per day.
Vitamin B12	SG, RYGB or BPD/DS	• Risk of developing vitamin B12 deficiency. • Give vitamin B12 intramuscular injections every three months. • Review anyone switched to oral cyanocobalamin 1000 micrograms/ day during the COVID-19 pandemic for suitability for a change back to three monthly vitamin B12 injections as appropriate.[25]
Vitamin D	All types	• Adjust vitamin D3 supplementation to maintain serum 25-hydroxyvitamin D levels of 75 nmol/L or higher.
	SG, RYGB or BPD/DS	• Maintenance levels of between 2000 and 4000 IU oral vitamin D3 per day may be required.
Calcium	All types	• Ensure good dietary calcium intake as it is more bioavailable than supplemental calcium. • To aid calcium absorption, advise that calcium taken as equally divided doses; calcium carbonate with food; calcium citrate with or without food. • Calcium citrate may be the preferred supplement for people at risk of developing kidney stones. • If parathyroid hormone is raised, despite adequate serum 25-hydroxyvitamin D levels and calcium is normal then consider a combined vitamin D and calcium supplement.
	LAGB, SG, RYGB or BPD/DS	• Requirements may be higher in individuals who have SG, RYGB or malabsorptive procedures such as BPD/DS. • 1200mg to 1500mg calcium per day from food and supplements following LAGB, SG and RYGB. • 1800mg to 2400mg daily following BPD/DS.

Supplement	Type of bariatric surgery	Recommendations
Vitamin A (fat soluble vitamin)	LAGB, SG	• People should be able to meet requirements for vitamins A, E and K through their oral diet and a complete multivitamin and mineral supplement.
	RYGB	• Some people may require additional routine oral vitamin A supplementation – identified through monitoring. • Especially if symptoms such as deterioration in night vision and dry eyes are present.
	BPD/DS	• Following malabsorptive procedures daily supplementation with additional oral vitamin A required. • Following malabsorptive procedures such as BPD/DS, start at 10,000 IU (3mg) oral vitamin A daily and adjust as necessary. • Water-miscible forms of fat-soluble vitamins may improve absorption especially after malabsorptive procedures.
Vitamin E (fat soluble vitamin)	LAGB, SG	• People should be able to meet requirements for vitamins A, E and K through their oral diet and a complete multivitamin and mineral supplement.
	BPD/DS	• Daily oral supplementation with additional vitamin E, start with 100 IU daily and adjust as necessary. • Water-miscible forms of fat-soluble vitamins may improve absorption especially after malabsorptive procedures.
Vitamin K (fat soluble vitamin)	LAGB, SG	• People should be able to meet requirements for vitamins A, E and K through their oral diet and a complete multivitamin and mineral supplement.
	BPD/DS	• Daily oral supplementation with additional vitamin K, start with 300micrograms oral vitamin K daily. • Water-miscible forms of fat-soluble vitamins may improve absorption especially after malabsorptive procedures.
Zinc and copper	All types	• Advise people to take a multivitamin and mineral containing 15mg zinc and 2mg copper.
	BPD/DS	• As zinc and copper have an inverse relationship for absorption, advise starting with at least 30mg oral zinc daily, which may be contained within the oral multivitamin and mineral supplement. • If additional zinc supplements are given, monitor both zinc and copper levels as normally a ratio of 8–15mg of zinc for each 1mg copper should be maintained to avoid zinc-induced copper deficiency.
Selenium	All types	• Recommend a complete multivitamin and mineral supplement containing selenium.
	BPD/DS	• Additional routine oral supplementation with selenium may be needed to prevent deficiency. • Over-the-counter preparations or Brazil nuts may also be used to supplement selenium.

Supplement	Type of bariatric surgery	Recommendations
Thiamine	All types	• Consider recommending oral thiamine or vitamin B co strong tablets for first three to four months post-surgery. • Prescribe oral thiamine 200 - 300mg daily, vitamin B co strong 1 or 2 tablets, three times a day to people with symptoms such as dysphagia, vomiting, poor dietary intake or fast weight loss to prevent the development of Wernicke's encephalopathy. • Clinicians should be educated about the factors, which may predispose to thiamine deficiency and the importance of initiating immediate treatment. • People should be educated about the risks of potential thiamine deficiency and asked to seek early advice if they experience prolonged vomiting or poor dietary intake.
Key: LAGB - laparoscopic adjustable gastric band SG - sleeve gastrectomy RYGB - Roux-en-Y gastric bypass BPD/DS - Bilio-pancreatic diversion and duodenal switch		

