

ASMBS guidelines/statements

American Society for Metabolic and Bariatric Surgery: postoperative care pathway guidelines for Roux-en-Y gastric bypass

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Abstract

Background: Clinical care pathways and guidelines help guide and provide structure to clinicians and providers to improve healthcare delivery and quality. The Quality Improvement and Patient Safety (QIPS) Committee of the American Society for Metabolic and Bariatric Surgery (ASMBS) has previously published care pathways for the performance of laparoscopic sleeve gastrectomy (LSG), preoperative care of patients undergoing Roux-en-Y gastric bypass (RYGB), and most recently, intraoperative care of patients undergoing RYGB.

Objectives: This current RYGB care pathway guideline was created to address postoperative care guidance.

Setting: Academic Health Center.

Methods: For this systematic review, PubMed queries were performed from January 1979 to December 2019. Follow-up queries were performed from January 2020 to July 2024. Peer-reviewed publications were reviewed according to the level of evidence (LoE) regarding specific key questions developed by the QIPS Committee and working group for this pathway.

Results: Evidence-based recommendations are made for the postoperative care of patients undergoing RYGB, including recommendations for early postoperative care, postoperative medication management, and long-term postoperative surveillance.

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Conclusions: This document may provide a structure to providers based on current evidence for the postoperative care of patients with overweight or obesity undergoing RYGB. (Surg Obes Relat Dis 2025;21:523–536.) © 2025 American Society for Metabolic and Bariatric Surgery. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Keywords: ASMBS; Quality Improvement and Patient Safety Committee; Postoperative; Roux-en-Y gastric bypass; Care pathway; Guidelines

The Quality Improvement and Patient Safety (QIPS) Committee of the American Society for Metabolic and Bariatric Surgery (ASMBS) seeks to develop evidence-based clinical pathways for bariatric procedures. In a value-based healthcare environment, defining surgical care pathways is of considerable importance from patient safety, healthcare efficacy, and efficiency perspectives [1]. The Metabolic and Bariatric Surgery Accreditation and Quality Improvement Program (MBSAQIP) mandates the use of clinical care pathways as a requirement for accreditation [2], and the ASMBS issues care pathways to serve as evidence-based guides for practitioners.

Care pathways do not represent the “standard of care” in bariatric surgery. This disclaimer is applicable to all care pathways issued by the ASMBS, including the laparoscopic sleeve gastrectomy (LSG), preoperative care for laparoscopic Roux-en-Y gastric bypass (RYGB), and intraoperative care for minimally invasive RYGB care pathways that have been published [3–5]. This current pathway focuses on postoperative care after RYGB and includes 24 topics (Appendix A) that were analyzed and assessed for evidence-based practice recommendations.

Materials and methods

Care pathway topics were determined by subcommittee members. The National Library of Medicine’s PubMed database was queried from January 1979 to July 2024 for relevant publications. Medical subject headings (MeSH) used included (((“Bariatric Surgery”[MeSH]) OR “Obesity/surgery”[MeSH]) OR “Gastric Bypass”[MeSH]) AND (“Postoperative Care/methods”[MeSH] OR “Postoperative Care/standards”[MeSH])). Subcommittee members reviewed articles for assigned topics to determine suitability for inclusion.

Like the recently published intraoperative care pathway from the ASMBS QIPS Committee [5], level of evidence (LoE) are provided in this care pathway to support recommendations. Criteria used for LoE are those utilized by publisher Elsevier for *Surgery for Obesity and Related Diseases* and are consistent with LoE criteria by the Center for Evidence-Based Medicine. Articles were included if they were LoE I, representing the findings of systematic reviews of prospective randomized controlled trials (PRCTs), meta-analyses of PRCTs, or individual PRCTs. If no articles met these criteria, LoE II represented meta-analyses or systematic reviews of

nonrandomized clinical trials (NRCTs), prospective or retrospective cohort studies, or case-control studies, individual cohort studies, or individual case-control studies. ASMBS consensus guidelines were also included for review and served as primary source articles. LoE was designated by working group members assigned to each topic and independently validated by additional workgroup members. No surveys, case series, case reports, or published expert opinions were included in the development of this pathway.

Recommendation categories for this care pathway included “recommended,” “selective,” or “not recommended.” “Recommended” provides evidence-based objective results that can appropriately affect short- or long-term outcomes in patients after RYGB. “Selective” applies in cases where patients have a high clinical risk of a specific outcome and the data on the intervention are equivocal. For “not recommended” items, there are data to demonstrate that the intervention may be associated with harm. Any metrics that did not have the appropriate LoE or reach group consensus were designated as “further research needed.”

Early postoperative care recommendations

Recommendations for early postoperative care, postoperative medication management, and long-term surveillance are summarized in Tables 1–3, respectively.

Postoperative monitoring

Recommended

- Patients should routinely receive continuous heart rate, intermittent blood pressure, and continuous pulse oximetry monitoring. Monitoring for recurrent desaturation [oxygen saturation (SpO₂) <90%, 3+ episodes], recurrent bradypnea (respiratory rate <8/min, 3+ episodes), apnea (10 s, 1+ episodes), pain-sedation mismatch, and bleeding is recommended [6].

