






Guidance for Prescribing and Monitoring in Post Bariatric Surgery in Primary Care in County Durham and Tees Valley

Bariatric surgery is now an essential option for the treatment of obesity and its associated comorbidities. Many patients presenting for surgery will have pre-existing low blood vitamin concentrations and all bariatric surgical procedures compromise nutrition to varying extents, and have the potential to cause clinically significant micronutrient deficiencies. Therefore, long term nutritional monitoring and follow-up are essential components of all bariatric surgical services. However, there are no current standard guidelines in the UK for the biochemical monitoring and replacement of essential micronutrients in patients undergoing bariatric surgery^{1,11}.

Bariatric surgery covers several different procedures which have different requirements post-operatively. This guidance aims to give information for prescribers regarding the suitability of medication and the monitoring requirements post bariatric surgery. However it is not meant to override clinical judgement and decision, and each individual patient should be reviewed on a case-by-case basis.

Type of Bariatric Surgery					
	Gastric Balloon	Gastric Band	Sleeve Gastrectomy	Gastric Bypass Sunderland Royal & JCUH also carry out OAGB	Duodenal Switch (Biliopancreatic Diversion)
Information on the Procedure	A soft balloon filled with air or salt water is placed into the stomach via a gastroscopy. It is only a temporary measure and the balloon is usually left in for a maximum of six months ² .	A band is placed around the stomach, creating a small pouch towards the top. The band is connected to a small device placed under the skin so it can be tightened after surgery ² .	Reduces the size of the stomach by about 75%. It is divided vertically from top to bottom. Although smaller, the stomach function remains unaltered ³ .	Surgical staples are used to create a small pouch at the top of the stomach. The pouch is then connected to the small intestine, bypassing the rest of the stomach ² .	Similar to a gastric bypass, except the stomach pouch is connected further along the small intestine. Even fewer calories from the food you eat will be absorbed ² .
					
Impact on Absorption ³	No impact on absorption of nutrients. Patients may experience vomiting or regurgitation and develop food intolerances.		Iron, calcium, vitamin D, vitamin B12, zinc, copper, selenium and vitamin A absorption may be affected.		Iron, calcium, vitamin D, vitamin B12, protein, fat, fat soluble vitamins A, E and K, zinc, copper and selenium absorption are affected.

		Gastric Balloon	Gastric Band	Sleeve Gastrectomy	Gastric Bypass Sunderland Royal & JCUH also carry out OAGB	Duodenal Switch (Biliopancreatic Diversion)	
Prescription Medications	LMWH	Inpatient ONLY	As per specialist advice for short-term use only post-surgery			Not national guidance – please consult local guidelines and specialist recommendation	
	PPI	As per specialist recommendation – review after 3 months					
	Ursodeoxycholic Acid	As per specialist recommendation – review after 6 months					
	Ondansetron	For 7 days post-surgery as required					
	Domperidone						
	Calcium & Vitamin D	Continue with maintenance doses if required.		Continue with maintenance doses as identified preoperatively. Treat and adjust vitamin D supplementation. Many patients will require additional vitamin D.			
	Vitamin B12			3 monthly 1mg vitamin B12 IM injection			
Thiamine	If patient experiences prolonged vomiting always prescribe additional thiamine (thiamine 200–300 mg daily & vitamin B co strong 1 or 2 tablets, three times a day) and urgent referral to bariatric centre.						
Recommended OTC Medications ^{1,11}	Multivitamin & Mineral supplement	Life-long OTC Multivitamin & Mineral supplement. Follow specialist advice for appropriate dosing. The Department of Nutrition & Dietetics at South Tyneside & Sunderland NHS recommend the following OTC products which meet the supplementation requirements ⁴ <i>Asda A-Z Multivitamins & Minerals, Home bargains A-Z, Minavit (Lidl) A-Z Multivitamins & Minerals, Morrisons A-Z Multivitamins & Minerals, Sainsburys A-Z Multivitamins & Minerals, Sanatogen A-Z Complete Multivitamins, Tesco A-Z Multivitamins & Minerals and Wilko Multi Vitamin A-Z.</i> Pregnancy: Consider pregnancy multivitamin and mineral e.g. <i>Seven Seas Pregnancy, Pregnacare, Boots Pregnancy Support</i>					
	Iron	Continue with maintenance doses if required.		200 mg ferrous sulphate, 210 mg ferrous fumarate or 300 mg ferrous gluconate daily. Menstruating Women: 200 mg ferrous sulphate or 210 mg ferrous fumarate twice daily.			
	Zinc & Copper			Sufficient contained within multivitamin and mineral supplement. If additional zinc is needed, ratio of 8 to 15 mg zinc per 1 mg copper must be maintained *			
	Selenium			Sufficient contained within multivitamin and mineral supplement. If required, additional selenium may be provided by two to three Brazil nuts a day or by OTC preparations.			
	Folic Acid		Pregnancy: Additional requirement preconception and first 12 weeks**	Contained within multivitamin and mineral supplement. If deficient, check compliance with multivitamin and mineral supplement. If compliant, check for vitamin B12 deficiency before recommending additional folic acid. Additional folic acid OTC if deficient. Recheck folate levels after 4 months. Pregnancy: Additional requirement preconception and first 12 weeks**			
	Vitamin A, E & K					Additional fat soluble vitamins are needed ¹ .	