Vitamins and minerals are included in the NHS England Guidance for Clinical Commissioning Groups on conditions for which over the counter (OTC) items should not routinely be prescribed in primary care. The guidance states that there is insufficient high-quality evidence to demonstrate the clinical effectiveness of vitamins and minerals. Any prescribing not in-line with listed exceptions should be discontinued. Exceptions are made for vitamins and minerals for medically diagnosed deficiency, including for those people who have undergone surgery that results in malabsorption.[25] People who have undergone RYGB, SG or BPD/DS surgery which does result in malabsorption would be included in these exceptions. As gastric banding does not result in malabsorption, this would not fulfil the exception criteria. People with a gastric band should be advised to purchase a suitable OTC multivitamin and mineral preparation for self-care.

To prevent or delay any micronutrient deficiency, all patients should be encouraged to purchase OTC multivitamin and mineral supplements for self-care. Patients, who have undergone procedures that result in malabsorption and who are unable to afford to purchase OTC products, may be eligible to receive an NHS prescription for their vitamin and mineral supplements in line with local policy.[21,23]

The continuing need should be reviewed on a regular basis.[26] The interval between reviews is dependent on individual patient circumstances and should be completed by a clinician directly involved in the care of the patient, for example a pharmacist.

Medicines Optimisation priorities

Bariatric surgery can alter the absorption and bioavailability of medications and may increase the risk for potential side effects. Additionally, bariatric surgery candidates often have comorbidities resulting in complex medication regimens that make post-operative medication management difficult. Clinical pharmacists are trained to identify medication-related issues and provide recommendations to reduce potential ADRs. Inclusion of a pharmacist in medication management in the pre-operative setting adds a layer of safety in preventing medication errors in the future.[27] The British Dietetic Association project

preparing patients for bariatric surgery demonstrated that patients found that an MDT approach was beneficial in preparing them for weight-loss surgery.[28]

Regular medicine reviews should be undertaken post bariatric surgery. Practice or Primary Care Network (PCN) clinical pharmacists are well placed to regularly review people's medicines as they have access to the persons records, including blood results. Interval between reviews would depend on individual patient circumstances considering factors such as the speed and degree of weight loss, any long term conditions diagnosed and current medications. Any medication changes should be discussed with the person and other healthcare professionals involved in the person's care, such as the community pharmacist. Attachment 2 includes points to consider during medication reviews post bariatric surgery.

Short term medicine optimisation priorities

Up to six weeks post bariatric surgery, consider the following:

- Recommence any medicines stopped before surgery which are still needed.
- Review the continued need for all items on repeat prescription.
- All oral medication should be in a liquid, crushed or chewable form - crushing tablets or opening capsules may be possible, but becomes an off-license use. Refer to the Summary of Product Characteristics for information on opening capsules and tablet dispersal. Add these items as acute prescriptions as frequent changes may be needed.
- Avoid using costly, unlicensed, 'special' liquids where possible.
- Consider a licensed alternative formulation to the oral route if available or suitable, such as topical preparations, patches, suppositories, or injectables.
- Use small liquid volumes or spread the doses out to prevent overloading the small gastric pouch. Alternatively consider using licensed, higher strength liquid formulations to reduce the volume of each dose. Take care with dose conversion and ensure the person is fully briefed on any new dose.
- Enteric-coated or modified-release oral preparations should be switched to immediate-release plain preparations or suitable alternatives where possible.
- Review a person's blood tests, depending on the type of procedure they have had (see BOMSS guidance[22]).
- Give advice on dietary supplements which can be purchased OTC and monitoring for nutritional deficiencies.

Long term medicine optimisation priorities

Beyond six weeks post bariatric surgery, consider the following:

- Review whether liquid medicines started post bariatric surgery can be converted back to tablets/ capsules when solid nutrients are reintroduced.
- Review whether tablets being crushed, split, dissolved or chewed or capsules being opened can be taken whole again.
- Review whether alternative formulations or medicines switched to can be converted back to tablets/ capsules again.
- Avoid oral formulations with a diameter larger than 10mm (see attachment 4, refer to the Summary of Product Characteristics for information on tablet diameters or contact the manufacturer for information).
- Medicines prescribed based on a person's weight will need to be adjusted as they lose or regain weight.