Selective

- Supplemental oxygen. Routine use of supplemental oxygen reduces the frequency and severity of hypoxemic episodes but is ineffective in reducing the incidence of airway obstruction and may diminish the stimulus to breathe [7].
- Continuous respiratory rate monitoring. Pulse oximetry does not adequately detect hypoventilation (or apnea) in

Table 1
Summary of early postoperative care recommendations after Roux-en-Y gastric bypass

Recommended	Selective	Not recommended
• Continuous monitoring • CPAP therapy • Multimodal pain management • Multimodal postoperative antiemetic prophylactic therapy • VTE risk assessment • Early postoperative ambulation • Discontinue use of all insulin secretagogues, sodium-glucose cotransporter-2 inhibitors, and thiazolidinediones • Long-acting injectable insulin dose should be guided by daily usage of short-acting insulin • Hospital-based subcutaneous insulin therapy, using a rapid-acting insulin analog, to achieve glycemic targets <180 mg/dL • Early initiation of clear liquid oral intake and quick progression to full liquid diet • On postoperative day 1, full liquids or pureed/soft solids can be introduced or continued if early feeding initiated • After hospital discharge, patients should follow an overall nutritional care plan supervised by a registered dietitian nutritionist	• Supplemental oxygen • Continuous respiratory rate monitoring • CO₂ monitoring • Chest physiotherapy • Urinary catheter use for patients experiencing POUR • IV acetaminophen • Nonsteroidal antiinflammatory medications • Adjuvant analgesics • Antiemetic rescue treatment • Intractable or chronic nausea treatment • In-hospital mechanical prophylaxis in moderate VTE risk patients • In-hospital mechanical and thromboprophylaxis in high VTE risk patients • Extended thromboprophylaxis in high VTE risk patients in whom the risk of bleeding does not outweigh VTE risk • Unfractionated, low-molecular-weight heparin, or direct oral anticoagulants for perioperative pharmacologic and extended thromboprophylaxis • Consider adjusted dosage of thromboprophylaxis medications in higher VTE risk patients • Metformin and/or incretin-based therapies may be continued postoperatively • Endocrinology consultation • Discharge and/or home glucose monitoring • UGI when clinically indicated • CT scan when clinically indicated.	• ICU admission • Prophylactic IVC filter • Routine use of UGIs or abdominal CT scan

CPAP = continuous positive airway pressure; VTE = venous thromboembolism; POUR = postoperative urinary retention; UGI = upper gastrointestinal; CT = computed tomography; ICU = intensive care unit; IVC = inferior vena cava; IV = intravenous.

patients receiving supplemental oxygen. Continuous respiratory rate monitoring is selectively used for those with a history of obstructive sleep apnea (OSA) or those receiving postoperative narcotics [8].

- CO₂ monitoring. CO₂ monitoring may be used in a selective group of high-risk patients with OSA and those who receive patient-controlled analgesia [8,9].

Not recommended

- Intensive care unit (ICU) admission. Routine admission to the ICU is not necessary [6].

Pulmonary care

Recommended

- Use of CPAP therapy is safe early after RYGB and improves sleep-disordered breathing and the respiratory-depressant effects of opioids [10]. CPAP therapy should be used routinely postoperatively in patients with moderate to severe OSA and/or obesity hypoventilation syndrome [8].

Selective

- Chest physiotherapy. Chest physiotherapy and mobilization after LSG have shown improved respiratory function compared to mobilization alone [11]; however, its impact on RYGB patients requires further investigation.

Not recommended. None.

Urinary catheter use

Recommended. None.

Selective

- Postoperative urinary catheter use should be reserved for patients experiencing postoperative urinary retention (POUR). Selective versus routine use of urinary catheters contributes to enhanced recovery, less patient discomfort, and decreased perioperative morbidity [12], including pulmonary complications due to urinary catheter-related impaired ambulation [13] and urinary tract infections (UTIs) [14].

Not recommended. None.

Postoperative pain management

Recommended

- Multimodal pain management strategies. Multimodal pain management after RYGB led to improved pain scores, decreased length of stay, less opioid use, and fewer opioid-related complications [15,16], including long-term opioid dependence after bariatric surgery [12,17]. The benefit of multimodal pain management was demonstrated by the MBSAQIP Bariatric Surgery Targeting Opioid Prescriptions (BSTOP) enhanced recovery after surgery project, showing significantly reduced inpatient and outpatient opioid use as well as length of stay [18].