Recommended Monitoring ^{1,11} by GP Practice post discharge from Secondary Care (usually 2 years post bariatric surgery)	Test	Gastric Balloon	Gastric Band	Sleeve Gastrectomy	Gastric Bypass	Duodenal Switch (Biliopancreatic Diversion)	Management
	U&Es, LFTs & FBC		Annually <i>More frequently if concerns regarding nutritional intake</i>				Abnormal LFTs due to non-alcoholic fatty liver disease are common or may relate to other conditions and require further investigation. Low albumin may be a sign of dietary non-compliance or malabsorption especially following Duodenal Switch. Low albumin levels may also indicate underlying inflammation and infection.
	HbA1c/FBG	Monitor as appropriate in those with preoperative diabetes					As per BNF & local guidelines
	Lipids	Monitor as appropriate in those with preoperative dyslipidaemia					As per BNF & local guidelines. Treatment needs should be reassessed after achievement of weight loss.
	Vitamin D		Not required unless patient has symptomatic Vitamin D deficiency.	Annually <i>Adjust supplementation to maintain serum 25-hydroxyvitamin D levels of >75nanomol/L</i>			Loading regimes for deficiency as per local guidelines or Royal Osteoporosis Society . (Serum calcium levels to be checked one month after the last loading dose.) Maintenance doses of 2000 – 4000 IU/day following Sleeve Gastrectomy & Gastric Bypass. Higher may be required in Duodenal Switch.
	Ferritin, Folate, Calcium & PTH		Annually				Megaloblastic & macrocytic anaemia associated with vitamin B12 deficiency can be masked by deficiency of either folic acid or iron. Assess all haematinics before recommending additional folic acid supplements.
	Thiamine		Routine monitoring not required <i>Clinicians should be aware that patients with prolonged vomiting can develop acute thiamine deficiency, which requires urgent treatment.</i>				Additional thiamine supplementation should be administered to patients at risk of Wernicke encephalopathy e.g. prolonged vomiting, poor dietary intake, oedema, alcohol abuse, symptoms of neuropathy or rapid weight loss. Review in-line with symptoms and underlying cause, and de-prescribe as appropriate.

Test	Gastric Balloon	Gastric Band	Sleeve Gastrectomy	Gastric Bypass	Duodenal Switch (Biliopancreatic Diversion)	Management
B12			Annually			Hydroxocobalamin has completely replaced cyanocobalamin as choice for therapy. Treatment is generally initiated with frequent administration of intramuscular injections to replenish the depleted body stores ^{7,11} .
Zinc			Annually Monitor for unexplained anaemia, hair loss or changes in taste acuity.			If additional zinc supplements are required, the ratio of 8-15 mg of zinc for each 1 mg copper should be maintained. Forceval contains 2 mg copper and 15 mg zinc and doubling up on the dosage of Forceval may be sufficient in some cases to meet the additional requirements. Review 3-6 monthly ⁸ .
Copper			Monitor for unexplained anaemia or poor wound healing. Monitor in those on high levels of Zinc <i>Note zinc levels affect copper levels and vice versa*</i>			
Vitamin A				Only if concerns regarding steatorrhoea or symptoms of deficiency e.g. night blindness	Annually (once levels are stable)	Oral supplementation with 10,000-25,000 IU/day for 1-2 weeks is recommended in deficiency, more may be needed if the patient is experiencing night blindness ⁹ . The levels should be rechecked at three months.
Vitamin E		Measure if unexplained anaemia or neuropathy.			Secondary Care <i>Annual α-tocopherol</i>	Maintenance of 100-400 IU/day, more may be required for repletion. Continue until serum levels reach the normal range ⁹ .
Vitamin K		Measure INR if excessive bruising / coagulopathy.			Secondary Care <i>Annual Vitamin K1 and PIVKA-II</i>	Treat symptomatically with 1-2mg oral Vitamin K. Seek haematologist advice if taking anticoagulants.
Selenium				Annually		A selenium supplement should not be given unless there is good evidence of deficiency. Additional selenium may be provided by two to three Brazil nuts a day.
			Monitor for unexplained fatigue, anaemia, metabolic bone disease, chronic diarrhoea or unexplained cardiomyopathy.			