- Monitor for ADRs, and signs of toxicity, a possible result of increased bioavailability or due to weight loss.
- Monitor for decreased efficacy of medicines, this may be due to reduced bioavailability.
- Adjust doses or stop treatments where the underlying condition improves with weight loss, or worsens after weight regain, and ensure close monitoring to make sure no adverse effects are occurring.
- Consider moving appropriate medicines back from acute to repeat prescription.

Medicine groups that should be prioritised

- Hypoglycaemics including insulin
- Antihypertensives
- Lipid modification
- Analgesics including NSAIDs and opioids
- Diuretics
- Medicines that have weight-based dosing.

Attachment 3, medicines use review before and after bariatric surgery, is a useful tool to complete during medication reviews and to give to people to share with other healthcare professionals. It also reinforces the key messages discussed and acts as an aide memoire. This can be adapted for local use.

Some medicines might need to be substituted with alternatives or the doses increased due to the impact on their absorption site depending on the bariatric surgery type. Where possible, monitoring of blood levels to ensure therapeutic levels are maintained is recommended.[29]

People should be assessed after surgery for the long term continuation of medication for diabetes and hypertension. These medications may require complete cessation or dose modifications in the immediate postoperative period (with regular monitoring of blood pressure (BP) and capillary glucose) to prevent postural hypotension and hypoglycaemia, respectively. Other medications need to be to be taken with dose modifications if required. However, it should be made clear to the person and all caring teams that type 2 diabetes relapses in a proportion of people with time and the effect of weight loss on hypertension is variable, incomplete and often temporary.[29]

People should be reviewed at regular intervals to check metabolic status and to titrate correct doses of certain medications, e.g. levothyroxine dose might need to be reduced following weight loss, the absence of which can lead to cardiac complications in a person with low cardiac reserve due to hypermetabolism. People prescribed anticoagulants, e.g. warfarin, low molecular heparin, should be managed by the bariatric MDT in conjunction with the anti-coagulation team, especially people with a duodenal switch who are more likely to develop fat soluble vitamin deficiencies, e.g. vitamin K. Detailed dietary advice about vitamin K content of foods and warfarin interaction should be provided to people by the bariatric dietician and anti-coagulation team.[29]

Generally, people who have had a gastric bypass are discharged on prophylactic proton pump inhibitors to help reduce marginal ulcers.[29]

Privately funded bariatric surgery

Some people who do not meet the NICE or Scottish Health Board bariatric surgery criteria choose to fund their bariatric surgery privately. Not all private bariatric centres offer a complete service, and this could cause difficulties for patients and their care. People who do not meet the NICE or Scottish Health Board bariatric surgery criteria and choose to fund their bariatric surgery privately will not receive multivitamin and mineral supplements on NHS prescription or NHS funded follow-up care.

When choosing a private provider people need to consider if the private provider provides:[30]

- Psychological support before and after surgery.
- Pre surgery care:
  - Complete nutritional assessment with specialist dietitian.
  - Blood tests for nutrition deficiencies, diabetes, cholesterol level and kidney function (routine blood tests not related to bariatric surgery will still be provided by the NHS).
  - Identification of nutrition deficiencies which may need to be treated before surgery.
  - Any multivitamin and mineral supplement required should be purchased OTC.
- Post surgery care:
  - Lifelong follow up is required to ensure that nutrition needs are met.
  - Follow up care including monitoring of nutritional needs is the responsibility of the chosen bariatric centre for at least two years after surgery.
  - It should be included in the agreed package of care.
  - After the first two years follow up period, further follow up of nutrition needs is still important and should be assessed at least once a year.
  - This may be provided by the GP if they have agreed to do this with the bariatric centre.
  - If the surgery causes malabsorption, the bariatric centre should provide follow up care for you for longer than two years.
  - A complete multivitamin and mineral supplement is to be taken every day and should be purchased OTC.

Summary

Bariatric surgery can cause changes in the pharmacokinetics of medicines as they go through the altered digestive system. People who have had bariatric surgery often have co-morbidities associated with obesity that may be improved by weight loss and the associated polypharmacy will need review.

It is important to review the medication prescribed regularly in view of the persons changing medication requirements.

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Additional PrescQIPP resources

Briefing	https://www.prescqipp.info/our-resources/bulletins/bulletin-323-bariatric-surgery/
Implementation tools	

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