Selective

- Acetaminophen. Randomized controlled trials have shown that the use of intravenous (IV) acetaminophen is associated with decreased length of stay, improved pain control, quicker return of bowel function, and reduced 30-day emergency department visits [19].
- Nonsteroidal antiinflammatory medications (NSAIDs). While prolonged NSAID use after RYGB is associated with marginal ulcers (MUs), short-term use in the immediate postoperative period is associated with decreased pain scores, improved patient satisfaction, earlier discharge from the postanesthesia care unit, and more enthusiastic participation in respiratory physical therapy [20,21].
- Adjuvant analgesics. Systemic adjuvants, such as ketamine, clonidine, dexmedetomidine, magnesium, lidocaine, pregabalin, and gabapentin, alone or in combination, have shown benefit in multimodal pain management in bariatric patients. Dexmedetomidine has been shown to decrease postoperative pain scores in RYGB patients [22]. A recent Cochrane systematic review demonstrated that low-dose perioperative IV ketamine reduced pain intensity and 24–48-hour postoperative opioid consumption [23]. The use of gabapentinoids as an adjuvant in multimodal pain management has also been shown to reduce pain scores after RYGB [23].

Not recommended. None.

Managing postoperative nausea and vomiting

Recommended

- Multimodal postoperative antiemetic prophylactic therapy [12]. Multimodal postoperative antiemetic prophylactic therapy is recommended to mitigate prolonged hospital length of stay and readmission risk.

Selective

- Antiemetic rescue treatment. Rescue postoperative nausea

and vomiting (PONV) treatment should be done with an antiemetic of a different class than the drug used for the original prophylaxis [24].

- Intractable or chronic nausea treatment. Consider the use of selective serotonin reuptake inhibitors, tricyclic antidepressants, or aprepitant for the management of chronic nausea/vomiting without an underlying surgical cause [25].

Not recommended. None.

Postoperative venous thromboembolism prophylaxis

Recommended

- Venous thromboembolism (VTE) risk assessment. If not completed preoperatively, VTE risk assessment should be performed to guide the perioperative thromboprophylaxis strategy, including discharge, as VTE risk may exceed 4% in some high-risk bariatric patients [26].
- Early postoperative ambulation. Early postoperative ambulation in all patients after RYGB.

Selective

- In-hospital mechanical prophylaxis in patients with moderate VTE risk undergoing RYGB. In lower- and moderate-risk patients, mechanical prophylaxis alone is considered acceptable for VTE risk reduction [12,27,28].
- In-hospital mechanical and pharmaco-thromboprophylaxis in patients with high-VTE risk after RYGB [12,28]. Even though a rare postoperative complication, VTE is the most common cause of bariatric-related mortality [29], and combination mechanical and pharmaco-thromboprophylaxis has been shown to reduce VTE after bariatric surgery without significantly increasing bleeding complications [30,31].
- Extended thromboprophylaxis should be considered in patients at high VTE risk after RYGB in whom the risk of bleeding does not outweigh the VTE risk. Over 70% of postbariatric surgery VTE occurs after hospital discharge, with an associated 28-fold mortality increase compared to pre-discharge VTE [32]. In a prospective cohort study using the Caprini VTE risk assessment tool to guide extended thromboprophylaxis in high-risk patients, Nimeri et al. showed significant VTE reduction without an increase in bleeding complications [33].

While multiple VTE risk-assessment tools are available, they differ in variables as well as accuracy in predicting VTE events. Currently, no specific risk-assessment tool is recommended over another for RYGB patients. For patients receiving discharge pharmaco-thromboprophylaxis after bariatric surgery, low-molecular-weight heparin (LMWH) is the most used medication [27].

- Unfractionated heparin (UFH) or LMWH may be used for perioperative thromboprophylaxis in patients undergoing RYGB. Optimal chemoprophylaxis medication remains a point of practice pattern variation [28]. Both UFH and LMWH have been shown to be effective in bariatric surgery patients. While Birkmeyer et al. showed adjusted VTE rates were significantly lower with LMWH versus UFH [34], and the European Society of Anesthesiology VTE Guideline Task Force recommends the use of LMWH over UFH [35], both are currently acceptable.
- Direct oral anticoagulants (DOACs). The use of DOACs for postoperative and extended VTE prophylaxis after RYGB may be considered but has been minimally studied.
- Adjusted dosage of chemoprophylaxis may be considered in patients undergoing RYGB at a higher risk for VTE complications. There are no standardized recommendations for chemoprophylaxis dosing for RYGB patients. While dosing options may include standard unadjusted, weight-adjusted, or body mass index (BMI)-adjusted dosing [28], reported outcomes have been variable. In a systematic review by Ikesaka et al., lower rates of in-hospital VTE (.54% versus 2%) were observed with weight-adjusted compared to nonweight-adjusted chemoprophylaxis, without a heightened bleeding risk (1.6% versus 2.0%) [36]. In the nonblinded prospective randomized BAFLUX study comparing low and high doses of LMWH in bariatric surgery patients (>80% RYGB), VTE (1.5% versus .8%) and bleeding (6.1% versus 5%) rates were similar, suggesting low-dose LMWH is equally effective for VTE prevention [37].
- Antifactor Xa levels. It is unclear if routine monitoring of anti-Xa levels is necessary. It may provide useful information in select patients with high BMIs or hepatorenal dysfunction [28].