* If patients require a zinc supplement they should receive 1mg of copper for each 8 – 15mg of zinc as zinc replacement can cause copper deficiency⁵.

** Healthy women, planning for pregnancy, should take an additional 400 mcg/day folic acid prior to conception until the 12th week of pregnancy however in women with obesity or diabetes, the recommendation is 5 mg folic acid until the 12th week of pregnancy as there may be an increased risk of neural tube defect.

Dealing with the impact of bariatric surgery on medicines – *Table adapted from PrescQIPP Bulletin 224 August 2019³*

Formulation	Advice Following Bariatric Surgery
Solid Dosage Forms	Use tablets with a diameter less than 10mm to avoid them getting stuck. If the tablet size is greater than 10mm then consider how to reduce this. For example, halving the tablets if they are scored, using an alternative manufacturer's version which has a smaller diameter, dissolving or dispersing the tablet, an alternative administration route, soluble tablets or liquid formulations. Refer to the section below on soluble and liquid formulations for post bariatric surgery.
Liquid Formulations	Used for up to six weeks post-operatively when patients can usually only tolerate a liquid diet. Do not start liquid formulations before surgery. Convert liquids back to solid dose forms when solid nutrients are reintroduced. Avoid using costly, unlicensed, 'special' liquids where possible.
Sugar-Containing Medicines	To minimise dumping syndrome in gastric bypass patients, avoid products (including over-the-counter medicines) that contain a large amount of sucrose, corn syrup, lactose, maltose, fructose, honey and mannitol. For example, use sugar-free versions of liquid formulations where available.
Effervescent Tablets	Effervescent formulations should be avoided in bariatric patients as the build-up of gas trapped in the pouch can be uncomfortable for the patient. The excess sodium in these formulations is also not appropriate for bariatric patients with hypertension. If no suitable alternative is available, the effervescent tablet should be allowed to dissolve and settle fully before taking.
Sustained/Delayed Release or Enteric-Coated Preparations	Formulations with prolonged dissolution times (e.g. sustained release, long-acting, modified release, extended release, enteric coated) should be avoided as they can pass through the altered gastrointestinal (GI) tract of gastric bypass patients before absorption is complete. They will have a reduced bioavailability so should be replaced with immediate release formulations. Sustained release, long-acting, modified release, extended release, enteric coated preparations should not be crushed or cut in half.
Drugs Damaging to Gut Mucosa	Avoid NSAIDs or aspirin as the risk for GI bleeds, ulcers or perforations is increased. Avoid diuretics as they can precipitate potential complications in patients who are dehydrated or have prolonged nausea or vomiting. Increased potential of GI perforation by bisphosphonates due to reduced stomach size. However, bariatric surgery patients are at risk of osteoporosis due to reduced calcium absorption. Possible alternatives to oral bisphosphonates are intravenous bisphosphonates.
Drugs Used to Treat Constipation	Follow local post-surgical constipation guidance taking into consideration the impact of the type of bariatric surgery. Suppositories would be the preferred first choice. Bulk-forming laxatives requiring dilution in large volumes of liquid may be difficult to drink. Lactulose has a risk of dumping as per sugar-containing medicines above. Stimulating laxatives can commonly cause cramping, use with caution in first 3-6months.
Direct-acting Oral Anticoagulants (DOACs)	To date, DOACs are not recommended in patients who have undergone bariatric surgery, because of limited available data. Pending new studies to confirm the predictable pharmacokinetics and safety of DOACs in this population, especially at therapeutic doses, warfarin remains the first option for chronic anticoagulation ¹⁰ .
Oral Contraceptives	Reduced oestrogen absorption likely dependent upon surgery type. Fertility also likely to increase after surgery. Consider changing to non-oral contraceptive methods such as barrier methods, intra-uterine contraceptive device, intra-uterine progestogen-only device or parenteral progestogen-only contraceptives (injections or implant).