Not recommended

- Prophylactic inferior vena cava (IVC) filter. The routine placement of a prophylactic IVC filter is not recommended in patients undergoing RYGB. Numerous studies, meta-analyses, and systematic reviews have shown higher rates of VTE and VTE-related morbidity and mortality associated with prophylactic IVC filter use in metabolic and bariatric surgery [28,38,39]. In the meta-analysis by Kaw et al., prophylactic IVC filter use was associated with a 3-fold higher likelihood of deep vein thrombosis and death [38]. In Reddy et al., IVC filter use was independently associated with increased deep vein thrombosis, pulmonary embolism, and mortality rates, as well as longer hospital stays and increased costs [39].

Diabetes medications and glycemic control

Recommended

- In the immediate postoperative phase, the use of all insulin secretagogues (sulfonylureas and meglitinides), sodium-

glucose cotransporter-2 inhibitors, and thiazolidinediones should be discontinued for patients with type 2 diabetes mellitus (T2D). Patients with insulin-requiring T2D before surgery will have up to an 87% reduction in their total daily insulin requirements by postoperative day two [40]. The reduction of diabetes medication(s) in the early postoperative period is important to decrease the risk of hypoglycemia. Sodium-glucose cotransporter-2 inhibitors may need to be continued for patients with heart failure under the guidance of cardiology.

- Long-acting injectable insulin (insulin glargine, detemir, or degludec) dose should be guided by daily usage of short-acting insulin. In patients on long-acting injectable insulin, daily short-acting insulin usage should be calculated and used to guide dosing for long-acting insulin [41].
- Hospital-based subcutaneous insulin therapy, using a rapid-acting insulin analog (insulin lispro, aspart, or glulisine), should be used to achieve glycemic targets (<180 mg/dL) in hospitalized patients. No single standardized rapid-acting insulin sliding scale has been determined.

Selective

- Metformin and/or incretin-based therapies may be continued postoperatively. In patients with T2D, metformin and incretin-based therapies can be continued until prolonged clinical resolution of T2D is demonstrated by normalized glycemic targets (including fasting and postprandial blood glucose and hemoglobin A1c [HbA1c]) [42]. Glucagon-like peptide-1 (GLP-1) agonists can be considered as an early choice for patients with diabetes who do not experience remission.
- ICU admission. ICU admission should be considered for patients with postoperative hyperglycemia requiring IV regular insulin as part of a standard intensive insulin therapy protocol to control hyperglycemia to a 140–180 mg/dL blood glucose target.
- Endocrinology consultation. Endocrinology consultation should be considered for patients with type 1 diabetes or with T2D and uncontrolled hyperglycemia.
- Discharge and/or home glucose monitoring. Preprandial, 2 hours postprandial, and bedtime reflectance meter glucose (“fingerstick”) determinations or the use of continuous glucose monitors in the home setting is recommended, depending on the patient’s ability to test, the level of glycemic control targeted, the use of oral agents or insulin, and the overall care plan [27].

Not recommended. None.

Diet initiation and progression

Recommended

- Early initiation of clear liquid oral intake and quick progression to a full liquid diet. This diet initiation and

progression strategy is safe and may hasten the return of bowel function and decrease patients' length of stay when implemented with other elements of enhanced recovery after bariatric surgery care pathways [27]. Water or a low-sugar clear liquid can be initiated on postoperative day zero following surgery once patients are fully awake [14].

- On postoperative day 1, full liquids or pureed/soft solids can be introduced or continued if early feeding was initiated. A minimal protein intake of 60 g/d and up to 1.5 g/kg ideal body weight/d with liquid protein supplements is recommended. Dumping syndrome is minimized by eliminating simple carbohydrates.
- After hospital discharge, patients should follow an overall nutritional care plan supervised by a registered dietitian nutritionist (licensed healthcare professional). The emphasis remains on adequate protein intake and hydration with at least 60 oz (1800 cc) of fluid daily [27].

Selective. None.

Not recommended. None.

Postoperative radiology and laboratory studies

Recommended. None.

Selective

- Bariatric programs should standardize checking postoperative laboratory tests [27], such as a complete blood count, basic metabolic panel, and electrolytes, based on specific patient medical conditions and intraoperative or postoperative occurrences that may require laboratory monitoring. No specific laboratory tests have been recommended in the literature, although some are routinely or selectively performed by many bariatric programs after RYGB.
- Upper gastrointestinal (UGI) X-ray series in the postoperative setting after RYGB is advised based primarily on patient symptoms and the overall clinical picture. While UGI series has demonstrated the ability to detect obstruction and leaks after RYGB with high specificity and negative predictive value, sensitivity and positive predictive value are reportedly less than 50%, and routine use after RYGB may delay appropriate treatment with a false negative result [43].
- Computed tomography (CT) scan in the postoperative setting after RYGB is advised based primarily on patient symptoms and the overall clinical picture. Evidence supports using imaging in a selective way based on the clinical picture in detecting postoperative complications [44]. Data suggest that selective use of CT scans based on clinical suspicion may be the optimal diagnostic strategy [45]. In the meta-analysis by Musella et al., CT scans were found to have higher sensitivity (91%–94% versus 49%–54%) and positive predictive value (100% versus 54%) compared to UGI series [44].

Not recommended. None.

Postoperative medication management recommendations

Chronic anticoagulation medications

Recommended. None.

Selective

- Bariatric surgery can be safely performed in patients using oral anticoagulation preoperatively but may be associated with increased perioperative bleeding risk. Chronic anticoagulation therapy, found in 1%–4% of patients undergoing bariatric surgery, is associated with higher postoperative morbidity [46,47], most notably a 6%–21% increased risk of bleeding [46], as well as increased risk of readmission (odds ratio [OR] = 2.1), reoperation (OR = 1.5), mortality (OR = 2.08–2.9), and longer length of stay (OR = 1.2) [47].
- Long-term therapy with oral anticoagulation is safe and effective following RYGB. Hendricks et al. evaluated the efficacy and safety of oral anticoagulants in the management of nonvalvular atrial fibrillation in patients with a history of bariatric surgery and found oral anticoagulants to be equally safe and ineffective in RYGB compared to non-RYGB patients [48].
- Absorption of oral anticoagulation medication may be altered after RYGB and should be carefully monitored. The influence of RYGB anatomy on drug pharmacology, efficacy, and safety is not well characterized. Tandra et al. evaluated medications with activity on various cytochrome enzymes and found that patients after RYGB, compared to nonsurgical controls, had more rapid absorption with similar bioavailability and clearance greater than 1 year after surgery [49]. Other studies suggest high variability in drug metabolism after RYGB, and more frequent monitoring may be warranted. The use of DOACs after RYGB remains controversial, with variability in its recommended use.
- As no bariatric surgery-specific data exists, resuming therapeutic anticoagulation postoperatively should currently be based on standards for other abdominal surgeries. There is no consistent practice nor studies specifically evaluating the timing for resuming oral anticoagulation after bariatric surgery. Guidelines for the management of anticoagulants around the time of surgery have been published by the American College of Chest Physicians [50]. Vitamin K antagonists, such as warfarin, should be stopped 5 days prior to surgery. Bridging anticoagulation is recommended in patients with high risk for thromboembolism but not in patients at low risk. Vitamin K antagonists may be resumed approximately 12–24 hours after surgery when there is adequate hemostasis. Surgeons can consider holding

Table 2
Summary of medication management recommendations after Roux-en-Y gastric bypass

Recommended	Selective	Not Recommended
• Perioperative management of immunosuppressive therapy should be based on standards for other abdominal surgeries. • The need for antihypertensive medications should be evaluated repeatedly and frequently during the active phase of weight loss. • Combined oral contraceptives should be stopped one cycle prior to surgery, and patients should remain off for at least one cycle after surgery.	• RYGB can be safely performed in patients taking oral anticoagulation. • Long-term therapy with oral anticoagulation is safe and effective following RYGB. • Absorption of oral anticoagulation medication may be altered after RYGB and should be carefully monitored. • Resuming therapeutic anticoagulation should be based on standards for other abdominal surgeries. • PPI prophylaxis for at least 90 d • Immunosuppressive medication management over the long term depends on the disease state and requires monitoring. • Medication management in the postorgan transplant population following RYGB may require special attention due to changes in pharmacokinetics. • Diuretics should be restarted with caution especially in the early postoperative period where fluid intake can be limited. • ACE inhibitors or ARBs should be continued or restarted early after RYGB. • Beta-blocker can be safely resumed. • All methods of birth control may be considered for patients after RYGB. • In patients with a high level of concern or risk for biliary disease, gallstone prophylaxis may be administered	• H₂-blockers

RYGB = Roux-en-Y gastric bypass; PPI = proton pump inhibitors; ACE = angiotensin-converting enzymes; ARBs = angiotensin receptor blockers.

DOACs 2–3 days pre-RYGB and restarting on postoperative day 1–3 [51].

Not recommended

None.

Acid suppression medications

Recommended. None.

Selective

- Proton pump inhibitor (PPI) prophylaxis for at least 90 days should be considered. A meta-analysis by Ying et al. found reduced MU incidence (OR = .50; 95% confidence interval: .28–.90) with PPI therapy [52]. Other studies have shown variable impact of PPI on MUs after RYGB. These differences are likely a reflection of significant variability in provider practice patterns, as Giannopoulos et al. highlighted in a recent national survey of bariatric surgeons on the use of PPI after RYGB [53].

Not recommended. None.

Immunosuppressant medications

Recommended

- As little bariatric surgery-specific data exist, perioperative management of immunosuppressive therapy should currently

be based on standards for other abdominal surgeries. A recently published systematic review by Kassel et al. provides recommendations for immunosuppressive medication management for patients undergoing bariatric surgery, based on data from other surgical procedures [54]. The authors conclude that, based on limited data, corticosteroids, methotrexate, and tumor necrosis factor (TNF) inhibitors are safe to restart postoperatively, provided there are no signs of infections. Corticosteroids are not an independent predictor of perioperative complications in primary bariatric surgery, and the authors recommend weighing the risks and benefits of continued use on an individual patient basis. Methotrexate use in the perioperative period does not increase the risk of postoperative complications. However, folic acid supplementation should be initiated and continued with methotrexate treatment. TNF inhibitors are recommended to be discontinued prior to surgery based upon their half-life (between 2 and 9 weeks prior to surgery) and can be restarted postoperatively if there is appropriate wound healing and no signs of infection. The authors recommend a similar approach to TNF therapy with vedolizumab (humanized monoclonal antibody to the $\alpha 4\beta 7$ integrin), advocating waiting at least 1 dosage cycle to elapse prior to surgery [54].