Please note there are some medicines with specific advice following bariatric surgery – this information can be found at <https://www.prescqipp.info/our-resources/bulletins/bulletin-224-bariatric-surgery/>

References

1. BOMSS Guidelines on peri-operative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery. September 2014. <https://www.bomss.org.uk/wp-content/uploads/2014/09/BOMSS-guidelines-Final-version1Oct14.pdf> Accessed Jan 2020.
2. NHS. Weight loss surgery, types. April 2017. <https://www.nhs.uk/conditions/weight-loss-surgery/types/> Accessed Jan 2020.
3. PrescQIPP Bariatric surgery patients and their medicines including alternative formulations and nutritional supplements. August 2019. <https://www.prescqipp.info/umbraco/surface/authorisedmediasurface/index?url=%2fmedia%2f4278%2f224-bariatric-surgery-21.pdf> Accessed January 2020.
4. South Tyneside and Sunderland NHS Foundation Trust. Department of Nutrition and Dietetics. Bariatric multi-vitamins and Minerals. Published June 2019. Accessed January 2020.
5. Mechanick JI, Youdim A, Jones DB, Garvey WT, Hurley DL, McMahon MM et al. Clinical practice guidelines for the peri-operative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient- 2013 update: Cosponsored by the American Association of Clinical Endocrinologist, The Obesity Society, and American Society for Metabolic and Bariatric Surgery. *Surg Obes Relat Dis.* 2013; 9(2):159191. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4142593/> Accessed Feb 2020.
6. Francis R, Aspray T, Fraser W, Gittoes N, Javaid K, MacDonald H et al. Vitamin D and bone health: A practical clinical guideline for patient management. National Osteoporosis Society [Internet]. 2013. <http://www.nos.org.uk/document.doc?id=1352> Accessed March 2020.
7. British National Formulary. Treatment summary: Anaemia, megaloblastic. <https://bnf.nice.org.uk/treatment-summary/anaemia-megaloblastic.html> Accessed March 2020
8. Nutrition support for adults: oral nutrition support, enteral tube feeding and parenteral nutrition. Clinical guideline [CG32] <https://www.nice.org.uk/guidance/cg32/> Accessed Nov 19
9. Mechanick JI, Kushner RF, Sugerman HJ, Gonzalez-Campoy M, Collazo-Clavell ML, Guven S et al. American Association of Clinical Endocrinologists, The Obesity Society, and American Society for Metabolic and Bariatric Surgery. Medical guidelines for clinical practice for the peri-operative nutritional, metabolic, and nonsurgical support of the bariatric surgery patient. *Endocrin Pract.* 2008; 14(S1): 1-83. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4142593/> Accessed March 2020.
10. Leven C, Hoffmann C, Roche C, Couturaud F, Thereaux J, Lacut K. *Fundamental & Clinical Pharmacology.* Impact of bariatric surgery on oral anticoagulants pharmacology, and consequences for clinical practice: a narrative review [Internet]. 2020. <https://onlinelibrary.wiley.com/doi/pdf/10.1111/fcp.12587> Accessed September 2020.
11. O'Kane M, Parretti HM, Pinkney J, Welbourn R, Hughes CA, Mok J, Walker N, Thomas D, Devin J, Coulman KD, Pinnock G, Batterham RL, Mahawar KK, Sharma M, Blackmore AI, McMillan I, Barth J. Obesity Reviews. British Obesity and Metabolic Surgery Guidelines on perioperative and postoperative biochemical monitoring and micronutrient replacement for patients undergoing bariatric surgery 2020 update. [Internet]. 2020. <https://www.bomss.org.uk/wp-content/uploads/2020/10/Wiley-Documents-obr.13087.pdf> Accessed April 2021.