Selective

- Immunosuppressive medication management over the long-term depends on the disease state and requires

careful monitoring. There is little evidence and conflicting results about immunosuppressive medication management after RYGB. Some studies have shown a reduced need and use of immunosuppressive medications following RYGB, while others have shown increased use after RYGB. A review of existing literature suggests that weight loss associated with bariatric surgery results in decreased serum inflammatory markers and a decreased need for some immunosuppressive medications [55].

- Medication management in the postorgan transplant population following RYGB may require special attention due to changes in pharmacokinetics. While there is also variability in the published literature, current literature suggests that patients with prior transplants may require no or minor changes in immunosuppressive medication dosing after bariatric surgery [56].

Not recommended. None.

Antihypertensive medications

Recommended

- The need for antihypertensive medications should be evaluated repeatedly and frequently during the active phase of weight loss, as RYGB has been associated with hypertension resolution in a significant proportion of patients with preexisting hypertension and may occur as early as 1 week postoperatively [57]. Frequent monitoring and adjustment of antihypertensive medications to prevent sequelae of hypotension is recommended.

Selective

- Diuretics should be restarted with caution, especially in the early postoperative period, where fluid intake can be limited. The combination of increased diuresis and less absorption after RYGB can theoretically put patients at higher risk for dehydration and acute kidney injury.
- Angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) should be continued or restarted early after RYGB. The discontinuation of ACE inhibitors or ARBs has been found to be independently associated with an increased risk for acute kidney injury [58].
- Beta-blockers may be restarted after RYGB. Limited studies have shown no difference in the bioavailability of immediate and controlled-release metoprolol after RYGB.

Not recommended. None.

Birth control medications and pregnancy

Recommended

- Combined oral contraceptives (OCs) and transdermal contraceptive patches should be stopped one cycle

(1 month) prior to surgery due to the increased risk of VTE, and patients should remain off these birth control methods for at least one cycle after surgery [27]. Therefore, alternative methods of contraception that do not increase VTE risk, such as progestogen-only pills, are recommended and should be discussed with female patients during this period.

- Pregnancy after RYGB is best delayed 12–18 months after surgery until weight stabilization has been achieved [27].

Selective

- All methods of birth control may be considered for patients after RYGB. Long-acting methods like implants and intrauterine devices are generally considered the best and most reliable methods [27].

Not recommended. None.

Gallstone prophylaxis

Recommended. None.

Selective

- In patients with a high level of concern or risk for biliary disease (for example, with a strong family history), gallstone prophylaxis may be administered. In such cases, a regimen supported by the literature would be ursodiol 250 or 300 mg bid, to begin at <10 days after surgery and then continued for 6 months. Rapid weight loss after RYGB increases the likelihood of gallstone formation, and the administration of ursodeoxycholic acid during the rapid weight loss phase of bariatric surgery has been shown to reduce the incidence of gallstone formation [59].

Not recommended. None.

Long-term surveillance recommendations

Postoperative follow-up

Recommended

- Frequent, early, and consistent long-term follow-up. Existing bariatric surgery guidelines recommend a schedule of follow-up with a multidisciplinary bariatric team after surgery [27,28]. Most bariatric surgery practices recommend that patients follow-up frequently in the early timeframe after RYGB, then at least annually. The goals of follow-up visits include teaching and reinforcement of recommended lifestyle changes, identification and treatment of nutritional deficiencies, facilitation of adjunctive services (such as pharmacologic weight

Table 3
Summary of long-term surveillance recommendations after Roux-en-Y gastric bypass

Recommended	Selective	Not Recommended
• Frequent, early, and long-term follow-up • Physical activity with a target of moderate aerobic activity as soon as clinically able • Laboratory monitoring and micronutrient surveillance • Regular supplementation • Dual-energy X-ray absorptiometry for long-term surveillance of bone health • Body contouring surgery deferred for at least 18 mo or until achieving stable weight loss. • Monitoring of alcohol or substance use • On suspicion of alcohol use disorder, the American Psychiatric Association recommends referral for evaluation and comprehensive and patient-centered treatment.	• Increased attention to facilitating follow-up should be given to patients at risk for follow-up noncompliance. • Virtual visits should be considered to facilitate follow-up for at-risk patient populations. • The amount of exercise recommended should take each patient's physical condition, limitations, and lifestyle into account. • Administration of supplements should be considered during any subsequent admission. • Body contouring surgery should be considered for patients with body mass index ≤ 30 kg/m². • Recreational marijuana should be avoided. • AUDIT screening questions should be utilized in conjunction with AUDIT consumption for better sensitivity and specificity for detection of alcohol use disorder.	• Transdermal patch multivitamins • Routine supplementation of vitamins A, E, and K beyond that included in oral MVIs is not routinely recommended outside of the setting of an identified deficiency or malabsorptive state. • Smoking • Body contouring surgery in patients with untreated nutrition deficiencies • Body contouring surgery in patients who are current smokers

AUDIT = alcohol use disorder identification test; MVIs = multivitamins.

treatment, physical therapy, psychological support, registered dietician instruction/coaching), and early diagnosis and appropriate management of surgical complications that may occur late after RYGB, such as MU or internal hernia.

Selective

- Increased attention to facilitating follow-up should be given to patients at risk for noncompliance with follow-up recommendations. Patient compliance with recommended follow-up tends to be poor, ranging from 10% in some clinical practices up to 98% with strenuous proactive efforts in the Longitudinal Assessment of Bariatric Surgery (LABS) Consortium study [60]. Such differential follow-up has been correlated with weight loss success and comorbidity resolution.
- Considerations should be given to virtual visits to facilitate follow-up for at-risk patient populations. Studies have identified financial factors and travel distance as major barriers to long-term follow-up. The use of telemedicine virtual visits may limit such barriers and improve patient follow-up after RYGB [61].

Not recommended. None.

Activity goals

Recommended

- Patients should incorporate some amount of physical activity with a target of moderate aerobic activity as soon as clinically able after RYGB. A combination of aerobic with resistance training after bariatric surgery leads to

better weight loss, improvement in body composition, bone mineral density, muscle strength, and overall fitness.

Selective

- The amount of exercise recommended should take each patient's physical condition, limitations, and lifestyle into account. The optimal amount of exercise after RYGB has yet to be determined. It has been found that to achieve additional weight loss from an exercise component, patients must engage in large cumulative amounts of exercise each week. In a randomized trial of low, middle, or high exercise after RYGB, only patients in the high exercise group (average of 230+ min/wk of exercise) experienced additional weight and fat mass loss. The amount of exercise recommended should take each patient's physical condition, limitations, and lifestyle into account [62].

Not recommended. None.

Postoperative labs

Recommended

- Laboratory monitoring and micronutrient surveillance. The American Association of Clinical Endocrinology (AACE), The Obesity Society (TOS), ASMBS, and the American Society of Anesthesiologists (ASA) white paper provide guidelines on lab monitoring in the postoperative setting [63]. Early postoperative labs (within 5 days) should include creatine kinase if rhabdomyolysis is suspected. Vitamin B12, folic acid, iron studies, 25-hydroxyvitamin D, and parathyroid hormone are evaluated every 3 months until stable, then every 6–12 months after. Vitamin A may be evaluated

every 6–12 months after RYGB. Copper, zinc, selenium, and thiamine should be evaluated every 3 months until stable, then every 6–12 months after stable. Hemoglobin A1c and thyroid-stimulating hormone in patients on supplementation should be evaluated every 3 months until stable, then every 6–12 months after stable.

Selective. None.

Not recommended. None.

Vitamin deficiencies and supplementation

Recommended

- Postoperative supplementation is recommended to be taken regularly after RYGB. This should include a multivitamin or other preparation that contains at least the following micronutrients in a form that can be absorbed by patients who have undergone RYGB: vitamins C, B1, and B6, folate, zinc, selenium, copper, and chromium. B12 should be taken sublingually, nasally, intramuscularly, or in an oral form that has been shown to have effective absorption. Iron is recommended for menstruating women. Vitamin D, at least 3000 IU, should be taken daily. This may be taken separately or as part of the multivitamin above. Calcium citrate, at least 500 mg/d, should also be included in the vitamin regimen. RYGB leads to a reduction in absorption of several micronutrients, including iron, B12, and potentially calcium. Though there have not been any identified vitamin D absorption deficits with RYGB, the high rate of vitamin D deficiency present in the preoperative population carries through into the postoperative period, with rates of postoperative vitamin D deficiency ranging from 37% to 78%. In addition, patients after RYGB who are not consuming the recommended variety of healthy foods and general multivitamins are at increased risk of other micronutrient deficiencies (examples: vitamin A, zinc, folate, thiamine).

Selective

- Administration of supplements (including multivitamins and thiamine) should be considered during any subsequent admission/readmission. While vitamin supplementation does not appear to be necessary during the index RYGB procedure, it should be considered during any subsequent admission/readmission. Appropriate supplementation may be accomplished by oral route, but in clinical situations that involve reduced tolerance to oral intake, the necessary supplements should be administered parenterally.

Not recommended

- Transdermal patch multivitamins are not routinely recommended. Limited observational studies indicate that this

route is less effective and less predictable than oral supplementation.

- Routine supplementation of vitamins A, E, and K beyond that included in oral multivitamins is not routinely recommended outside of the setting of an identified deficiency or malabsorptive state.

Postoperative radiology studies

Recommended

- Dual-energy X-ray absorptiometry (DXA) for long-term surveillance of bone health. The metabolic changes following RYGB include susceptibility to micronutrient deficiencies, including calcium and vitamin D, and increasing bone loss, starting as early as the first year following RYGB, suggesting the need for regular long-term postoperative bone health assessment. This may increase fracture risk among patients after RYGB, particularly among postmenopausal women. Recent position statements recommend interval post-RYGB bone mineral density assessments with DXA [64].

Body contouring

Recommended

- Body contouring surgery (BCS) assessment at 18 months following RYGB or later once stable weight loss is achieved. While the timing to achieve optimal weight loss following RYGB varies, maximum weight loss is often achieved during the first year after surgery, with most patients having weight stability by 18 months postoperative.

Selective

- BCS after RYGB should be considered for patients with BMIs of 30 kg/m² or less. While most desire BCS, it is performed in approximately 19% of patients after bariatric surgery. Complications after BCS are about 30%, with an increased risk if performed in patients with a BMI $\geq$ 30 kg/m².

Not recommended

- BCS should not be considered in patients post-RYGB with untreated nutritional deficiencies. Protein malnutrition, as well as vitamin deficiencies, such as B-complex vitamins, folate, vitamin A, and vitamin C have been shown to play important roles in the wound healing process, and deficiencies may impair wound healing following BCS. Deficiencies in other minerals (such as zinc, iron, selenium, and copper) may result in increased wound complications. As such, nutrient deficiencies may result in impaired immune function and increased complications after BCS.

- BCS should not be performed in post-RYGB patients who are smokers. Studies have associated smoking with increased infectious complications in patients after RYGB undergoing BCS. In a retrospective cohort analysis of 60 such patients, the relative risk of surgical site infection conferred by smoking was 14 (95% confidence interval: 13.3–16.7) [65].

Smoking

Recommended. None.

Selective. None.

Not recommended

- Smoking after RYGB is not recommended. Smoking among patients with a history of bariatric surgery is as high as 40%, with an estimated 17% smoking recidivism rate, and is independently associated with increased odds of MUs, including persistent or recurrent MU (OR = 14.1) [66] and perforated MUs (26.71% versus 12.62%; $P < .0001$) [67].

Marijuana use

Recommended. None.

Selective

- Recreational smoking of marijuana should be avoided after RYGB. Studies on the impact of recreational marijuana use after RYGB are limited, and reported findings are variable. The recent review by Worrest et al. found that postoperative marijuana use was not associated with a higher complication rate but a trend toward less weight loss [68]. Others have suggested marijuana use may be associated with increased anxiety, grazing behaviors, loss of control eating, binge eating and night eating behaviors and may portend a worse outcome; however, more robust data is needed.

Not recommended. None.

Alcohol and substance use

Recommended

- Monitoring of alcohol or substance use during follow-up visits.

Screening for alcohol or substance use should be performed at each of the follow-up visits after RYGB [69]. Patients at high risk for alcohol and substance abuse disorder (ASUD) include those who have had the RYGB procedure, preoperative ASUD, younger age, male gender, history of more than 2 drinks/wk before bariatric surgery, and history of attention deficit hyperactive disorder. Providers should be aware of the risk of new-onset ASUD after RYGB and

assess patients in the postoperative period, as studies have shown up to a 3-fold increased incidence of alcohol use disorder (AUD) after bariatric surgery, up to 3-fold compared to controls [70].

- On suspicion of AUD, the American Psychiatric Association (APA) recommends patients should be referred for evaluation and for a comprehensive and patient-centered treatment plan.

Selective

- Alcohol Use Disorders Identification Test (AUDIT) screening questions should be utilized in conjunction with AUDIT Consumption for better sensitivity and specificity for detection of AUD.

Not recommended. None.

Conclusion

This document can serve as a pathway to assist providers in the early and long-term postoperative care of patients undergoing RYGB, with the goal of improving healthcare quality and surgical safety. There are multiple areas without level 1 evidence, and further research is needed. This pathway should be updated as more robust evidence emerges.

CRedit authorship contribution statement

Michael A. Edwards: Conceptualization, Methodology, Data Curation, Writing-Original Draft, Writing - Review & Editing, Project Administration. **Kinga Powers:** Methodology, Writing-Original Draft, Writing - Review & Editing. **R.Wesley Vosburg:** Methodology, Writing-Original Draft, Writing - Review & Editing. **Randal Zhou:** Writing-Original Draft, Writing - Review & Editing. **Andrea Stroud:** Writing-Original Draft, Writing - Review & Editing. **Nabeel R. Obeid:** Writing-Original Draft, Writing - Review & Editing. **John Pilcher:** Writing-Original Draft, Writing - Review & Editing. **Shauna Levy:** Writing-Original Draft, Writing - Review & Editing. **Karina McArthur:** Writing-Original Draft, Writing - Review & Editing. **Givi Basishvili:** Writing-Original Draft, Writing - Review & Editing. **Amy Rosenbluth:** Writing-Original Draft, Writing - Review & Editing. **Anthony Petrick:** Conceptualization, Writing - Review & Editing. **Henry Lin:** Writing - Review & Editing. **Tammy Kindel:** Conceptualization, Writing - Review & Editing, Supervision, Project Administration.

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Supplementary data

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